As dead as a Dodo?:

Public understanding and support *vis-à-vis* biodiversity and biodiversity loss.

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Abstract

The *Convention on Biological Diversity* and its derivative literature call for increases in public understanding and support as a condition for successful strategies to conserve biodiversity. Yet practically no relevant data exist. This research attempts to redress this situation by exploring UK public understanding and support *vis-à-vis* biodiversity. It employs a structured in-depth interview as the main data-gathering instrument, applying it to 126 individuals selected according to their relationships to nature and wildlife, their positions in relation to local and regional government decision-making, and their representation of different occupationally-based social classes. The findings, if representative of the wider population, suggest that the public's understanding of biodiversity is poor, its levels of participation in efforts to conserve it are low, that attitudes towards biodiversity *per se* are largely non-existent, but that there is a considerable amount of interest in wildlife and nature.

In looking at ways in which biodiversity education might be developed, consideration is given to the influences and debates that are likely to have greatest influence, and to the potential sources for this education. The principle obstacle to an effective biodiversity education is identified as the science/public divide, but the characteristics of biodiversity as a subject are recognised as enabling it to form a bridge between the two. Stables' (1998) three-tier conceptualisation of literacy is adopted as part of the framework for assessing the different sources of biodiversity education, and some, notably wildlife gardening and wildlife NGO activities, are found to provide significant opportunities in this respect. Given the nature of the subject and the research findings, it is argued that a good level of literacy should be coupled with good communication skills and the ability to address the issues beyond the science base to include the social, cultural, political, moral and aesthetic aspects. It is concluded that those best qualified to provide 'critical biodiversity literacy' should perhaps be sought in the discipline conservation biology rather than that of environmental education. The ramifications of the research for implementation of the *Convention on Biological Diversity* are considered. Recommendations for further research and biodiversity education are also made.

Preface

What set me on the path through this doctoral thesis, was a recognition that whilst the subject of education remained largely marginalized within conservation biology research and practice, usually paid little more than lip service, the need for increased public understanding and support was a principle mainstay of nearly all major policy documents relating to biodiversity conservation. From the Convention on Biological Diversity itself, through leading writings on conservation strategies, to the smallest local Biodiversity Action Plans (BAPs), the call has been for major changes in public understanding and support if efforts to slow and halt the present mass extinction event are to succeed. With education identified as the principle mechanism in achieving these changes, the questions which have come to nag me are: if changes in understanding and support are so fundamental and urgent to the process of conserving biodiversity, then what do present levels of understanding and support actually look like, and how might they most effectively be improved?

The paucity of dedicated research subsequently encountered in this area might largely result from a tendency amongst conservationists (many of whom have but a poor understanding of the social sciences) to accept the existence of a causal relationship between knowledge, attitudes and behaviour, and to view conservation education as a primarily fact-based supply process. Thus for example, in *Research Priorities for Conservation Biology* Soulé and Kohm identify the priority areas of research as including the effects of social and economic change on biological diversity, pinpointing changes in expectations and consumption as a key subject of study. Yet the *only* research question pertinent to education they suggest is *"What information do farmers, conservationists, corporations, politicians and other groups need about the biological sources they effect?"* (Soulé & Kohm 1989, p.68). They see the problem as one of information supply, and give no recommendations for finding out: what the individuals in these groups already know, think or understand; how their knowledge or opinions develop and how the relationship between their knowledge, opinions and behaviour might operate. With a wealth of evidence and contemporary mainstream educational theory supporting the view that desired changes in peoples attitudes and behaviour are unlikely to be achieved simply by supplying information, unless the relationship between them is explored and better understood, even the answer to Soulé and Kohm's single research question will not be forthcoming.

In attempting to address my principal questions, I have come to identify with Glacken's sense of travelling in academic regions "whose borders are patrolled by men who know every square foot" (Glacken 1967, xiii). As one essentially trained in the biological sciences, my encounters with sociology, social psychology, and social science research methodology, have been both exhilarating and intimidating. The main difficulty has been delimiting the realm of investigation and the topics, issues and materials to be included therein. Hopefully, the reader will find my self-imposed borders acceptable, and appreciate the question-seeking nature of this work, the need for considerably more research in this area, and seen this contribution as but a modest step in that direction.

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List of Abbreviations used in text

AAAS - American Association for Advancement of Science

ADS - Aggregated Data Set – main survey data for all respondents in the main survey, less those for the Conservation Biologists

BAP - Biodiversity Action Plan

BARB - Broadcasters Audience Research Board

BUX - Biodiversity Understanding Index - a main survey index (see appendix III)

CCC - Canterbury City Council

CEC - Commission of the European Communities.

CGBD - Consultative Group on Biodiversity

CoEQ - Council on Environmental Quality (USA)

DETR - Department of the Environment, Transport and Regions (UK)

DfEE - Department for Education and Employment (UK)

DoE - Department of the Environment (UK)

EAX - Environmental Activity Index - a main survey index (see appendix III)

ESA - Environmentally Sensitive Area

FDS - Full Data Set – main survey data for all respondents in the main survey, including those for the Conservation Biologists

IUCN - International Union for the Conservation of Nature

IZY - International Zoo Yearbook

KBAP - Kent Biodiversity Action Plan

KCC - Kent County Council

KPMG - KPMG Peat Marwick McLintock, Management Consultants for the Environment

MEX - Environmental/wildlife organisation Membership Index

MORI - Market and Opinion Research International

NHM - Natural History Museum, London

POX - Pet Ownership Index - a main survey index (see appendix III)

RSPB - Royal Society for the Protection of Birds

RSPCA - Royal Society for the Prevention of Cruelty to Animals

SCPR - Social and Community Planning Research (formally the British Attitudes Survey)

UKBAP - United Kingdom Biodiversity Action Plan

UNEP - United Nations Environment Programme

VAT - Value Added Tax

WAX - Wildlife Activity Index - a main survey index (see appendix III)

WCMC - World Conservation Monitoring Centre

WWF - World Wide Fund for Nature

ZSL - Zoological Society of London

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Chapter 1. Introduction

> "The public's lack of awareness of the importance of biological diversity - its relevance to every day life, the benefits from the use of its components and the consequences of its loss - is a major constraint which must be overcome if biodiversity conservation and sustainable use efforts are to succeed. Indeed, efforts to conserve biological diversity cannot succeed without the general public's understanding and support."
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> Glowka, Burhenne-Guilmin and Synge (1994, p.68).

1:1 Biodiversity loss: The nature and extent of the problem.

The world faces a plethora of problems caused by human agency. Many are expressed in the degradation of our natural environment and in the deleterious effects this has and is likely to have upon human societies. Some of these so-called environmental problems, though serious, could, at least theoretically, be largely solved within a few generations; the thinning of the ozone layer resulting from the release of CFC gases and the severe pollution caused by urban traffic congestion, are two examples. Of the others, a few, such as the disposal of nuclear waste, will require tens, perhaps hundreds of thousands of years to overcome. However, only the loss of genetic, species and ecosystem diversity, will take millions of years to remedy (Wilson 1984).

'Remedy' is the correct word to use, because this loss will certainly never be fully replaced. Each species contains a large reservoir of unique genes, so even if in time very similar species were to emerge, it is practically impossible for the same organisms to re-evolve. Recovery can never really be complete, and any which occurs will take a very considerable amount of time. Wilson (1992) gives the period of recovery from each of the five major extinction events in geological history as: Ordovician - 25 million years, Devonian - 30 million years, Permian and Triassic (together) - 100 million years, and the Cretaceous - 20 million years. Clearly, the time-scales involved are so huge in relation to that of human civilisation that the biodiversity loss comprising the present extinction event can effectively be thought of as permanent.

The level of global species diversity, the usual unit by which biodiversity is measured, is not accurately known and the operation of extinction processes is poorly understood. It is not surprising therefore, that expert estimates as to the extent of anthropogenic species extinction vary considerably. Myers (1995) suggested that as many 50% of all extant species would be lost in the next 50 years. Diamond advanced the same proportion over the next century (Diamond 1990). Several authors have given estimates of between 20-25% of the earth's total biological diversity being at serious risk of extinction during a 20-30 year period (Myers 1985; Lovejoy 1986; Raven 1988; IUCN/UNEP/WWF 1991). Reid (1992) has argued that there will be a 2-13% global reduction between 1990 and 2015, with a possible 17-35% loss of tropical forest species by 2040, whilst Soulé describes the probable disappearance of over half of all species in the next 50-100 years (Soulé 1986).

Although percentage estimates vary, there is widespread agreement amongst experts (Ayres 2000) that the extinction process humanity has set in motion is very substantial and the largest in recent geological history (Wilson 1984; Magin *et al.* 1994). However, it is not the magnitude that is causing most concern. Indeed, extinction is a natural part of evolution and as many as half of animal species were lost during earlier extinction episodes (Raup 1988). It is the present rate of disappearance, generally thought to be 100-100,000 times pre-human levels, which is unprecedented (Goldsmith & Hildyard 1989; Wilson 1992; Pimm *et al.* 1995) and which is seen as particularly worrying. Jablonski (1986) estimates the average background extinction rate over the past few hundred million years to have been approximately one species *per* year, whilst other calculations give figures of 1-10 species *per* year (Tuxill 1999), 90 species of vertebrate *per* century (Raup 1986), and one species every 27 years for higher plants (Myers 1988). If the frequently quoted estimates of anthropogenic extinction rates of animals and plants, which range from 50 species *per* day (Myers 1993b) to 100,000 *per* year (WCMC 1992), are approximately correct, then the current rate is extraordinarily high. Indeed, there is no evidence that it has been higher in any period of the earth's existence. This loss is occurring within a tiny period in geological terms, just one or two human generations, and is paralleled by a similar pattern of disappearance of genetic variation within species, and of the diversity of communities and habitats. The capacity of the global ecosystem to adjust, reorganise and make long-term evolutionary responses that enable it to maintain its dynamic processes, is questionable (Briggs 1991); arguably its capacity to withstand such a shock has never before been tested.

Many prominent authors, including Myers (1989, 1994), Eldredge (1993), Wilson (1991), Diamond (1990), Ehrlich and Ehrlich (1982), and Huston (1994) agree that since biodiversity may be vital to the continued habitability of our planet, the very existence of humanity may depend upon our being able to drastically slow the rate of biodiversity loss. Others, more modest in their predictions, point out that biodiversity helps maintain the integrity of ecosystems and landscapes (Kim & Weaver 1994) and that the elimination of a large proportion of terrestrial plant species and key environments is a historically unique event which will profoundly diminish global evolutionary capacity (Soulé & Wilcox 1980). Even if these views prove to be exaggerated, it is almost unanimously held that extant biodiversity is very important to the future of our species, and that any sizeable loss might remove an 'insurance policy' against major environmental changes (de Vries 2000) and would be a tragic waste of potentially extremely valuable resources (e.g.

Wilson 1992; Leakey & Lewin 1996). A very small number of authors question the significance of present extinctions (e.g. Simon & Wildavsky 1993), but a large and increasing section of the expert community now insists that the processes that are causing declines in biodiversity need to be addressed with some urgency. This is a view typified by the words of McNeely *et al.* (1990) in the concluding paragraph to *Conserving the World's Biodiversity*, a landmark publication supported by The World Bank, The World Resources Institute, The International Union for the Conservation of Nature, Conservation International, and The World Wide Fund for Nature.

> "We are at a cross-roads in the history of human civilisation. Our actions in the next few years will determine whether we take a road towards a chaotic future characterised by over-exploitation and abuse of our biological resources, or take the opposite road - toward maintaining great biological diversity and using biological resources on a sustainable basis. The future well-being of human civilisation hangs in the balance."
>
> McNeely *et al* (1990, p. 132).

1:2 Biodiversity loss: The need for changes in people's understanding and support.

Although the words of McNeely *et al* (1990) are perhaps overly pessimistic in terms of the effects of biodiversity loss on human civilisation, less contentious is their view that until human activities come into line with the realities of the earth's resource capacities and processes, the planet's life-support systems will continue to be eroded. As part of the widespread acknowledgement of the problem, many key texts arguing for the importance of preserving biodiversity or protecting the environment, identify the need for widespread changes in people's behaviour as a crucial element of successful strategies for doing so. For example, the introduction to *Caring for the Earth: A strategy for Sustainable Living*, a key publication which grew out of the earlier *World Conservation Strategy* (IUCN/UNEP/WWF 1980) and the 1987 report of the World Commission on Environment and Development, *Our Common Future* (WCED 1987), states that it "is founded on the conviction that people can alter their behaviour when they see that it will make things better." (IUCN/UNEP/WWF 1991, p.1).

In accepting the need to change people's behaviour there is also recognition that the required changes cannot be achieved by coercion. Solutions to environmental crises rest neither with the scientists nor with government officials. Ultimately, they rest with a citizenry educated in environmental problem solving (Hawkins & Vinton 1973), an informed, educated public (Stucky *et. al.* 1987). If this citizenry does not exist at present, the necessary behavioural changes will be reliant upon changes in people's attitudes and understandings. This requirement is widely accepted. For example, it underlies the Council of Europe's declaration that effective actions for environmental protection are dependent upon the informed support of interested parties and the general public (CoE 1995). The same view is also explicitly stated in many texts concerned specifically with biodiversity. For instance, one of the main principles laid out in *Biodiversity: the UK Action Plan* - the plan that followed Britain's signing of the *Convention on Biological Diversity* at Rio de Janeiro in 1992 - is that biodiversity conservation "requires the care and involvement of individuals and communities" (DoE 1994a, p.15). The report also states that in achieving human behavioural change (one of its three primary objectives) there needs to be an increase in public awareness of, and involvement in conserving biodiversity. This argument reiterates the content of Article 13 of the *Convention on Biological Diversity* which maintains that the public's lack of awareness of the importance of biological diversity is a constraint which must be overcome if biodiversity conservation and sustainable use efforts are to succeed. Article 13 requires that Contracting Parties shall:

> "Promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity, as well as its propagation through the media and the inclusion of these topics in educational programmes."

Essentially the same message is repeated throughout a considerable body of literature, from the international agreements, through agenda for conservation action set by the voluntary sector (Wynne *et. al.* 1995), to regional and local Biodiversity Action Plans (e.g. CCC 1995, KCC 1997). As the quote is at this chapter's head shows, efforts to conserve biological diversity cannot succeed without the general public's understanding and support (Glowka, Burhenne-Guilmin and Synge 1994). With education and increased involvement so widely accepted as an essential part of any effective conservation strategy, one might easily assume that governments simply need develop appropriate policies to encourage an increase in understanding and support *vis-à-vis* biodiversity. However, for appropriate policies to be developed and for these policies to result in effective actions, a body of research evidence concerning the degree and nature of this understanding and support needs to exist. There also needs to be proven and effective means for developing this understanding and support. In fact, as the next section demonstrates, so far both needs have barely been addressed.

1:3 Existing evidence of public understanding and support vis-à-vis *biodiversity*

With the rapid growth of environmentalism, over the past two decades environmental attitudes and behaviour, and the relationship between them, have attracted a significant amount of attention from a variety of sources (Hackett 1995). These include environmental organisations, government policy makers, manufacturing industry and academics. A substantial amount of empirically based work has been produced but relatively few studies have gone beyond the attitude/behaviour interface to explore the underlying structure of environmental attitudes (Hackett 1995). Few studies have looked at the main components of which these attitudes are comprised. Similarly, hardly any research has been conducted into what the public actually knows about environmental issues, or what the relationship is between this knowledge and either environmental attitudes (Arcury 1990) or environment-related behaviour. Even the few studies which have assessed people's knowledge have done so in order to evaluate its relationship with attitudes and/or behaviour, or to simply compare knowledge levels across different groups (see for example the use of knowledge scales by Arbuthnot 1977; Ramsey & Rickson 1976; Schahn & Holzer 1990; Syme, Beven & Sumner 1993). A more considered exploration, reporting and discussion of the nature and levels of this knowledge does not appear to have taken place, and explorations of the nature of people's understandings of, and support for, particular subjects, are largely absent from the literature.

Within the specialised field of conservation biology, Hagvar's (1994) observation that there has been very little discussion of the importance of attitudes is still true today. In relation to the subject of biodiversity and the issue of biodiversity loss in particular, a review of the associated literature reveals virtually nothing that deals with either knowledge, understanding, attitudes or support. It confirms Pollock's finding that there exists "...no substantive research on the UK public's understanding of biodiversity *per se.*" (Pollock 1995, p.2).

One exception is the small qualitative sectorial study by Thomas and Chetwynd (1995) commissioned by the Department of the Environment as part of its activities relating to the UK Biodiversity Action Plan, and conducted in parallel with Pollock's (1995) review of related quantitative research. Their study investigated understandings of, and involvement in, the conservation and enhancement of biodiversity amongst professionals from ten UK employment sectors,[1] and involved individuals who had declared a strong interest in environmental issues relating to their own sector. It consisted of 27 in-depth interviews looking at each person's professional understanding of the concept of biodiversity, its relevance to their sector and their own involvement in biodiversity conservation and enhancement together with their ideas of related good practice and of the barriers and constraints to action. These interviews were followed by four group discussions combining certain sectors around themes[2] and considering the issues in greater detail and focusing on 'good practice' and its dissemination.

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[1] These being: landowners and land managers; industry and commerce; education; youth, community and the Church; planning; engineering; architecture; media; 'Green' groups; environmental consultants.

[2] These being: the built environment; agriculture and land management; industry and commerce; education, community and the Church.

Because its qualitative nature, Thomas and Chetwynd (1995) produced few hard data. Most findings were reported in general terms and illustrated with quotations from participants. Only two questions explored respondents' direct understanding of the subject. One question asked them what the term 'biodiversity' means, another considered its value and importance. In several sectors the word 'biodiversity' was said not to be used at all and representatives reported that they felt at a distance from it. So in these sectors the idea of biodiversity was explored using the terms "nature conservation", "wildlife" and "ecology" (Thomas & Chetwynd 1995, p.6). Understandings of biodiversity were reported as being most commonly species-based, with its importance being recognised in terms of its economic and utilitarian benefits, its value for maintaining ecological systems through the interdependence of species, and its aesthetic and cultural aspects. Some interviewees, notably those with "ecological" backgrounds, related this importance to society's use of the environment, with biodiversity preservation being seen to mean preserving human life as well. More generally, with the exception of the "green" activists and consultants, the relevance accredited to biodiversity broadly related to how closely the activities of the particular sector contacted the environment. Thus farmers accepted themselves as having greatest responsibility for biodiversity, and the media, industry/commerce, youth/community sectors, the least.

Perhaps the most valuable findings concerned the perceived barriers and constraints affecting individuals' or organisations' "....ability to act in relation to either biodiversity specifically, or conservation more generally." (Thomas & Chetwynd 1995, p.15). Participants identified a lack of awareness and understanding of the subject as a major barrier to action. They also noted a lack of knowledge of personal connections with the processes of the production and consumption of goods and services, and the greater concern given to issues of employment, education and health. In addition, the general view was that 'biodiversity' was something the public associated with nature reserves. Not only was it seen to be of little relevance to most people, but also the costs of taking action to conserve it were seen as high, and a lack of easily accessible, clear, practical, and reliable information about the subject, thought to be a key obstacle to public understanding.

Thomas and Chetwynd (1995) was complimented by Pollock's somewhat eclectic literature survey which tried to assess current levels of awareness about UK biodiversity (Pollock 1995). In it he considered the social context in which biodiversity information is produced and consumed, and reviewed some of the more general quantitative data about environmental concern. He also referenced work by Burgess, Harrison and Filius (1995), which revealed an inconsistency in people's perceptions about environmental problems and the solutions they have to offer. Pollock (1995, p.46) concluded that there exists "....enormous residual enthusiasm for nature and the natural world" but the public neither understands the issues nor believes government capable of effective action in dealing with them. One of his specific recommendations was that the DoE fund "a major, bench-mark survey of the public's engagement with environmental issues"; biodiversity loss included (Pollock 1995, p.48). Unfortunately, no such investigation has been conducted to date (2001).

The meagre evidence produced by these two studies is supported by data from overseas. A stratified national public opinion survey on biodiversity was conducted in the USA (Hart Associates 1993, cited in WWF-USA 1996). It found that when asked an open question, just 1% of people identified endangered species loss as a serious environmental problem, and only 22% admitted to ever having heard about the "loss of biological diversity". When presented with scientific 'facts' about this loss, nearly 60% subsequently expressed high levels of concern by selecting 8 or above on a 10 point scale. The survey was coincidentally paralleled by a WWF led research survey designed to assess U.S. educators' needs, wants and current practices related to biodiversity (WWF-USA 1996). This study suggested there was considerable support expressed amongst both formal and non-formal educators for environmental and biodiversity education, and a high level of self-declared understanding of the concept and related issues (87% agreeing that they understood, 37% strongly). However, this question had followed a brief definition of the term itself: "Biodiversity refers to the variety of life on Earth. It is a contraction of biological diversity and includes genetic diversity, species diversity, and ecosystem diversity." (WWF-USA 1996, p.8). So such positive responses could well have been generated by a consideration of this definition. Moreover, the study did not include detailed measures of the nature and extent of the educators' understanding of the subject.

The Consultative Group on Biodiversity (CGBD 1998), Wisconsin, USA, commissioned focus group and survey research into public attitudes on biodiversity. They reported that although people tend to understand nature as "connected and interdependent" virtually none recognised the word itself. Furthermore, most did not understand the causes and seriousness of species decline, and only when the issue was explained to them did they express "support" for biodiversity conservation (CGBD 1998, p.2). The study found participants to be poorly informed about biodiversity and unconvinced of its magnitude and importance. Many believed nature to be capable of balancing itself and the current extinction event to be a natural process. Species were thought to be able to adapt to most environmental changes, and many new ones to be continuously created. The researchers produced a detailed list of objectives for biodiversity education. However, they did so without exploring either their subjects' knowledge or understandings in any real depth, or what they meant by 'support'; only the relative importance given to different forms of habitat and species loss was considered. As such, though providing some useful ideas and a few relevant data, this research is of limited value to the present study.

Another overseas study was a qualitative one conducted in 1997 in Holland by Wals, Van Weelie & Geesteranus (Wals, Van Weelie & Geesteranus 1997; Van Weelie & Wals 1998; Wals, 1999). This used nine 'expert' interviews and the "Delphi" approach (Linstone & Turoff, 1975) and provides possibly the most detailed English language investigation to date which looks at the meanings, values and the uses a public associates specifically with biodiversity. It is particularly pertinent because it also considers the role of biodiversity in relation to attitudes, behaviour, and environmental education. The general conclusion of this work is that:

> "Biodiversity can have different meanings depending on the user and the context in which it is used. Even within the scientific arena a great number of biodiversity meanings and interpretations can be distinguished. It is not uncommon to find that scientific, political and symbolic meanings are used interchangeably by the same person. Both the knowledge base and the value base of biodiversity are variable and to a degree unstable and questionable."
>
> Wals (1999, p.5).

The original study was of nine experts and thirty-two individuals (in the Delphi round) representing public service workers (4), youth representatives (7), policy makers (3), and artists/writers (4), but most were educators (14). Findings were therefore not representative of the wider population. Moreover, the sample was predominantly made up of persons with much higher than average levels of formal education, and each 'expert' also embraced multiple fields. These included pedagogy, biology, environmental education, environmental policy, the philosophy of social sciences, and the philosophy of biology, with just one of the four 'biologists' representing biology as a single field (Wals 1999, p.82). The other biologists classified themselves as also belonging either to the category 'the philosophy of biology' (2) or 'environmental education' (1). Given the qualitative approach employed, the highly educated cohort and the range of individuals' interests, it is not surprising that Van Weelie, Wals and Geesteranus (1997) encountered a "continuum" of meanings and reported a variety of understandings being offered by this group. Most interviewees were likely to have been well able to offer some sort of interpretation of the concept of biodiversity (even an 'educated guess' based on the construction of the word) and to do so irrespective of the accuracy of their personal knowledge or the quality of their understanding, neither of which were assessed. Despite the heavy skew of the sample towards the better educated citizenry, the authors still concluded that literacy should be a key objective of biodiversity education, that 'species richness' provides the most appropriate kind of variability to address initially in educational programmes, and that biodiversity is a subject best learnt experientially in one's immediate "backyard" (Wals 1999).

The final set of data come from a simple poll carried out in 1998 by the American Museum of Natural History (AMNH), which sought to find out the general public's awareness concerning the mass extinction event the planet is undergoing. Unfortunately, the number of respondents was not indicated. However, in reporting its conclusions, Ayres (2000, p.544) states that "...most people were unaware that we are in the midst of a biological crash - or that it is a crash we have brought upon ourselves.". Respondents had neither heard of 'biodiversity', nor knew about the present major spasm of biodiversity loss.

The available evidence points to the subject of biodiversity hardly existing in the public mind. Some individuals profess an interest in biodiversity and a desire for themselves and the general public to learn more about it, but these tend to be the better educated subjects and they appeared, along with nearly all those surveyed in the above studies, to have, at most, a meagre understanding of the subject. These studies demonstrate little else, although they do maintain that there is a need for widespread public education about biodiversity. To date it seems that no study has explored public knowledge and understandings, attitudes and behaviour *vis-à-vis* biodiversity in any great detail. This research is intended to go some way to redressing this situation for the UK context.

1:4 Thesis aims, objectives and structure

This thesis is predicated upon an acceptance of the reasoning outlined above. Focusing on the situation in the UK, it argues that if biodiversity loss is indeed a significant problem and there is a need for substantive developments in people's understanding and support, then it is imperative to assess existing levels of this understanding and support and consider the processes by which they may have been formed. It takes the view that only when such information exists can appropriate and effective suggestions be made as to how to best increase levels of understanding and support *vis-à-vis* biodiversity. The overarching aim is to identify means by which the demand for increased understanding and support made in the *Convention on Biological Diversity* and its derivative literature (particularly the *UK Biodiversity Action Plan*) might be most effectively met. In attempting to realise this aim, its principal objectives are to explore people's understanding of biodiversity and biodiversity loss, and their support for actions to curb this loss, and consider the means by which such understanding and support might be effectively increased. A secondary objective will be to consider any policy implications the research findings might have and develop an agenda for further research. The following research questions (following Campbell *et. al.* 1982, Robson 1993) will be considered:

- In the UK, what is the nature of people's knowledge, understanding and support *vis-à-vis* biodiversity and biodiversity loss?

- What patterns, if any, exist in this knowledge, understanding and support, and how are they affected by specific socio-demographic parameters and the membership of certain groups (such as wildlife organisations)?

- What might be the most important sources of learning about biodiversity, how could these most effectively serve to increase understanding and support *vis-à-vis* biodiversity, and what policy and research implications might these have?

In addressing these questions, the approach adopted does not adhere rigidly to the usual logico-deductive model of knowledge generation. Being an exploratory study of such a little-studied area, it is the type of research Robson would describe as "hypothesis generating" rather than "hypothesis testing" (Robson 1993, p.19). The structure of this thesis is as follows:

Chapter 2 provides a background picture to the existing research in this area, explains and justifies the general approach adopted in this study, and provides definitions of the key concepts it will use. Chapter 3 describes the research process and methods employed for the collection of data, as well as explaining the initial data manipulations in the main survey. Chapters 4 and 5 present the findings from main survey and discusses them in relation to the research questions, their wider context and other related research, and the development of the general approach adopted. Finally, Chapter 6 discusses the subject of biodiversity education and Chapter 7 presents the conclusions and makes recommendations for subsequent research and educational activities.

At this point a brief word should be said about the disciplinary orientation of this thesis. It will quickly become obvious to the reader that the investigation draws on material from a range of disciplines, including ecology, social psychology, environmental education, and environmental sociology. Some conservation biologists might find it difficult to accommodate a piece of work that is so distanced from the practice of actually researching or managing wildlife. Possibly, those accessing it from other disciplines will be frustrated by its seemingly eclectic setting in a 'no-man's land' lying outside conventional disciplinary boundaries. But this positioning is deliberate, for the thesis sees itself as part of the "metadiscipline" which conservation biology embraces, deriving knowledge from individual disciplines and attempting to synthesise new insights from this (Jacobson 1990). It is over 20 years since the publication of Soulé and Wilcox's seminal text *Conservation Biology* (Soulé & Wilcox 1980), and 16 years since the creation of the Society for Conservation Biology in 1985 (Hannigan 1995). Since then the base of conservation biology has expanded considerably and continues to do so. Hopefully, this thesis will prove to be a valuable contribution to this process.

Chapter 2. Main theoretical frameworks: developing an approach to the methodology

Introduction

Chapter 1 presented the issue of biodiversity loss, established the importance of people's understanding and support in relation to attempts to slow it, and considered existing studies in this subject area. Of just three studies that gathered detailed data (Thomas & Chetwynd 1995, Wals, Van Weelie & Geesteranus 1997, CGBD 1998) all were of a predominantly qualitative nature, whilst the research by Hart Associates (WWF-USA 1996) and the American Museum of Natural History (Ayres 2000) produced few and somewhat superficial quantitative data concerning very broad aspects of the issue of biodiversity loss. Together the studies and the conclusions drawn from them are of limited value in relation to the research questions this thesis poses. They suggest that vague or partial understandings exist amongst individuals selected from specific sectors, but provide little evidence in respect to the precise nature of the knowledge, understanding and support involved. In developing a methodology for gathering this sort of evidence it is important to understand why these studies have taken the form they have and why they have reached rather general, imprecise conclusions. Amongst numerous developments of possible significance, four stand out as being particularly important. They are:

- the legacy left by the development of natural history and the naturalist tradition;
- the social construction of nature debate;
- developments in environmental education and environmental education research; and,
- attempts to improve the public understanding of science.

Whilst those relating to natural history or the public understanding of science, are reflected in relatively long-standing divides which provide a backdrop to existing studies of understanding and support *vis-à-vis* biodiversity, others, such as the 'social constructionst' approach to explaining environmental concern, are quite recent, and inform the approaches individual studies have employed. As shall be seen, they are interwoven with each other to form a *nexus* within which the above studies have been posited. This chapter will discuss this *nexus* and thereafter set out the approach used in this thesis.

2:1 Existing evidence of public understanding and support vis-à-vis *biodiversity: background developments and debates.*

2:1:1 The naturalist tradition and natural history

Although the concept of biodiversity itself is relatively new, learning associated with some aspects of biodiversity, notably the study of species diversity, has a long and illustrious history. Much of this is rooted in the systematic collecting and recording which was the passion of many Victorians, and in the somewhat older past-time of studying “natural rarities and wonders of all sorts” popular in the seventeenth century (Whitaker 1996, p.75). Possibly the most long-standing of the organised influences on learning about biodiversity in Britain, has been the tradition of the natural historian, a tradition whose origins can be traced back to the system of classification devised by the eighteenth century physician Linnaeus, itself derived from the work of Aristotle. Through their participation in field clubs, societies, and larger organisations, naturalists have accumulated a considerable amount of new biological knowledge and developed a great deal of expertise, much of which accredited to amateurs (Morris, P. 1987; Harrison 1993; Outram 1996). A major impetus was provided when Darwin brought the Copernican revolution to science through the employment of Baconian principles of fact collection (Marshall 1992). This resulted in the blossoming of popular interest in the natural world during the late nineteenth and early twentieth centuries. Examples include the study of the seashore which accompanied the appearance of sea-bathing as a fashionable past-time, and the various ‘crazes’ that swept the nation (Allen 1996), such as fossil hunting and what Kingsley in 1904 described as the then current “Pteridomania” (“fern-mania”, Kingsley 1904, p.3).

Gone was the writing style characterised by variety and contrast, and specifically designed to cause wonder in the reader through careful juxtaposition (Whitaker 1996); gone was the “irrational cabinet”. In their place appeared “the cabinet on the world” (Hooper-Greenhill 1992), systematically organised museums of natural history and a popular, yet organised writing which combined the Aristotelian tradition of classifying with the Baconian approach to knowledge, and which:

> “ [made] the way plain for those who wish to acquaint themselves with the structures, habits and histories of living animals; while for students a still greater supply of excellent manuals and text books has been, and still continues to be, forthcoming.”
>
> Hutchinson (1893, ix).

This picture still endures, yet the structure of biological science in which it appeared, has changed dramatically. With Darwinism boundaries were drawn between existing areas of biology, notably between scientific zoologists and the systematists, and new areas such as evolutionary morphology appeared (Nyhart 1996). Haeckel (1834-1919) was the principle architect of these changes through his reunification of systematics and morphology using anatomical and developmental studies based on preserved materials (Nyhart 1996). His approach embodied a move to analytical laboratory-based experiments, which itself was conceptualised as an evolutionary progression, with the laboratory viewed as housing the ‘cutting edge’ of the biological sciences. The result was that traditional systematics was forced to find its home largely in museums outside the universities, and amidst the continued expansion of the biological sciences, natural history, though remaining healthy, underwent a relative decline Nyhart (1996). Having expanded rapidly along with British imperialism (Browne 1996); having produced bounteous 'trophies of empire' which adorned museums and zoos all over the country, the natural history of collecting, describing and classifying became just one branch of biology amongst others, and one of a relatively low status.

Natural history was thereby faced with a problem. Unlike physics and chemistry whose domain was the laboratory, and unlike much of the rest of biology now similarly confined, the natural world was open to all and remained both academic and immensely popular at the same time. As a means of legitimating and distinguishing their own research, academic natural historians actively sought to deepen this division by defining the 'amateur' naturalist with a word implying a mere fondness for the subject and a lack of skill (Drouin & Bensaude-Vincent 1996). At the same time academics felt the need to don the strict, scientific cloak of their colleagues and disassociate themselves from the early 19th century Romanticists' sense of harmony between the human state of mind and natural landscapes, a sense embodied in the title of Gosses's (1861) popularist text *The Romance of Natural History.*

Whilst the tradition of the 'amateur naturalist' lived on in field clubs and natural history societies (Lowe 1983), these groups too sought to distinguish themselves from the general public in order to achieve a degree of scientific legitimacy (Allen 1976). A long tradition was established of non-vocational natural history courses offered to the general public and taught by 'experts' from natural history societies (Thomas 1993). With its emergence as a subject area, there was a flood of adult education courses in ecology during the 1930s and 1940s. However, these declined over the following decades, so that nearly all courses remaining today, once again deal with identification (Thomas 1993, p.36). This decline was partly due to the word ecology being highly politicised by the environmental movement, but was mainly because it became more scientific. Responding to the sort of ridicule heaped on it by the likes of Sir Arthur Tansley, who described it as "old natural history masquerading under a high-sounding name - and not always good natural history at that!" (Tansley 1951, cited in Tilling 1993), ecology followed in the direction of those biological fields which had appeared at the turn of the 19th century. It too gradually consolidated itself as a 'proper' scientific discipline and distanced itself from the public to reach its present respectable status in the 1960's. Natural history, largely in the form of simple species identification and observation, was again left as the only area of biology readily accessible to the public, and the rift between systematics and other biological disciplines thereby reaffirmed. Moreover, the status of systematics continued to decline, so that today it occupies a lowly position in the hierarchy of disciplines and the term 'natural historian' sounds "quaintly old fashioned or even abusive"

(Secord 1996, p.449). As the 19th century drew to a close, what Lowe describes as the "natural history period" in the history of British nature conservation, was eclipsed by the "preservationist period" (Lowe 1983, p.329), partly in response to concerns about excesses of over-collection, but partly in response to the institutionalisation of the scientific study of biology.

A division between biological sciences, natural history and the public, was thus created which tended to compartmentalise 'serious' scientists, amateur naturalists and the public such that only the latter could openly indulge its wonder and pleasure in the natural world, and only the scientists (and to a lesser extent, the amateur naturalists) legitimately possess objective knowledge about nature. The establishment of the Nature Conservancy Council in 1949 marked the final separation of the study of nature from its enjoyment, and was accompanied by its removal from a popular basis of support (Sheail 1976). This is of no great surprise considering that its first chairman was Sir Arthur Tansley himself (Sheail 1976, p.215). By the time Harrison (1993) came to explore public perceptions of conservation at Rainham Marshes, the rift between the public and the experts was so great that she reported the specialist knowledge involved as knowledge which her focus group members were simply unable to access. The same observation seems applicable to most participants in Thomas and Chetwynd's (1995) sectorial study. On the one hand there are the 'experts' who have knowledge about nature; on the other hand the 'public', whose understandings are largely derived from 'unscientific' observations and feelings. This divide was also observed amongst Wals, Weelie and Geesteranus's (1997) study group participants, and may well cut to the heart of the public understanding of biodiversity. It certainly appears to figure quite prominently in the typology of approaches to environmental education set out in section 2:1:3, (and Table I, Appendix I). More generally, it has been evident in recent debates over the public understanding of science (section 2:1:4), debates that have been another important influence on the studies of public understanding and support *vis-à-vis* biodiversity.

2:1:2 The social construction of nature debate

> "Facts, values and personal experiences are all bound up together so that nature and its conservation are social and cultural constructs not just a matter of science."
>
> Harrison (1993, p.46).

There is growing body of evidence from studies looking at perceptions of nature and wildlife or the changing paradigms of the science of ecology and approaches to conservation. However, the idea of 'construction' is quite recent. Western environmental sociology developed during the 1980s alongside the growing environmentalism and moved beyond explanations provided by writers such as Schnaiberg (1980) who saw environmental problems as essentially based on the development of industrial society. Challenging the sociological 'naturalism' of Marx and

Durkheim, this environmental sociology rejected what it saw as the biological determinism of the scientific community, recognised the dependency of knowledge about nature on theoretically produced knowledge (Eder 1996), and, building upon the post-materialist realist perspectives of writers such as Cotgrove (1982) and those who believed society was moving towards a 'New Environmental Paradigm' (notably Buttel, Catton, Dunlap and Van Liere), established a 'social constructionist' perspective on the relationship between society and nature (Simmons 1993).

Advocates of this constructionist perspective such as Hannigan (1995) argue that it does not deny the validity of many claims about the objective reality of environmental problems, merely that these problems and their ordering are largely manufactured by "communities of specialists" (Hilgartner 1992, p.51-2) through a process of "definition, negotiation and legitimation" (Hannigan 1995, p.31). Others however, firmly reject the possibility of objective truth, maintain that "there is no single nature, only natures" (Macnaghten & Urry 1998, p.249) and agree with Bird (1987) that:

> "Our understanding of environmental problems is a social construction that rests in a range of negotiated experiences. To cite the 'laws of ecology' as a basis for understanding environmental problems is to rely on a particular set of socially constructed experiences and interpretations that have their own political and moral grounds and implications. ***There can be no recourse to 'objective' truth.*** [....] Environmental problems are not the result of a mistaken understanding of nature. Rather they are the results of mis/taken (unfortunate or ill-chosen) negotiations with and constructions of nature in the shape of new socio-ecological orderings of reality."
>
> Bird (1987, p.270) (my emphasis).

There is now a considerable literature tracing the changing relationship between civilisation and the natural world that convincingly demonstrates how images of nature have been differently 'constructed' in different historical periods. Jardine, Secord and Spary (1996) describe this as "cultures of natural history" in their book of the same title (see also Glacken 1967; Marshall 1992; Pepper 1996; Macnaghten & Urry 1998). One good example is Weiner's (1981) use of the idea of "the countryside of the mind" to describe an idealised myth of the southern English countryside which he sees as having been created and imposed on the rest of Britain at the end of the Victorian period (see also Hoskins 1955).

Such views are compelling and produce useful insights, especially into science as a claims-making activity. They allow for the problem of biodiversity loss to be seen as having been to some extent assembled by key players (such as the Ehrlichs, Myers, Raven, Soulé, and Wilson), as promoted by economic interests representing the rapidly developing biotechnology industry, and as painted with a powerful rhetoric of calamity and loss despite scientific estimates for rates of species disappearance differing by orders magnitude, and despite predictions of the effects of this mass extinction event showing considerable variation (Hannigan 1995).

Interest in how people construct understandings of phenomena pointed research towards the use of qualitative over quantitative methods of data collection. This is reflected in the studies of biodiversity understanding conducted so far. Thus the constructionist approach profoundly influenced the qualitative studies conducted by Thomas and Chetwynd (1995) and WWF-USA (1996), with these researchers exploring understandings of biodiversity from the point of view of their subjects' perceptions of nature and wildlife. Both consider respondents' understandings from what Spellerberg (1996) would term a “popular” viewpoint, rather than one defined by the concept as used by the scientific community. Similarly, the constructionist view guided the study by Wals, Weelie and Geesteranus (1997) that considered the public understanding of biodiversity from an educational perspective. This piece of research was, however, perhaps greatly influenced by developments in environmental education, which were, in turn, greatly affected by the constructionist approach.

2:1:3 Environmental education and environmental education research

Those recognising the seriousness of the current mass-extinction event and the need for profound changes in human understanding and support as a basis for addressing this problem, almost invariably respond with a call for substantial educational work to be carried out (e.g. WCED 1987; Tolba & El-Kholy 1992; IUCN/UNEP/WWF 1991; DoE 1994a, 1994b). They see knowledge, understanding and attitudes as important in changing human actions (Ramsey & Rickson 1976), and the process of education as capable of changing all these for the better. They also tend to view biodiversity education as being substantially encompassed by environmental education and as sharing some of its common roots. This has, in fact, been the case. The origins of modern environmental education lie in outdoor education and nature studies (Sterling & Cooper 1992), and environmental education has been described analogously as a river both deriving from and incorporating the “tributaries” of ‘conservation education’ and ‘education for sustainability’ (Palmer 1998, p.22). Both these “tributaries” give considerable importance to certain aspects of the subject of biodiversity. Indeed, one of the key documents marking the development of environmental education, the *World Conservation Strategy* (1980), included a dedicated chapter that insisted that:

> “Ultimately the behaviour of entire societies towards the biosphere must be transformed if the achievement of conservation objectives is to be assured ..... the long term task of environmental education [is] to foster or reinforce attitudes and behaviour, compatible with a new ethic.”
>
> IUCN/UNEP/WWF (1980, p.6).

Over the past 30 years in Britain environmental education has grown into an established academic field with its own journals and formal qualifications. It boasts its own Council for Environmental Education, core funded by government and with over two hundred NGO member organisations and associates (CEE 1999). During this time, with added impetus provided by growing environmentalism and key events such as the production of *Agenda 21* and the signing of the *Convention of Biological Diversity* at the Rio Summit in 1992, environmental education has managed to build its influence, particularly within the formal education sector (mainly schools and colleges), and to finally force itself on to the statutory agenda (Palmer 1998). It also changed considerably over the period, becoming much more wide-ranging in its subject matter, expanding to include the human, political and economic aspects of environmental concern (Sterling & Cooper 1992), and undergoing what Palmer (1998) describes as paradigmatic changes in the approaches it employs. The original aim was to see positive environmental attitudes manifested in pro-environmental behaviour (Swan 1971) through creating awareness and understanding, and by motivating people to appreciate, enjoy and actively participate (Johnson 1983). In line with the developments in environmental sociology and new ideas about economic development in the 'Third World', this view gave way to a supposedly more empowering paradigm whereby instructional approaches tended to be discarded (Stapp 1974) in favour of ones which sought to foster independent critical and creative thinking and which embodied key elements of what was being accepted as a new world-view (the New Environmental Paradigm). These approaches embraced so-called 'ecological' ideas such as participation and 'holistic' knowing (Robottom & Hart 1993) and a recognition of the importance of aesthetic and moral dimensions to an environmental understanding. Under the influence of social constructivists they also came to include the idea that perceptions of nature can be constructed differently by different individuals, groups of individuals, communities or societies.

The 'cutting edge' of environmental education research reflected these developments in the subject area, moving away from the more positivistic positions derived from scientific, quantitative approaches adopted from the natural sciences which were predominantly aimed at describing and measuring the relationships between knowledge, attitudes and behaviour. It responded to the supplanting of the linear Knowledge→Attitudes→Behaviour model with more sophisticated ones, such as those developed by Hines *et. al.* (1986/7) and by Hungerford and Volk (1990), and formulated "interpretative and critical paradigms" (Palmer 1998, p.107) largely under the influence in of constructionist theory. The 'interpretative' paradigm is based on the recognition that it is important to explore the world the individual constructs in relation to his or her environment. It encompasses autobiographical works such as that by Gough (1999), as well as Palmer's (1993) own qualitative 'concept mapping' methodology. In contrast, those adopting the 'critical' paradigm see this world as strongly influenced by social forces, and attempt to reveal the ideological underpinnings of environmental issues through actively participating in them.

Whilst the 'interpretivist' approach tends to employ qualitative research techniques, the 'critical' approach embodies a clearly stated objective of intervening to transform environmental education into a community-based process for "improving the quality of human existence" (Robottom & Hart 1993, p.11). As such it involves the environmental researcher becoming an environmental activist who leaves the Academy and its adherence to objectivity altogether behind (Malone 1999). Table I (Appendix I) reproduces three images of environmental education (Robottom & Hart 1993). The 'positivist' paradigm is grouped with objective knowledge about the environment, with participant learners labelled as passive recipients of preordinate knowledge, and the role of environmental education seen as externally imposed. In contrast, the 'interpretivist' paradigm is associated with active learning, experience, and so-called 'progressive' education, whilst the 'critical' paradigm, is associated with active participation in environmental problem- solving, so-called 'socially critical' education. This typology represents the evolution of environmental education. It also reflects what has been a real tendency to label the more traditional elements as having been superseded by later theoretical positions. Thus approaches deemed 'positivist' are labelled as ignoring subjective aspects of people's understanding and are consequently sidelined in favour of more aspects of education regarded as more progressive, such as a focus on the experiential.

With a perceived progression from 'positivist' to 'critical' paradigms, the implication has been that participant, qualitative approaches to environmental education research are in some way better and more valid. This is a view supported by some environmental education research findings that tend to confirm anecdotal evidence provided by reports from various projects and activities that suggest experientially-based environmental education provides a tool for cognitive and affective gains (see Palmer & Neal 1994). A consistent finding has been the central importance played by formative influences and what have been termed 'significant life experiences' (SLEs) in relation to subsequent commitment to environmental concerns (e.g. Finger 1994). Indeed, a specialist area called 'SLE research' has now developed in the wake of the influential work of Tanner (see Tanner 1980, 1998 & Chawla 1998), and studies have found outdoors experiences (Tanner 1980), natural areas (Peters-Grant 1986) or the outdoors (Palmer 1993) to be by far the most frequently mentioned factor in respondents' development of personal concern for, or interest in, the environment (Chawla 1998; Palmer *et. al* 1999).

These developments help explain why an acceptance of the critical paradigm prevails amongst members of the Council for Environmental Education - Biodiversity Working Group,[1] and why those researchers who have looked at understandings of biodiversity from an environmental education perspective (i.e. Wals, Weelie and Geesteranus 1997) have tended to employ qualitative/participatory research foci and techniques. Palmer (1998) does wisely caution against the danger of regarding the three images as separate from one another and argues that educational programmes should include all the elements noted in Table I (Appendix I). However, a major problem with delineating paradigmatic differences is that they tend to be regarded as mutually exclusive (Orr 1992). Indeed, Wals, Albas and Margadant (1999, p.21) describe these approaches as being "expressions of fundamentally different ideologies" and as "incompatible". In practice therefore these groupings tend to emphasise a hard, exclusive division between traditional 'scientific', and new, progressive approaches, between science and the public, and between 'progressive' qualitative approaches to data gathering, and the 'traditional', quantitative ones. These divisions can, however, also be seen as having been partly precipitated by those changes which have taken place in the field of natural history, a legacy which has now gained special significance in the context of growing interest about the public understanding of science, and which may in turn have special relevance to the public understanding if biodiversity.

2:1:4 The public understanding of science

During the past decade, amidst growing concern over environmental problems, the (sometimes catastrophic) failure of technology to realise its post-war promise of security and prosperity for all, and a widespread public mistrust and misunderstanding of science and scientists, many scientists, politicians and educators have recognised a need for greater public scientific 'literacy' or 'understanding' (although as Irwin & Wynne, 1996, point out, this recognition can also be found in the early part of the nineteenth-century). In the UK this has recently been given added impetus by the poorly informed public debate over Genetically Modified Organisms (GMOs) and the government's handling of the BSE 'crisis'. A considerable effort has been made to address the 'gap' in scientific knowledge between experts and the public, and this was marked by the setting up of the Committee on the Public Understanding of Science (COPUS) in 1985, the instigation of the journal *Public Understanding of Science* in 1991, and the 1995 inauguration of Richard Dawkins at Oxford University as the Charles Simonyi Professor of the Public Understanding of Science. Such developments have been accompanied by a new wave of popularist writings by eminent scientists, including Dawkins' own *The Selfish Gene* (1976) and *The Blind Watchmaker* (1986) and Wilson's *The Diversity of Life* (1992).

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[1] Of which this researcher has been a member since 1997.

Much of the earlier development of this movement for the public understanding of science (PUS) rested on what has been described as a "deficit model", one which essentially regards the problem of one of 'empty' minds lacking correct scientific information (Gregory & Miller 1998, p.17). According to this model in its most vulgar form, simply supplying the right information in large enough quantities would be sufficient to bring about changes in people's behaviour to the benefit of biodiversity. Evidence of very low public knowledge of even simple scientific 'facts' (e.g. Evans & Durrant 1989; Witherspoon 1994) seemed to support this position, whilst some of its main exponents, such as Ehrlich (1996, p.393), argue that there has been "a failure of the scientific community to explain its principles, procedures and conclusions to the general public" and call for this community to spend much more time educating this public in this way. The 'problem' is seen as one stemming from the bad impression scientists created in their public dialogue (Battey 1999), and the 'solution' as one of communicating effectively so that the public can also learn how to make value-free scientifically based judgements. Largely in keeping with this model, new strategies have been developed for more effective ways of communicating science to the public. These range from texts specifically designed to explain and demystify science (e.g. Zimmerman 1995), the setting up of science centres and new museum exhibitions (MacDonald 1996), to reformulations of science TV programming and a rapid expansion of other electronic media as part of the 'information revolution'.

Under the influence of social constructivists, many proponents of PUS have however now rejected the simple deficit model in recognition of a need to reconceptualise the two entities of 'science' and the 'public' as significantly heterogeneous and to accept the relationship between them as "socially negotiated" (Irwin & Wynne 1996, p.7). There is a growing acceptance of a need for science to recognise that it itself is not value free, and that therefore, as well as trying to deal with the public's multiple understandings, it must address its own way of working and other aspects of its social construction (Durant 1993, Golley 1993). It is now widely argued that not only does there seem to exist a multifarious and strongly socially contextualised understanding of the natural world, but the science/public 'gap' is itself perceived by different people in different ways. Individuals are seen to have certain intellectual structures that they use as a basis for rejecting contending viewpoints (Ardener 1989). This means that abstract scientific knowledge can be constantly undermined by 'down to earth' observations made by non-scientists (as evidenced by McKechnie 1996), and consequently, science and 'common sense' come to be opposed to each other (Wolpert 1992). It is this perspective that appears to have encouraged the data-gathering exercise conducted by Hart Associates (WWF-USA 1996) which accepted respondents own assessment of their understanding of the concept of biodiversity and related issues as valid rather than seek a more objective measure. It may also have played an indirect role in respect to the studies by the Consultative Group on Biological

Diversity (CGBD 1998), Wals, Weelie and Geesteranus (1997), and Thomas and Chetwynd (1995), in so far as none of these studies considered it important to look in any detail at more objective, science-based, understandings of biodiversity.

2:1:5 Implications for studies of public understandings of biodiversity

In combination, the developments outlined above have tended to emphasise divisions between science and the public, and between science, social science and non-science. These divides are reflected in the characterisations of how nature is regarded (objective/constructed), how natural history has been institutionalised (experts/amateurs/the public), of how the 'problem' of the lack of public understanding of science has been approached (deficit model/socially negotiated), and the way in which educational and other research has been understood and conducted (positivist-quantitative/interpretivist-qualitative/critical-participatory).

The handful of studies which have looked at understandings of biodiversity have done so within a general research context strongly influenced by constructionist views, the divided state of natural history, and the so-called 'progressive' elements operating in the field of environmental education and the PUS debates. As a result, the approaches they employ have tended to be qualitative and oppose those of conventional science. Although they might be suitable for considering wider environmental issues such as pollution or animal welfare, these approaches are arguably not so appropriate in the case of biodiversity. The reasons for this derive from the extent of its presence in the public domain, the way it has been dealt with by social scientists, and the nature of the subject itself.

The term 'biodiversity' is very new, having been developed by biologists and only recently enjoying widespread usage within the scientific community, let alone having a notable existence in the public domain. Figure 2.1 illustrates this, showing the incidence of the word 'biodiversity' compared to 'ecology' and 'biological diversity' in journal articles titles on the Science database on the Bath Information Database 1981-1999. Prior to the 1992 Earth Summit and the signing of the *Convention on Biological Diversity*, there were hardly any occurrences. Thereafter the frequency increases rapidly relative to that of the other two terms, thereby suggesting its adoption by the scientific community. The same pattern does not however apply to the spread of the term 'biodiversity' into other areas. Figure 2.2 compares its incidence in titles of social science and humanities journal articles, and newspaper articles over the same nineteen-year period. It suggests that the term has been taken up by the social science literature, although much more slowly than it has in natural science texts, but has hardly appeared in either humanities academic literature or the national press.

Figure 2.1. Number of articles with the term 'biodiversity', 'ecology' or 'biological diversity' in their titles 1981-1999 (derived from: BIDS database science index).

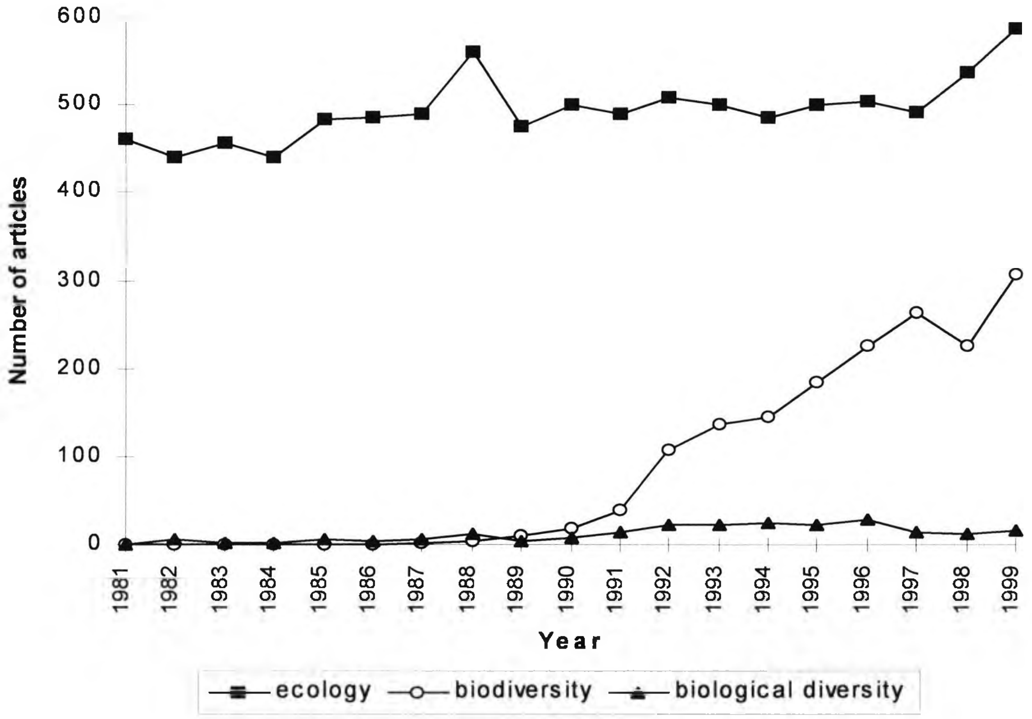
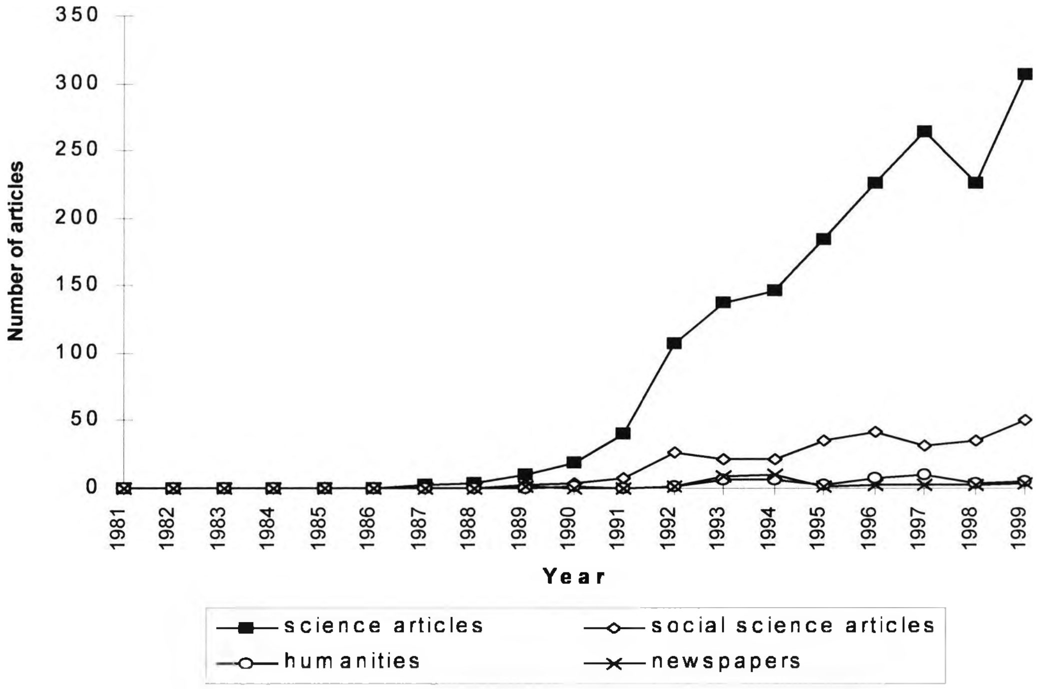
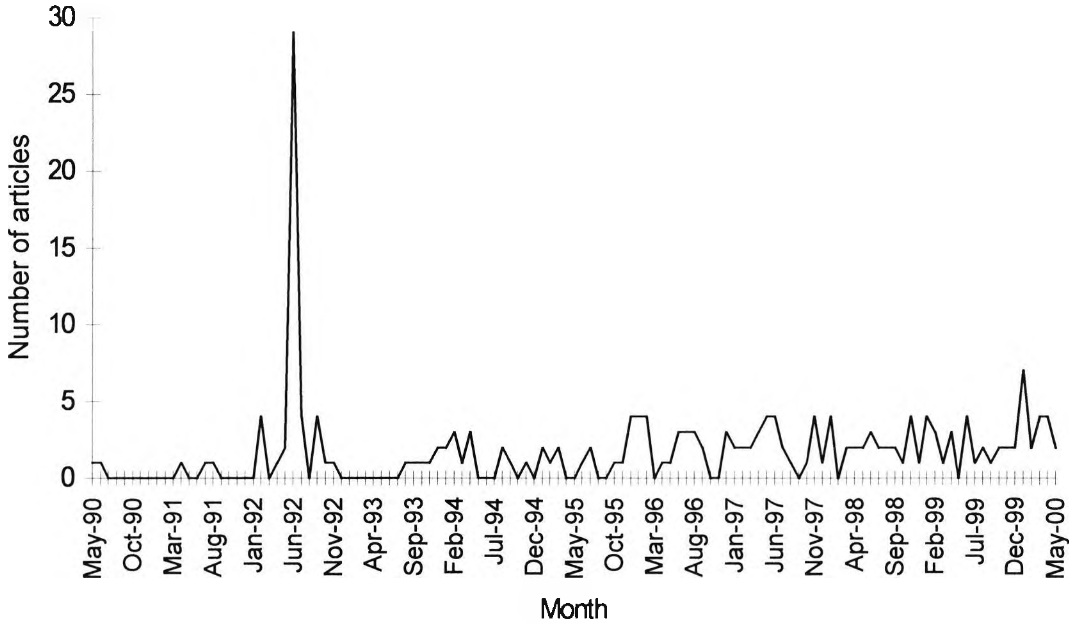


Figure 2.2. Number of articles with the term 'biodiversity' in their titles 1981-1999 (sources: derived from BIDS database, social science index, humanities index; and Palmers Index 2001).



These data tend to confirm the proposition that biodiversity is a concept whose use is largely restricted to a specialist literature, wherein it has only recently become established. They also suggest the level of public utilisation of the term is very low. Data for *The Times* newspaper presented in Figure 2:3 support this view, suggesting that 'biodiversity' may have gained little more than a toehold in the newspaper media. With the exception of the brief period surrounding the Rio Summit, *The Times* hardly used the word in its pages - although over time there was a gradual increase in the number of articles containing the word. In fact *The Times* performed rather better in its coverage of Rio than the tabloid press, producing 174 articles containing the keyword 'earth summit' in May/June 1992, compared to just 25 in the *Daily Mail*, 20 in the *Daily Mirror* and 8 in *The Sun* (Lacey & Longman 1997, p.142). Since, the broadsheet press accounts for only about 22% (*The Times* = 6%) of national daily newspaper sales, looking at these findings in the context of the national press, provides further support for the idea that the term 'biodiversity' hardly exists in the public domain.

Figure 2.3. Number of *The Times* articles per month containing the word 'biodiversity', May 1990 - May 2000. (source: Longman, pers. comm., Palmers Index 2001).



Given the infrequency with which the concept of biodiversity appears in the public domain, the UK public might be expected to have a poor understanding of the concept(s) it represents. However, the lack of widespread use of a particular term does not necessarily mean that an understanding of the concept or concepts it embodies cannot be found in the population at large. A considerable disparity may exist between the general population and the expert community in levels of knowledge and understanding about a subject, but this is not the same as there being an absence of some sort of public understanding of that subject. Spellerberg recognises this in distinguishing a "biological view" of biodiversity (the view held by biologists), and a "popular view" (that which is exercised in popular language) and suggests that the latter possesses its own parameters (Spellerberg 1996, pp.7-9). In so doing he acknowledges there to be a socially constructed view of biodiversity. Similarly, Wals, Weelie and Geesteranus (1997) assert that in its political and other public usage 'biological diversity' may be predominantly a symbolic concept, whilst Pollock speculates that public consciousness maintains the "conceptual underpinnings" of biodiversity but is hostile to the word itself (Pollock 1995, p.6.). There are however, few data that provide support for these views. Nor is any indication given as to what these "conceptual underpinnings" consist of. Those who maintain these views appear to do so despite having gathered almost no evidence in their favour. Moreover, they seem to have only considered understandings of biodiversity based on culturally generated notions of a variety of living things. This reflects the concern demonstrated in the recent work of many of the leading exponents of environmental sociology, (e.g. Pepper 1996; Macnaughton and Urry 1998; Mayerfield-Bell 1999). In considering a range of major environmental issues, these authors include no references, either to 'biodiversity' or 'biological diversity'. Only Hannigan (1995, pp.146-222) specifically considers the subject of biodiversity loss. He devotes a chapter to it in which he argues that three major developments "set the stage for the rise of biodiversity loss as a major environmental problem". These he cites as: the growing economic importance of biotechnology; the emergence and development of conservation biology as an academic discipline; and the formation of an international legal and organisational framework for dealing with the biodiversity loss related issues. Describing the way in which the claim of biodiversity loss has been "assembled" and "presented", Hannigan emphasises the role of "scientific entrepreneurs" and "champions", the imprecision of the scientific evidence, the recognition of wider socio-economic/political links and ramifications, and the rhetoric of loss and calamity. He concludes that the social construction of biodiversity loss has been favoured by its institutional context, its economic implications, its "emotional resonance", and its consolidation at the centre of conservation biology (Hannigan 1995, p.160).

Much of what Hannigan (1995) suggests has credence, but he does not acknowledge the possibility that a very real problem might exist. The growth in expert interest and the institutional responses he describes could actually reflect a widening recognition of the significance of a real issue in response to an increasing weight of supporting scientific evidence. In fact, along with most other environmental sociologists, Hannigan (1995) neither engages with the scientific discourse on the matter, nor appears to accept the possibility that biodiversity loss may be a real phenomenon, let alone acknowledging that it might be important to slow biodiversity loss, if even from a purely economic or utilitarian viewpoint. With such approaches dominating the field, it is of no surprise that researchers considering the public understanding of biodiversity describe people's view of biodiversity as "symbolic". More precise understandings have not readily presented themselves because they have not been sought, and because the scientific understanding has been eschewed.

As many writers maintain, including Martell (1994) and Pepper (1996), although the reality of our relationship with nature is indeed partly socially constructed, it also depends on its objective properties. The well-documented failure to recognise the importance of fires and grazing to the ecology of heathland for instance, clearly did result from a mistaken understanding of natural processes (Pickett, Parker & Fieldler 1992). Likewise for many of the disastrous yet deliberate introductions of plants and animals that have been made down the ages (Crosby 1986). Regarding the idea that humans have precipitated a major and rapid global extinction event as nothing more than a social construct (and by implication as nothing much to worry about) is a mistake. The scientific evidence, though unavoidably not very accurate because of the incompleteness of the data and difficulties involved in gathering it, do suggest a real process occurring. These data are socially mediated, for, as Redclift and Woodgate (1997, p.61) argue: "Ecological principles themselves are part of science, and science in turn is part of human culture". However, nature must also be accepted as "a set of culturally generated symbols" *and* "the material conditions of our existence" (Redclift & Woodgate 1997, p.61). The four mass extinction events recorded in the fossil record and which predate human existence, are themselves testament to this. Moreover, to this view can be added the thought that the very process of identifying something as a social construction is epistemologically premised on the existence of something which is not.

The parameters that define biodiversity can therefore be accepted as not just culturally generated symbols, but as part of our material conditions. In fact, the "conceptual underpinnings" of biodiversity consist, not of some vague notion of variety amongst living things, but a range of clearly defined concepts. Biodiversity is not simply a symbolic concept, it is a measurable entity (Gaston 1996). Even if some of the actual figures involved are necessarily uncertain, and despite the term itself not being widely utilised publicly, the parameters that describe biodiversity are nevertheless quite closely defined by scientists. Furthermore, many of the components that these parameters utilise are, in some form or other, widespread in the public domain, for example, the concepts of extinction, rarity, species and habitat. Contrary to what Wals (1999) maintains, much of the knowledge base is actually quite robust, even if the value base is not. This not only means that people's knowledge and understandings of biodiversity can perhaps be evaluated, but that they might be able to be evaluated with some degree of accuracy.

The nature of the concept of biodiversity is important for another reason. Even if it is accepted that all environmental issues are socially mediated, if biodiversity loss is acknowledged to be a real and significant issue, when questions such as 'What should be done to stem the present tide of biodiversity loss?' are posed, it is the scientific concept of biological diversity that must be employed. This is because this concept forms an essential starting point for any form of worthwhile strategy to conserve biodiversity. Furthermore, the task of identifying appropriate behaviours of individuals and communities to encourage biodiversity, must necessarily depend on a reasonably reliable understanding of the parameters and processes involved. In addition, the concept of biodiversity as it has been employed in the *Convention on Biological Diversity* and its derivative literature, is fundamentally a scientific one, and the understanding and support repeatedly called for in these texts relate to this scientific conceptualisation and definition.

Because of the novel characteristics of the subject, when assessing a person's view of biodiversity, the finding that s/he possesses a vague symbolic notion of a decreasing variation in living forms and recognises the need to do something about it, reveals little about that person's actual understanding of the concept. Such a notion approximates more to an awareness of the existence of a problem called 'biodiversity loss' rather than any knowledge or understanding of it as the scientific concept it is. Though an awareness of something is a prerequisite for knowledge and understanding, it can exist independently. In seeking, as this thesis does, to explore what people in the UK know and understand about biodiversity and biodiversity loss, it is therefore inappropriate, at least in the first instance, to adhere to a non-scientific understanding. To date, no study of public understanding and support *vis-à-vis* biodiversity has taken this approach. Adopting a science based approach does not suggest that more popular understandings cannot be looked at, simply that in the first instance the primary concern should relate to the subject as it is defined by science and embodied in the *Convention on Biological Diversity*. Neither does this approach imply a total rejection of the constructionist approach, nor an automatic acceptance of the deficit model in respect to any lack of public understanding of biodiversity that may be met. It merely indicates an acceptance of biodiversity loss as a real and important issue and an initial central concern with people's knowledge and understanding of the scientific concept.

2:2 The perspective adopted in this study

Taking a position that looks at knowledge, understanding and support from the point of view of biodiversity as a clearly defined scientific concept points to a quantitative approach to data gathering than has been used before. That no data of this type have been collected is perhaps surprising given the high levels of concern to increase understanding and support expressed in the *Convention on Biological Diversity* and its derivative literature. Quantitative approaches could have been employed in order to establish baseline measures from which to consider the increases in understanding and support called for. Their absence is particularly remarkable when it is realised that such approaches continue to occupy a strong position in the mainstream of environmental education research (Marcinkowski 1993) and to find particular favour (even with some critics) when employed in investigations in which new avenues of exploration are being opened up. Biodiversity is a good example of this sort of subject. The value of quantitative investigations lies in their providing factual data and direction for subsequent qualitative studies (Williams 1996). The public understanding of biodiversity is such an avenue. Given this fact, coupled with the nature of the subject itself, in the first instance, the quantitative approach appears to be the most useful.

At this juncture a final reminder will be made as to the reasoning behind this study. Essentially, it is that which is embodied in the *Convention of Biological Diversity* and its derivative texts, namely that successful biodiversity conservation efforts require changes in people's behaviour that cannot be achieved without a substantial increase in public understanding and support. This study may serve to challenge or substantiate this reasoning. Hopefully, it will provide parameters for assessing progress in the development of more positive attitudes toward biodiversity. It will however at least produce baseline data on public understanding and support *vis-à-vis* biodiversity, and produce two agenda, one for further research, one for biodiversity education.

2:3 Chapter summary

This chapter has discussed the background to the existing data concerning public understanding and support *vis-à-vis* biodiversity, and has suggested that nature of the subject indicates a need for a study based on the scientific concept of biodiversity and the gathering of predominantly quantitative data in this area. Chapter 3 will consider key terms and concepts, explain the development of the data gathering process, and present the detailed data gathering methodology.

Chapter 3. Developing a methodology

Introduction

Chapter 2 concluded that a data gathering exercise would be necessary in order to address the research questions. This chapter establishes the methodological framework for this exercise. It does so by:

- clarifying some key terms and concepts (section 3:1);
- describing the approach to the data gathering exercise (section 3:2);
- describing the process by which this data gathering exercise was developed (section 3:3);
- and, describing the design and implementation of the main survey instrument (section 3:4)

The remainder of this chapter describes initial data manipulations for the main survey (3:5) and discusses the characteristics of the respondent group (3:6).

3:1 Clarifying key terms and concepts

Terminology is important to any piece of research, but of particular importance to an interdisciplinary study of this kind. In such studies, terms are frequently used in a variety of manners by researchers approaching from different disciplines (e.g. Fischer-Kowalski's 1997 study of the use of 'metabolism' in sociology, cultural anthropology and social geography). In many environmental social psychology texts there appears to be confusion over the distinction between terms such as 'knowledge' and 'understanding', or between 'concern' and attitudes'. This can lead to errors in data interpretation and result in ill-founded conclusions. Therefore it is worth giving attention to concepts that occupy prominent positions in much of the contextual literature and the research questions. All definitions used here are from the *Oxford English Dictionary* (1993).

The term **'awareness'**, in the sense of being conscious, not ignorant of something, is frequently used by governments, environmental organisations and environmental educators. It is clearly related to knowledge, but by itself is at most a rudimentary knowledge, closer to just being conscious of the existence of something. As such it is not particularly useful to this study. To know that a process such as biodiversity loss is occurring, is to be aware of it, but this awareness does not imply any associated understanding. For instance, many people who are aware of the existence of the 'Greenhouse Effect', may not understand how it operates or why it is necessary for human survival because it keeps the earth from freezing (Carwardine 1990). The concept of 'awareness' will therefore not figure highly in this study. Instead the focus will be on the related terms: **knowledge** and **understanding**. 'Knowledge', meaning the facts, feelings or experiences known by a person or group of people, is an important component of understanding, but does not determine it. Thus, a person can know a great deal about a particular subject and be able to answer many factual questions relating to it, yet still not understand how these facts relate to one another or be able to grasp its substantive nature. 'Knowledge' can contribute to the cognitive (and perhaps affective) component of an attitude, but partial knowledge can be worse than none at all when it is associated with inappropriate behaviours. A good example is the knowledge that some snakes are poisonous, knowledge that underlies the worldwide persecution of many species of harmless and/or beneficial snake and legless lizard. In contrast to 'knowledge', 'understanding' involves the power or ability to perceive the meaning or explanation of, be conversant or familiar with, or have mastery of, a subject, skill and so on. Understanding is therefore a more important concept for this thesis than knowledge. This is not just because of its centrality to the research questions posed, but because in implying a competence and a comprehension which operate above and beyond a knowledge base, it suggests a grounding for the sort analytical problem solving essential to the development of effective conservation strategies. Understanding is also an important element in the cognitive component of an attitude, although it can also exist in the absence of an attitude.

'Concern', **'support'** and **'behaviour'** are three other terms frequently met with in literature dealing with human responses to environmental issues. 'Concern' refers to something being of importance to, engaging the attention of, or causing anxiety to, an individual, group or body. Measures of concern are widely used in survey work but are of limited value when exploring understanding and support. Concern may well be an immediate precursor of support, but it can be so readily and cheaply expressed that it is unlikely to have more than a very general link with behaviour, and therefore will not receive much attention in this research. 'Support' refers to the action of backing up a person or group; assistance; the advocacy (of a proposal, motion etc.). The second key parameter in this thesis, 'support for biodiversity' can be direct, indirect, declared or active. It can include verbal expressions and a variety of actions ranging from doing practical conservation work, gardening for wildlife, being a member of a particular organisation or simply giving money to help biodiversity conservation activities. Support thus embodies several forms of behaviour - observable actions that relate to attitudes directly through their behavioural component. In considering attitudes, it is important to remember that the behavioural component refers to potential or intended behaviour rather than actual behaviour. Actual behaviour may in turn be influenced by any of a number of other factors. For example, a person who does not eat meat because s/he holds a certain attitude towards intensive methods of meat production, may, on occasion, consume it in order to be polite to an uninformed host.

Feelings (emotions, susceptibilities, sympathies) are a key component of attitudes, but are notoriously difficult to assess because they are necessarily mediated through some sort of cognitive or physiological means (i.e. via a verbal or biological expression). A problem with evaluating feelings is that declared feelings may have little to do with actual feelings. For instance, a person might declare great anger or sadness over dwindling wild rhino numbers because s/he sees this as the appropriate, socially acceptable response to give, but may in fact feel little or nothing about this issue. Feelings are however important in respect to conservation. Despite being so difficult to measure, because they can profoundly influence behaviour, they are explored in this study.

By contrast, **'opinion'** refers to a view held about a particular subject or point; a judgement formed. Closely allied to beliefs and attitudes, they are distinguished from beliefs insofar as they reveal rather more of what is thought about the subject. **'Beliefs'** simply refers to the mental acceptance of a statement of fact, doctrine, thing etc. as to whether it is true or existing. Like understandings, beliefs are important elements in regard to the cognitive component of an attitude; attitudes have even been defined as "evaluative beliefs" (Bem 1970). Beliefs are informed by knowledge, influence attitudes directly, and contribute to the contextual framework within which attitudes develop and are expressed. For example, it is widely believed that the black rhino is in danger of extinction, but many opinions exist as to how this situation should best be dealt with. Opinions are distinguished from attitudes in that they are more superficial. They consist of looking at a particular subject in a particular way, but do not incorporate a tendency to respond cognitively, emotionally or behaviourally. Nevertheless, certain opinions are likely to be associated with certain attitudes. In this study, opinions and beliefs will be subsumed to the consideration of attitudes.

The principles or moral standards of a person or social group; the generally accepted or personally held judgements of what is valuable and important in life, are called **'values'**. They are distinguished from **value**, which refers to the worth, usefulness, or importance of a thing. The difference between values and value is usefully clarified by the distinction between a "held value" and an "assigned value" (Brown & Manfredo 1987, p.12). Values, though sometimes described as basic attitudes, are usually distinguished as a certain class of attitudes in being much more general, more deeply held and less susceptible to change. Thus Bem (1970, p.16) describes a value as a "...primitive preference for a positive attitude toward certain end-states of existence (such as equality or self-fulfilment) or certain modes of conduct (such as courage or honesty)". Like attitudes, values influence perceptions of fact and guide choice and actions, but in being so close to attitudes, they will not be a focus of this study.

'Attitude' refers to a disposition of mind: deliberately adopted, or a habitual mode of regarding the object of thought. Ever since 19th century psychologists first employed the term (Allport 1954), it has been utilised in different ways. Contemporary approaches continue to exhibit some definitional variation, but there is general consensus as to its proper domain. Allport provided the landmark definition, which most researchers now agree on:

> "An attitude is a mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related."
>
> Allport (1935, p.9).

The following version, provided by Oppenheim, will be employed here.

> ".....an attitude is a state of readiness, a tendency to respond in a certain manner when confronted with certain stimuli."
>
> Oppenheim (1992, p 174).

Another, widely accepted aspect of attitudes is the 'tripartite' view (Crites *et. al.* 1994) which can be traced back to the work of McDougall (1908), whereby attitudinal responses are seen as classifiable according to cognitive, affective and behavioural components. According to this tripartite theory, an attitude has three components:

- a cognitive component. - the idea, which is generally some category used by humans in thinking e.g. wildlife, birds, spiders, biodiversity;
- an affective component - the emotion which charges the idea e.g. wonder, hate;
- a conative or behavioural component - a predisposition to action e.g. willingness to give to wildlife charities.

When assessing any parameters that might influence or involve human behaviour, the study of attitudes is bound to hold a position of importance. This has shown to be the case with many studies concerned with environmental behaviour. This is not simply because attitudes have been the focus of a great deal of research aimed at explaining human behaviour (including the materialisation of understanding and support), but results from the concept holding such a central position in the study of social interactions. In fact, the whole field of social psychology has been described as "the scientific study of attitudes" (Thomas & Znanieki 1918/20, cited in Allport 1954, p.43). Attitudinal research thus provides a body of knowledge on which to draw. Attitudes are closely associated with behaviour because the modern definition incorporates an explicit behavioural element. Whilst some investigators have been able to find little or no correlation between attitudes and actions, many studies have found attitudes to be significant predictors of behaviour (Ajzen & Fishbein 1977, 1980), or at least of behavioural intentions (Edwards 1957). Part of the problem in assessing this relationship is the frequent discrepancy between what people say they do or will do and what they actually do in practice; actual behaviour being influenced by a variety of other contextual factors (Edwards 1957; Triandis 1971; Cacioppo 1981). However, notwithstanding this difficulty, attitudes continue to be accepted as worthy subjects when considering behaviour.

Central to much of the research on environmental attitudes has been the testing of the so-called Dunlap-Hefferman Thesis (Dunlap & Hefferman 1975), essentially the idea that positive environmental attitudes are linked to outdoor recreation. As Van Liere and Noe (1981) have observed, this linkage is rather more complex than the hypothesis suggests, not least because the same activity can hold different meanings for individuals who engage in it. The new models developed over the past fifteen years, most influentially by Hines *et. al.* (1986/7), Hungerford and Volk (1990) and Kaiser, Wölfing and Fuhrer (1999), distinguish different types of environmental knowledge and recognise a role for many other inputs, such as values, personality factors, environmental skills and perceived risk. There nevertheless remains a general acceptance of a link between environmental attitudes, behaviour and activism (Steel 1996), and this is supported by a considerable amount of research evidence (see Sherif & Sherif 1965 and review by Stroebe & Jonas 1996).

There now exists a significant body of text that looks at the relationship between attitudes and behaviour in relation to environmental issues. One review found nearly two-thirds of 1361 "environmental psychological" publications on the *PsychInfo* database (1/1/67-31/8/95) to include environmental attitude in one way or other (Kaiser, Wölfing & Fuhrer 1999, p.1). Most such studies have been conducted in the United States, and because there is evidence to suggest significant international variation in the importance given to environmental problems (UNEP 1988), parallels between countries must be made with caution. A sizeable number have considered knowledge and behaviour together. For instance, 153 of the 1361 studies Kaiser, Wölfing & Fuhrer (1999) reviewed, looked at the relationship between environmental attitudes and behaviour. However, virtually all of these are subject to the observation that they tend to focus on general environmental issues. They tell us little about the nature of the understandings and support their data allude to. In addition, few 'item pools' employed in any one study have been used by other researchers. This means that most lack validation and development (Gray 1985). As Gray (1985) reports of Weigel and Newman's (1976) examination of measures used in 49 studies of the relationship between attitudes and behaviour (previously reviewed by Wicker 1969), in very many instances actual measures are not sufficiently well described to enable their appraisal.

A frequently cited study (Maloney & Ward 1973) is worth special mention because it claims that the subscales employed assessed people's feelings, commitment (verbal and actual) and knowledge about the environment, pollution and, most significantly, about ecology. However, their later review (Maloney, Ward & Braucht 1975) reveals problems with their "ecology" scale. In fact, only two scale items actually assess knowledge of ecology as such. The others look at the causes and consequences of pollution. Hardly any of the fifty most important concepts in ecology identified in a survey of members of the British Ecological Society (Cherrett 1989), are even touched upon. Moreover, even one of these two questions is liable to answers based upon other factors. It is formulated as: "Ecology assumes that man is: a(an) ... part of nature." with answer categories: a) differential; b) integral; c) inconsequential; d) superior; e) original, but arguments could be made by someone with a good understanding of ecology for either answers a, b or d to be correct; even e if the respondent also believes in Creation. As this example illustrates, research that takes a general approach and does not consider scale items carefully is not at all useful. Indeed, little of the existing research is anything but indirectly relevant to this study. Measures, which focus specifically on biodiversity, are required.

In this study attitudes may be important because in addition to the behavioural element, they embody a cognitive component - they are reinforced by knowledge, understanding and beliefs - and an affective or emotional component - they involve feelings (Sherif & Sherif 1967; Oppenheim 1992). As such they can be regarded as 'bridging the gap' between understanding, emotions and behaviour, and therefore might go a considerable way toward helping to demarcate relevant public understanding and support. Given this focus, the primary concern will be on the cognitive and conative (behavioural) components of attitudes. However consideration will also be given to affective components despite their invariably being mediated in one way or another - their measurement involving either looking at physiological changes or relying on the individual's self-reporting (Stahlberg & Frey 1996).

The concept of **social group** provides another valuable dimension to this study because much of what is investigated, particularly in relation to 'support', is comprised of patterns in social behaviour. The obvious level at which to explore social behaviour is that of the commonest social unit, the group (Homans 1951). Any society of individuals is patterned into distinguishable social groups and categories, and, albeit to varying degrees, people's attitudes and practices are often acquired from and maintained by groups to which they belong. According to Homans (1951), a social group is defined as a group of persons who communicate with one another, and who are few enough in number to enable each to communicate face-to-face with all the others. The members of such a group tend to share common values, and ideal and actual behavioural patterns - which collectively can be referred to as a culture (Mitchell 1979). Subsequent writers have developed this concept of social group considerably. A distinction between "primary groups" (face-to-face groups which enjoy feelings of solidarity and which are productive of, or reinforce moral norms) and "secondary groups" (larger aggregates like social classes) has become widely employed. In this study it is mainly the latter kind of group that will be considered, with more specific types of secondary group being looked at; what are often called associational secondary groups - groups bounded by some recognisable level of normative order and display interactions. The profound changes in British social organisation over the past fifty years have meant, however, that these categories have become much less cohesive (Halsey 1995). In this study such groups include those defined simply by organisational membership and/or occupation.

The idea of paradigmatic change in people's environmental worldview has been very influential in the study of environmental attitudes and behaviour, most notably in the research collectively referred to as New Environmental Paradigm studies. The concept of **paradigm** has been of great use in aggregating different elements in order to explain the often enormous distances in thinking between different groups, in helping deal with the inevitability of change, its spasmodic nature and the idea of progress, and, as Routley (1983) points out, in offering an organisational framework for environmental philosophy. Despite this, the use of the term 'paradigm' remains "notoriously ambiguous" (Giddens 1979, p.137) due to its application at many different levels, in many different roles, and because of the consequent difficulty in defining what it really is (Routley 1983).

This picture is further complicated by the recent extension of the application of the concept of paradigm to the field of Conservation Biology itself. Pickett, Parker and Fiedler (1992) take Kuhn's refined definition of paradigm: "The constellation of beliefs, values and techniques, and so on shared by the members of a given community" (Kuhn 1970, p.175), and apply it to the development of the science of ecology. They describe the classical paradigm of the field of ecology as the "equilibrium paradigm" according to which ecological systems tend to be seen as closed and as progressing towards a 'climax' state at which a relatively stable equilibrium is reached. This paradigm, they argue, is "consonant with the cultural metaphor of the 'balance of nature'" (Pickett, Parker & Fiedler 1992, p.67) which assumes disturbed systems will necessarily return to the same equilibrium. They see it as resulting in a preservationist approach whereby human activities are separated from natural systems, and conservation becomes a process of setting aside areas and excluding people. With profound lessons learnt from the failure of this 'leave it alone' paradigmatic approach to conservation, with a growing understanding of the way in which ecological systems function, and important developments in the wider scientific community (such as the appearance of quantum mechanics and its acceptance of probability and indeterminacy), there was a recognition that periodic, episodic and spasmodic occurrences are of major importance to the structure and function of natural systems. Nature preservation now became nature conservation (Sheail 1987). Processes became the primary focus. The new paradigm was one of "non-equilibrium", the approach to nature conservation, one of managing these processes alongside the effects of human agency in order to maintain the "shifting mosaic" of nature (Pickett, Parker & Fiedler 1992, p.82). More recently, this understanding is said to have moved still further on (Infield 1988), such that the focus of ecology and conservation practice can be thought of as studying and managing resource utilisation, what might be termed a 'utilisation' or a 'use it or lose it' paradigm.

In so well representing changes that have occurred in ecology and approaches to conservation, the use of the concept of paradigm has proved useful in following the development of conservation biology, particularly as this seems to have been paralleled by paradigmatic developments in the wider scientific community and society in general. The concept may therefore well be useful when considering changes in public understanding and support. However, the paradigms for the images of environmental education distinguished by Robottom and Hart (1993) (Table I, Appendix I) tends to tie certain characteristics to one another and see the three images as mutually exclusive and not coexistent. So the paradigm concept needs to be used with some caution.

3:2 The approach to the data gathering exercise

> "We must determine what the population 'knows' regarding ecology, the environment, and pollution; how they feel about it; what commitments they are willing to make; and what commitments they do make. These are necessary antecedent steps that must be made before an attempt can be made to modify critically relevant behaviours."
>
> Maloney and Ward (1973, p.584).

That which was advocated by Maloney and Ward (1973) over twenty years ago for ecology, the environment, and pollution (quoted at the head of this section), seems equally applicable to biodiversity today. Before people's 'critically relevant' behaviours *vis-à-vis* biodiversity can be effectively changed, key factors which influence that behaviour need to be determined. These factors are multifarious. They are likely to include those suggested by Maloney and Ward (1973), namely levels of knowledge and understanding, people's feelings, and the commitments they are willing to make and already make in relation to biodiversity. In addition, they may include certain beliefs, attitudes or values already held, even personality characteristics of the individuals involved. Many variables will in turn be influenced by socio-demographic parameters, such as age, ethnicity, disposable income, educational background, or place of residence, and many will be affected by specific features of the social context in which the behaviour would take place, for instance, the likely response of other people or the practical difficulties involved in carrying out an activity.

The number of variables potentially involved makes the task of accommodating them all nearly as daunting as that of measuring them accurately. Those relating to actual behaviour are difficult to assess reliably, unless individual subjects are actually followed and observed; those relating to feelings are necessarily mediated, usually having to depend upon the person's self-reporting; some concerning socio-demographic factors require honesty or a good memory on the part of the respondent. In addition, notwithstanding the methodological difficulties involved in identifying and evaluating these variables, the constraints of time and resources provide valid practical reasons why a balance must be struck between the amount of data sought for any one individual and the number of individuals for whom data are gathered. This means that only a selection of variables can be investigated in this study.

The areas designated by the research questions direct the investigation towards knowledge, understanding, behaviour and learning, whilst the importance accredited attitudes, groups and paradigms points to specific methodological elements. However, in entering virtually uncharted waters the temptation to start constructing attitude scales must be vigorously resisted. In the field of conservation biology so-called 'attitude measurements' relating to biological conservation often appear to have been developed without regard to the considerable literature dealing with the formulation of such measures and the problems associated with their application (e.g. Newmark *et. al.* 1993; Mkanda & Munthali 1994; Akama, Lant & Burnett 1995). Most importantly, given that the central interest of this study is in 'understanding and support' and their formation, in the first instance the focus will be limited to these components. Attitudes are no doubt related to these, but the development of attitudinal measures is premature when as yet there exists no clear picture as to which attitudes should be assessed. Attitudes are important to this study, but such measures should emerge and derive from research of this type rather than direct it. Attitudinal elements will be explored, but in the first instance the approach will restrict itself to a consideration of existing levels of understanding and support *vis-à-vis* biodiversity, the patterns which can be identified within them, and the processes by which they may have been formed.

What little evidence there is suggests that the great majority of people in the UK have little or no idea of what the term 'biodiversity' really means, that people's knowledge of the subject may be poor, and their understandings little more than fragmentary. In agreeing with that which Arcury, Johnson and Scollay (1985) maintain for environmental issues, measurements must be developed which test actual knowledge and understanding of biodiversity. The questions that immediately arise are: what should the 'biodiversity understanding' measure be, and how should it be developed? If levels of public knowledge are very low then a survey instrument pitched at a sophisticated knowledge will be inappropriate. Yet the evaluation should be reasonably comprehensive and not simply distinguish those who know a little or a lot, for a partial knowledge can sometimes be worse than no knowledge at all when it results in the wrong behaviour. The past practice of suppressing fires and grazing, both on heathland (Pickett, Parker & Fieldler 1992) and savannahs (Huston 1994), is a good example. What is required is an instrument that can assess understandings in a range from zero up to a relatively expert level. This begs the question as to what the expert level should be.

One way to establish an expert level is by reviewing a range of texts dealing specifically with the subject of biodiversity and identifying the most frequent common elements. As Huston (1994) maintains, the hope of understanding biodiversity relies on it being divided into components. Another means is to identify the level of understanding attained by students at the end of a specialist course including a substantial amount of study on the subject, such as a Conservation Biology MSc programme.[1] Yet another might be the understanding which professional conservation biologists and biodiversity educators believe most members of the public *should* have. Clearly, each involves subjective judgements. In fact all were employed, together with a literature review of specialist and lay publications, and two discussion fora. One of these fora involved six students beginning a diploma in Ecology who were asked to identify what they considered to be the most important parameters of biological diversity; the other, a group of twelve representatives from environmental and wildlife charitable organisations, were asked the same question whilst participating in a planning workshop for a project to identify what the practitioners believed to be 'best practice' in biodiversity education (July 1996). The dominant parameters that emerged (Table II, Appendix I) seemed to provide an acceptable coverage of the subject area and were incorporated into the main survey instrument.

It may seem logical to assume that there exists a consistent relationship between the level of a person's biodiversity knowledge, the type of attitudes s/he holds toward biodiversity, and the forms of education which link the two. Yet data on sources and processes of biodiversity education are only beginning to appear. Most evidence relates to wildlife and nature more generally, and is often hearsay rather than data, albeit hearsay derived from years of experience of educators in field centres, wildlife sites and formal education. Studies of the educational effects of specific forms of biodiversity education (e.g. Birkinshaw 1994; Everitt 1995; Leech 1996; Penn 1997) have not considered the relative importance of different educational sources. In the context of this thesis the question of what constitutes the most effective processes for developing biodiversity understanding will be addressed by considering different sources of learning in relation to levels of understanding and support.

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[1] The programme run at the Durrell Institute of Conservation and Ecology, University of Kent at Canterbury.

3:3 Strategies and tactics for data collection.

> "However, method is more than data alone. The gathering, analysis and interpretation of data is always conducted within some broader understanding of what constitutes legitimate inquiry and warrantable knowledge."
>
> Henwood and Pidgeon (1993, p.15).

In considering the need to gather data on understandings and support *vis-à-vis* biodiversity, and in recognising the potential difficulties involved in doing so, various approaches to and means for collecting these data were considered. Of the traditional social science research strategies, namely experiment, survey and case study, the exploratory and descriptive nature of this research favoured the use of surveys and case studies (Oppenheim 1992; Robson 1993) - however, in its comparison of specific groups the main survey instrument also includes some of what Cook & Campbell (1979) describe as quasi-experimental elements.

Having encountered the lack of quantitative data and the inadequacy of extant qualitative data, it was initially thought there was a strategic need to first establish an overall general picture within which a more detailed investigation could be contextualized. The original intention was therefore to conduct a survey that would produce a statistically representative reflection of the situation in the UK. The survey instruments which best facilitate the collection of these sorts of data are the interview-based questionnaire (or structured interview) and the postal questionnaire (Robson 1993). Others, such as focus groups and the Delphi method were rejected on the grounds that their group context for data collection would not provide a means of adequately exploring the details of each individual's knowledge and understanding. Such data would be difficult to isolate because in the group context participants could not be prevented from influencing or informing one another.

In endeavouring to begin building a general picture by gathering a considerable amount of data quickly, the first tactic was to design a large-scale postal questionnaire survey containing a maximum of about twenty questions which could be completed in about ten minutes and which would survey levels of knowledge about central concepts associated with biodiversity. Fortunately, participation in a Local Agenda 21 conference led to an invitation to include a short questionnaire in an issue of *Environmental News*, the Canterbury City Council's environmental newspaper. With a very substantial circulation (delivered to 60,000 households in the district), it was thought that it could be an ideal vehicle for this picture-building survey. In the event, the resulting data were of limited value, but the exercise was a useful contribution to the evolution of the main survey instrument.

3:3:1 The *Environmental News* postal questionnaire.

An individual's readership of *Environmental News* was assumed to indicate some interest in local environmental issues, so the survey was unlikely to produce findings that could be easily generalised to the recipient population. However, the survey seemed likely to generate a substantial amount of, albeit low quality, data and provide additional background material for the main study. Unfortunately, the original set of questions (Q1, Appendix II) had to be substantially cut as editors twice reduced print space allocation. The final version (Q2, Appendix II) was restricted to an open question asking respondents to write down the first three things which came to mind when they heard the term "wildlife", a tabular question derived from two other surveys (DoE 1994c and CEC 1986) evaluating levels of concern for a range of twelve Major Environmental Issues (MEIs), and a question about the respondents' membership of/support for named environmental and wildlife organisations. Data about age, gender, degree of urban/rural residence and occupation were also requested. To aid completion most answers were made by ticking a box. The questionnaire appeared on page eleven of the twelve page publication, which might have hindered accessibility, but cash prize sponsorship (£175) was obtained, a proven means of encouraging returns (Church 1993), and the prize draw advertised on the front page.

By the 1st of June closing date, 228 returns had been received; a very small sub-sample, representing just under 0.4% of the sample population (see Appendix IVa for summary data). The respondents set did reasonably accurately reflect the make-up of the population of the Canterbury District, but some groups were disproportionately represented. As Table 3.1 shows, the respondent group was skewed towards women, older age groups and rural residents.

Table 3.1. Age, gender and residence of *Environmental News* survey respondents and of Canterbury residents (source: Census 1991).

Variable	% of respondents	% of Canterbury residents
Female	60	53
Male	40	47
Age 10-17	3	6[a]
18-34	15	9[b]
35-54	40	32
54+	41	31
Rural residents	36	20
Urban residents	64	80

[a] Age category actually 10-18; [b] age category actually 19-34.

The proportions of the occupational groups (Registrar General 1961) represented by respondents also differed from those in the District as a whole in the 1991 Census. Table 3.2 gives these data (some aggregated), and shows the survey respondents substantially over-represented by "professional workers" and to a lesser extent by "intermediate non-manual workers" and "junior non-manual/personal service workers" (combined). "Employers and managers", "skilled", "semi-skilled" and "unskilled" manual workers were under-represented.

Table 3.2. Socio-demographic groups represented by economically active respondents to the *Environmental News* survey and by Canterbury households (source: Census 1991).

Socio-demographic group	% of respondents	% Cant. households
Employers and managers, large and small establishments (1,2)	6	28
Professional workers, self-employed and employees (3,4)	24	7
Intermediate non-manual workers (5)	20	14
Junior non-manual workers and personal service workers (6,7)	22	13
Foremen and supervisors and skilled manual workers (8,9)	15	16
Semi-skilled workers and unskilled workers (10,11)	6	11
Own account workers (12)	3	11
Farmers and agricultural workers (13,14,15)	3	2
Armed services personnel (16)	1	1

numbers in brackets ( ) correspond to Registrar General's "Socio-economic group" categories (Registrar General 1961).

Nearly all respondents demonstrated a high level of concern for the twelve Major Environmental Issues (MEIs). Applying a scoring system to these data[2] resulted in the maximum score of 36 being achieved by 19% (42) of respondents and only 15% (34) scoring a total of 24 or less. Amongst the MEIs, aggregated concern as expressed by an Index of Concern (IC)[3], was greatest for the pollution of rivers and lakes (IC=2.78) and least for the lack of access to the countryside (IC=2.07). Concern was highest for national issues (mean IC=2.60), marginally less for global issues (IC=2.55), least for local ones (IC=2.30). Table 3.3 compares MEI Index of Concern figures for respondents in this study with those in the Department of the Environment study (DoE 1994c) and UK figures from the CEC survey (1986). In keeping with these and other studies (GALLUP 1987; MAFF 1991), *Environmental News* survey data recorded high levels of concern declared across a range of environmental issues, with those related to biodiversity loss being amongst the highest scoring.

The general correlation with local socio-demographic variable distributions and this consistency with the data from studies based on representative samples, suggests that the other findings from the *Environmental News* survey might also be broadly representative. However, membership levels of environmental and wildlife organisations amongst respondents were rather higher than the national levels, with some 20% of respondents belonging to the RSPB, 20% to the National Trust, and with members of Greenpeace, WWF, the Kent Trust, and Friends of the Earth

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[2] Where: don't know/not at all = 0; not very much = 1; a fair amount = 2; a great deal = 3.

[3] Index of Concern = total score for MEI/total number of respondents.

being represented by roughly 1 in 10 respondents. This skewing partly explains the higher Indices of Concern found in this sample.

Table 3.3. Indices of Concern (IC) about Major Environmental Issues in the *Environmental News* survey and in other studies (sources: CEC 1986; DoE 1994c).

Major Environmental Issue (MEI)	**Index of Concern (IC)**		
	Canterbury	DoE	CEC
Lack of access to open space and countryside	2.07	-	0.36
Condition of local wildlife areas	2.29	[a] 2.19	0.82
Disposal of household waste in Kent	2.30	1.77	0.60
Traffic congestion	2.53	2.03	-
Local issues - mean	2.30	2.00	0.45
Disposal of industrial chemical waste	2.63	2.44	2.22
Disposal of nuclear waste	2.66	2.35	-
Damage caused to sea-life and beaches by oil tankers	2.68	2.35	2.16
Pollution of rivers and lakes	2.78	2.51	2.06
National issues- mean	2.60	2.41	2.15
The destruction of the ozone layer	2.40	2.10	-
Possible changes in the earth's climate due to CO_2	2.53	1.91	2.01
Extinction of species of plant or animal	2.64	2.07	2.18
Depletion of the world's forest resources	2.64	2.14	-
Global issues- mean	2.55	2.06	2.09

[a] Refers to landscapes rather than wildlife.

Data on what "wildlife" meant to respondents were coded according to whether they mentioned: named species;[4] classes of organism[5] (e.g. mammals, butterflies, insects, trees); kingdoms (animals/plants); particular habitats/communities; ecosystems; and several categories of relationship to humans (e.g. "exploitation", "autonomy", "aesthetics", "protection. These data were weighted because it became clear that a significant proportion, some 23% (52), of all respondents, in distinguishing between "animals" and "birds", appeared to have described mammals with the term "animals". Table 3.4, listing the wildlife categories represented by more than 15 respondents, provides a general picture of how this question was answered.

The picture is dominated by responses at the level of taxonomic class, by some particular classes, by mammals generally, by the rather general concepts of countryside and nature, and by certain relationships between humans and wildlife. There appeared to be a focus at the level of whole organisms, with habitats/communities being very poorly represented. It is worth noting however, that the habitat most frequently mentioned, namely "woods/forest", is the same found to be most popular amongst a sample of 227 members of the Northumberland Wildlife Trust (Garrod & Willis 1994).

[4] A degree of flexibility was necessary in interpreting these data e.g. "foxes" was taken to mean the single British species *Vulpes vulpes*, rather than the genus.

[5] Here the term "class" includes all taxonomic groupings from genus to class.

Table 3.4. *Environmental News* survey: Responses to the question: "When you hear the term 'wildlife' what does it mean to you?". Wildlife categories represented by more than 15 respondents.

Category	No. of respondents	% of all respondents
"birds"	94	41%
"animals"	83	36%
"mammals"	72	31%
"plants"	57	25%
"countryside"	48	21%
"autonomy/freedom"	41	18%
"named mammals"	37	16%
"insects"	33	14%
"exploitation"	33	14%
"nature"	31	14%
"flowers"	28	12%
"endangered"	27	12%
"conservation/reserves"	22	10%
"woods/forest"	18	8%
"trees"	16	7%
"aesthetics"	16	7%

In considering the relationships between variables as a means of identifying other patterns in the responses to this survey, initial paired variable comparisons using cross-tabulations were either insignificant or failed statistical validity criteria. Data re-coding into fewer values for each variable, followed by further cross-tabulations, suggested a lack of correlation between nearly all the variable pairs. Notable exceptions were: an increasing mention of "relationship to humans" categories and a decreasing mention of particular species and classes of organism with higher status of occupationally based socio-demographic group. No notable associations were found according to organisational membership. Further re-coding did produce more associations, particularly between individual MEIs and certain socio-demographic data variables. Proportionally higher percentages of female respondents were found to be "a great deal" concerned about global warming, the destruction of the ozone layer, world forest resource depletion, chemical waste, nuclear waste and oil pollution - findings which tend to agree with the gender-based difference found elsewhere (i.e. Young 1992; DoE 1994c). Relatively lower levels of concern about nuclear waste disposal were found amongst those respondents less than 35 years old, and the level of concern about traffic congestion was found to positively correlate with increasing age; no associations were found between specific MEIs and different socio-demographic groups. Table 3.5 shows these with Chi squared values (indicating the strength of the association) and significance levels (the lower the number, the less likely the correlation to have occurred by chance). By virtue of their mode of collection, these data could not reliably be regarded as representative of the general population. However, they did show a good degree of similarity with those data obtained from the stratified samples in the other studies. That the

Indices of Concern for the *Environmental News* survey were consistently higher than those for the DoE and CEC surveys, is not surprising. Responses depended upon the particular issue of the paper having first been looked through and the reader being sufficiently motivated to fill in and post the questionnaire. So a sub-sample exhibiting relatively high levels of concern was almost bound to have been drawn, notwithstanding the cash prizes on offer. What is noteworthy, is that the relative importance of the Major Environmental Issues (MEIs) recorded in the other surveys was closely mirrored here and that the mean Indices of Concern for local, national and global issues stood in the same relation to one another.

Table 3.5. *Environmental News* survey Major Environmental Issues. Statistically significant variable associations.

Major Environmental Issue (MEI)	**Correlating variable**	**χ^2 value**	**Degrees freedom**	**Sig.**
The destruction of the ozone layer	?gender	11.00	1	.000
Possible changes in the earth's climate due to CO_2	?gender	10.28	1	.001
Depletion of the world's forest resources	?gender	6.97	1	.008
Disposal of nuclear waste	?gender	4.95	1	.026
Disposal of industrial chemical waste	?gender	4.14	1	.042
Disposal of nuclear waste	↑ age	6.17	2	.046
Traffic congestion	↑ age	5.99	2	.050

The extinction of plants and animals, the Major Environmental Issue (MEI) most immediately concerned with biodiversity, was amongst the MEIs securing the greatest levels of concern (equal 4th, IC=2.64). This compares with its 8th position amongst the same MEIs from the 1993 DoE survey (DoE 1994c, see Table 3.3) and may either reflect a real increase in the recognition of its importance, the skew in the respondent group, or simply that the earlier question on wildlife in this questionnaire had sensitised respondents to this issue. Considered in conjunction with greater amount of concern expressed for global issues, this might reflect a growing awareness about particular charismatic endangered species for which international campaigns have been conducted. Otherwise its position suggests little as to the nature of the concern and understanding which underlies this response.

Perhaps the most interesting responses were those to the question "What does the term wildlife mean to you?". The predominance of responses in "non-organised biota" categories (species, classes, kingdoms) is possibly to be expected, given the focus on whole organisms that has dominated school-based biology education for many years (Hale & Hardie 1993), and given the subject orientation of most wildlife documentary television programming. It also remains the primary level for understanding biodiversity in practice, so species or class are probably the levels of biological organisation to which people relate most easily. The poor representation of habitat/community, a key concept in the understanding of ecology and biodiversity, coupled with the image of the respondents' perceptions of wildlife drawn by Table 3.4 did not suggest that those in the respondent group had a strong or immediate notion of interdependency amongst wildlife and/or between wildlife and humans. Indeed, the most prolific categories describing some sort of relationship to humans tended to confirm this in so far as they indicated a sense of separateness from nature ("autonomy/freedom") or a view of the relationship as human-centred and 'one-way' (i.e. "exploitation", "endangered", "reserves", "aesthetics"). Of course, these perceptions need really to be contextualized in relation to more specific components of people's understandings if they are to reveal anything more.

Very few relationships between data variables were statistically significant. Perceptions of wildlife showed little or no variation by age, gender, place of residence, socio-demographic group, level of concern or overall levels support for organisations. The small data set did not allow this to be tested in relating to the membership and support of specific organisations. The only exceptions found, were a move away from the "named species" and "classes" categories, and towards the aggregated "relationship to humans" category amongst higher status socio-demographic groups. This may suggest different types of understandings and perceptions of wildlife amongst different social classes/occupations, with perhaps the primary intervening factor being the level of education associated with each, but this conclusion is speculative. The fact that, in line with the other surveys mentioned, respondents expressed less concern about local environmental issues may have significant repercussions for long term strategies to conserve biodiversity. It might demonstrate a view of the problem of biodiversity loss as being something happening 'out there', rather than on one's doorstep. To a large extent, this is indeed a true picture of the situation globally, but arguably people might most effectively direct their understanding and support at local wildlife.

Overall, except in corroborating data from other studies and providing useful contextual data concerning perceptions about wildlife, the data produced by the *Environmental News* survey proved of limited value to this study. This was partly due to the greatly reduced size of the final questionnaire, partly to the sampling mechanism itself and poor response rate, and partly to the lack of questions dealing specifically with biodiversity concepts. Moreover, as with all postal surveys, it revealed almost nothing about those recipients who did not respond, and was unable to explore the topic in great depth. With a particularly complex subject such as biodiversity, about which respondents might require explanation or clarification, and with more extensive and detailed data being sought, it was decided that the research demanded a more carefully targeted survey. This decision was reaffirmed after piloting eleven survey questions during a poster presentation at a Departmental postgraduate symposium (Q3, Appendix II, July 1996). Not only did the six persons who completed this questionnaire in the presence of the researcher do so more quickly and comprehensively than the five who did not, most asked points of clarification. If explanations were required by a group of highly educated people, it seemed likely that more profound difficulties would be encountered by those less formally educated.

3:3:2 The Keoladeo visitor survey

Despite the judgement that the main survey instrument should take the form of an interview, another opportunity to conduct a postal questionnaire presented itself through a postal questionnaire to appraise visitor knowledge associated with nature tourism at Keoladeo National Park, Bharatpur, India. This was part of an ODA-funded project looking at nature tourism (Goodwin *et al* 1997). Because the questionnaire was more substantial than the *Environmental News* survey questionnaire, it was thought that this could possibly provide useful data and would enable further testing of the questions being developed for the main survey instrument. It was therefore decided undertake this second postal survey despite reservations about the value of the data it would produce.

A range of tour operators uses the Keoladeo site. Interviewers in the park had collected names and addresses of visitors. A postal questionnaire was designed with a view to gathering data on the visitors in six main areas of interest:

- wildlife-related activities
- reasons for going on the trip to India
- activities associated with the trip to Keoladeo
- knowledge of the Keoladeo Park
- general knowledge about biodiversity
- standard socio-demographic characteristics

In setting out to assess learning in connection with the Keoladeo site, the initial intention was to conduct a pre- and post-visit survey of visitors. However, it rapidly became clear that there was an unhelpful response from most tour operators. In combination with problems of seasonality (most tours take place November-January), this meant that in order to gather a sufficient quantity of data the sample population would have to comprise *any* visitors who had visited the site during recent years. This meant learning had to be considered solely in the context of a post-visit survey.

Thirty-five tour operators understood to be taking UK visitors to the Keoladeo site were approached by telephone, given an explanation of the nature and importance of the research and asked for their collaboration in distributing questionnaires to past clients. The questionnaires (Q4, Appendix II), together with reply-paid stickers were to be supplied in stamped envelopes and all the operator need do was to address the envelopes and forward them. The operator's attention was drawn to the possible benefits of the research that might accrue to them and offered a copy of the eventual final report and the data set relating to their clients. Of the 35 operators, 13 proved unsuitable, and many of those remaining required repeated contacts before they came to a decision on collaboration. Sample questionnaire packs with an explanatory covering letter were sent to all operators who did not refuse point blank. As found previously (Clifton 1996), operators were concerned about client and commercial confidentiality, and/or were short of resources and willingness to assist research of this kind. Five refused to collaborate on the grounds that they 'don't do that sort of thing' or 'didn't want to bother their customers', and 9 refused because it was either: 'too much trouble'(2), they 'could not afford the staff time' (3) or because their record system did not allow for easy access to past visitor data (4). These operators were offered the option of being financially compensated for the inconvenience, but were still not forthcoming. Key decision-makers in another three companies were reported as being absent during the period when agreement was being sought.

Only five tour operators responded positively, agreed to participate and were sent questionnaires. Two were bird watching specialists (A, B), two were general nature holiday providers (C, D), and one (E) was a general tour operator. Operators A-D were small companies in which individuals/tour leaders took on the responsibility for forwarding the questionnaires. Company E was a large operator that takes several small groups to Keoladeo each year. A total of 140 questionnaires were sent out via these operators (A=25, B=30, C=25, D=30, E=30), and an additional 231 were sent to individuals whose names and addresses had been collected by local researchers at the Park between August 1995 and March 1996. This latter group included 127 non-UK nationals. Because two separate routes were used to reach the visitors some degree of duplication for the UK visitors may have taken place. However, the 128 replies received by the deadline date of 1st March 1997 represent no less than 35% of the 371 visitors sampled. Thirty percent (73) of these were from the UK and 43% (55) from overseas.

The findings must be considered within the context of the make-up of the survey population and respondent sample. Those visitors to Keoladeo who received a questionnaire had gone on trips with one of the tour operators collaborating with the researcher or had given their names and addresses to local researchers whilst on holiday. It is unknown how representative the four tour operators who collaborated with the study were, but willingness to participate may reflect other aspects of their operation, such as their level of conscientiousness and/or the amount/sort of information/education they provide for their clients. Alternatively, as suggested by some of those operators who did not get involved, participation might simply have been due to the presence or lack of organisational barriers e.g. how the records are kept. Evidence from the study by Jordan (1996) suggests a somewhat higher degree of willingness to collaborate with tourism research amongst operators than was encountered here.

Another potential source of data distortion was the process of the actual distribution and receipt of the questionnaires itself. Probably not all of those individuals sent questionnaires, received them. Almost certainly, not all of those who received a questionnaire filled it in and returned it. A significant proportion may have been sufficiently intimidated by the knowledge questions to the extent that they did not wish to respond. The resulting data set is therefore skewed towards those people who were willing and able to take the time to complete the questionnaires, and this group is likely to be one whose members tend to have a greater interest in and perhaps knowledge of Keoladeo and wildlife in general. Extrapolations from the data, must therefore be made with care, despite the 35% (or more) response rate from recipients being a satisfactory one. Notwithstanding the questions surrounding the representativeness of the data, they did provide useful additional background material and reveal some interesting patterns for comparison. Data concerning the UK respondents (N=73) are presented in this study at appropriate points in the main survey instrument data analysis and general discussion and are summarised in Appendix IVb. The full data are presented elsewhere (Bride 1997).

3:3:3 The approach to the main survey instrument

The sort of substantial rolling benchmark survey conducted by the large polling organisations across the whole of the UK could meet the need for data which could be reliably generalised to the national level. Both SCPR and MORI survey about 1500 people in order to ensure sufficient responses to fulfil the requirements for statistical analyses across a range of socio-demographic variables. Given the concern to explore understanding and support in some detail, which meant that the survey instrument would involve a substantial number of questions, the use of a closely representative sample of the public had to be rejected on the grounds of impracticality. More importantly, at this inaugural, exploratory and relatively elementary stage of research, such a large-scale survey was not considered necessary. What was required was a survey methodology which could identify basic patterns and seek explanations for these, but whose data could be extrapolated using other means.

The theoretical context provided the "grounded theory" approach to sociological method conveniently supplied a valuable tool in achieving this end, through the "general method of comparative analysis" (Glaser & Strauss 1967, p.1). Although most frequently used in relation to qualitative research, it is also expressly described as suitable for quantitative work or where both methods are combined (Strauss *et. al.* 1964; Strauss & Corbin 1990). Essentially, the approach is one of developing theory through systematic data collection and analysis (Strauss & Corbin 1990). In this instance it meant emphasising the need to develop theory rather than test it. Given that the use of a representative sample was impractical, and given that circumstantial findings from other studies signalled the possibility of certain socio-demographic variables playing an important role, not only was a comparative approach implied, but also the social group presented itself as the unit most suitable for this comparison. This approach was considered acceptable because of the overall concern with building hypotheses, and because it was accepted as quintessential to this sort of exploration for accounts to be allowed to result from an oscillation between ideas and research (Bulmer 1979, cited in Strauss & Corbin 1990). It did not preclude rigour in data gathering and analysis. It simply permitted subjective incorporation of some additional parameters to those commonly used. In this case it enabled groups to be selected according to variables thought likely to be of particular importance or interest.

Although this approach has something of the methodological anarchy advocated by Feyerabend (1975), because the research is exploratory, it does so with some academic justification. A basic technique of the grounded theory approach, 'theoretical sampling', consists of selecting groups to be compared on the basic criterion that they have a "...theoretical relevance to the development of emerging categories." (Glaser & Strauss 1967, p.49). There was already some evidence from the *Environmental News* survey that qualitative differences in concern for the environment might exist between men and women, and evidence of higher levels of environmental knowledge has also been found amongst males (Gifford, Hay & Boros 1982/83; Arcury, Johnson & Scollay 1986; Arcury, Scollay & Johnson 1987; Arcury 1990; Schahn & Holzer 1990; Hausebeck, Milbrath & Enright 1992). Therefore, this category grouping seemed worthy of consideration. Similarly, social class, found to be a correlating factor in some large studies of environmental concern (Young 1986, 1987; DoE 1994c), had been identified as important in relation to environmental behaviour, and group membership and support (Buttel & Flinn 1974a, 1978). That differences in understandings and support might be encountered across different levels of formal education, was also considered a reasonable expectation. It was supported by findings from studies looking at other environmental issues and which consistently correlated educational level with a range of scales, including knowledge scales (e.g. Miller 1983; Arcury, Johnson & Scollay 1986; Arcury 1990), self-reported actual environmental commitment (e.g. Buttel & Flinn 1974b; Arbuthnot 1977; Schahn & Holzer 1990; Cottrell & Graefe 1997), and levels of concern (e.g. Arcury, Scollay & Johnson 1987). In practice, the process of choosing the conceptual categories (the selected groups) arose from the interplay of three primary factors:

- circumstantial evidence that social class and associated variables (e.g. disposable income, level of education, newspaper readership) might be of interest and significance in relation to people's understanding and support *vis-à-vis* biodiversity;

- following Thomas & Chetwynd's (1995) findings for sectorial differences, the idea that a comparison of social groups selected on the basis of the relationship they have with wildlife might provide valuable insights in respect to public understanding and support *vis-à-vis* biodiversity;

- recognition that the difficulties involved in accessing a range of social groups can be legitimately addressed by exploiting opportunities provided by the researcher's living and working environment. This meant hybridising the techniques of "purposive sampling" and "convenience sampling" (Robson 1993, p.141) in order to provide a type of "theoretical sampling" (Glaser & Strauss 1967).

Besides attempting to have both sexes represented in each group in equal numbers where possible, with the exception of the political persuasion of the group of elected members, no other parameters were used in selecting specific individuals. The groups selected for the main survey using the above combination of processes and factors were as follows:

Experts: Conservation Biologists.

Graduates of a Masters degree programme in Conservation Biology at Durrell Institute of Conservation and Ecology, the University of Kent at Canterbury were utilised as an easily accessible group who could be expected to understand the subject of biodiversity well and thereby provide an 'expert' point of comparison. Because the nature of the research became quite widely known in the Institute within days of the interviewing having begun, it was recognised that data from this group of closely associated individuals would be quickly compromised by potential interviewees knowing in advance what the research was about. This meant only a few interviews could be conducted amongst this group. However, since this group was included for comparative purposes rather than in order to be specifically investigated, a large cohort was deemed unnecessary.

Supporters: Members of the Kent Wildlife Trust.

The Kent Wildlife Trust provided a list of forty randomly selected names and addresses of Trust members living in the Canterbury area. A letter from the director introducing the researcher and his wish to include the member in his survey, and asking for their co-operation was sent to each. In line with research that has found that most people supporting environmental NGOs through membership do so because they want to support their work (Rose 1993), Kent Wildlife Trust membership was taken as an indication of committed support for conservation of the county's wildlife and countryside, and as possibly marking higher than normal levels of understanding of biodiversity.

Decision Makers: Senior Officers and Elected Members of the District and County Councils.

Previous collaborations with Canterbury City and Kent County council officers helped precipitate access to groups of senior officers and elected members belonging to both organisations. The Local Agenda 21 officer approached the District Council officers on the researcher's behalf. County officers were approached by an employee of the County Council's Environment Unit under instructions of the Director. Members were randomly chosen from published lists using random numbers, but in order to avoid accusations of political or gender bias they were selected so that the number of individuals representing each of the three main political parties was the same, and numbers of male and female District and County members were equal for each party cohort. County Council members were sent a letter by the Chairperson of the Member's Desk asking them to collaborate. In effect there were two sub-groups surveyed. Together they represented local and regional government decision-makers whose decisions directly or indirectly influenced the environment and wildlife. The officers constituted a sub-group of professionals of the top social class, and the members, a sub-group of active and committed citizens. This group selection also made comparison possible between district and regional decision makers.

Skilled workers.

In practice, this was the hardest group to access, many individuals being self-employed and/or unwilling to give up their valuable time. In the event, they were reached through the service and retail sector, either being approached by the researcher whilst using the service or when simply walking into the premises. Consideration of this group was not only thought important in order to ensure that a good range of occupationally based social classes was represented, but because sociological studies have suggested that skilled workers might hold particular attitudes and values (e.g. Salaman 1974)

University and City Council estate workers.

This group, of semi-skilled workers was accessed through contact with the administrative heads of their respective organisations. Once permission had been obtained, willing participants were met by the arrangement of their section heads - although they did not know what the interview was about. Given the fact that these workers are involved in the daily management of areas occupied by living things (both wild and exotic species), it was speculated that their understandings might differ from those of similar status workers in other sectors.

Semi-skilled and unskilled workers.

This group comprised of three sub-groups: University porters (men), and University catering staff and domestic care workers (women). Group members seemed to have little apparent relationship with biodiversity and, since none had required any formal qualifications for their employment, the levels of formal education they had completed were expected to be low. University staff were chosen because they were easy to approach and to subsequently access once the times at which they were not very busy had been established. Porters were approached randomly in each of the four University colleges and interviews arranged during quiet shifts, usually in the early hours of the morning. Similarly, catering staff were interviewed during lunch breaks or lulls in business. The group of care workers chose itself by their agency allocation to the researcher's home for the purpose of attending to a resident. Selected groups and sub-groups are summarised by Table 3.6, with reference to their predicted characteristics.

Table 3.6. Predicted characteristics and codes of groups selected for main survey instrument.

Groups		Possible relationship with biodiversity
Conservation Biologists		biodiversity 'experts'
Kent Wildlife Trust members		biodiversity 'supporters'
Workers	Estates	wildlife 'managers'
Government Officers	District	professional local biodiversity 'decision-makers'
	County	professional regional biodiversity 'decision makers'
Elected Members	District	elected regional biodiversity 'decision makers'
	County	elected local biodiversity 'decision makers'
Workers	Skilled	relatively affluent non-biodiversity - related workers
	Unskilled	less affluent non-biodiversity -related workers

3:4 Design and implementation of the main survey instrument

This section considers the general and specific design issues addressed, the testing and precise application of the main survey instrument and the detailed formulation of the questions contained therein. A considerable literature dealing with the design of survey instruments was consulted in developing this instrument, and great care was taken to adhere to the ground-rules set out therein. It included: Moser & Kalton (1972); Van Maanen (1983); Brenner, Brown & Canter (1985); Fowler & Mangione (1990); Allen & Skinner (1991); Jones (1991); Oppenheim (1992); Foddy (1993); Robson (1993); Foster & Parker (1995); and, Hewstone, Stroebe & Stephenson (1996).

The objective of comparing data on knowledge and understandings between and amongst selected groups suggested that of the different types of interview technique available, a questionnaire-based structured interview would provide the most suitable instrument, collecting, as it does, standardised data in a standardised manner. This would make comparison of data between groups easier than an unstructured interview would. Furthermore, because several respondents in the pilot interviews had expressed discomfort at being tape-recorded whilst being asked questions that tested their knowledge, it was decided that taping interviews would be aborted; it being a primary concern that respondents would be at ease in order to encourage them to provide accurate data. Without a taped record a more structured way of gathering data was necessary.

Although the structured interview has the advantage of obtaining a high response rate and of ensuring that each question is answered (Galtung 1970; Robson 1993), it is not without potential sources of error. Probably the most fundamental problem with a survey instrument of this type is that the interview itself is a social process of considerable complexity (Brenner 1985), one open to all the interpersonal effects that are found elsewhere in social life (Marsh 1982). The categories used are inevitably based upon theoretical positions (Marsh 1982), and verbal data are susceptible to error in interpretation. Payne (1951) defines an unbiased question as one that does not itself affect the answer; but how can one measure this affect? Understandings of biodiversity are not as sensitive an issue to investigate as, for example, sexual proclivities or views on race (Galtung 1970), but it is naïve to assume that everyone answers interview questions honestly or can remember accurately. Clearly, the assumption that identical interviews are executed with truly identical questions and equivalent responses is also wrong (Cicourel 1964). Not only will respondents be differentially tempted to give socially approved answers (Foster & Parker 1995), but since they do not all share the same linguistic code as each other or as the interviewer (Foddy 1993), misinterpretation by both parties can easily occur. This said, considerable efforts were made to standardise the conduct of the interviews. The items included in the final interview schedule can be broadly translated into four sets of questions:

- questions about things people do in relation to biodiversity and wildlife - the "activity" set;
- questions about the way people feel about biodiversity and wildlife - the "affective" set;
- questions about what people know and understand about biodiversity and wildlife - the "cognitive" set;
- questions about the socio-demographic characteristics of respondents - the "attributes" set.

Some questions in one set also related to the broad category of others. For instance, an "affective" question which included a knowledge element and *vice versa*. Before discussing the formulation of the questions in detail, the testing and application of the survey instrument will be explained.

3:4:1 The testing and application of the main survey instrument

Using a draft questionnaire developed from questions in previous ones (questionnaires Q2, Q3 and Q4, Appendix II), twenty pilot interviews were conducted with people from a range of social, occupational and educational backgrounds. This piloting was treated as a proper interview situation, with respondents being instructed to ask for clarification of anything they did not fully understand. After completion interviewer and interviewee went through the questionnaire together and discussed its format and contents. Appropriate changes were made to the form, number, wording and ordering of questions, and to the visual appearance of the questionnaire, and some answer categories were formed from responses to open questions. The final schedule (Q5, Appendix II), which had taken on average about 45 minutes to complete when piloting, was then applied to the selected groups. Interviews were conducted between April-December 1997, with no specific order in relation to selected group membership. Representatives of each group were interviewed throughout the data-gathering period.

Except in the case of the District and County Officers, with whom appointments were made by the researcher's contact in each organisation, all potential interviewees were contacted directly by telephone or approached in person by the researcher and those who had received a letter from their organisation were reminded of this. They were told that the researcher was from the University of Kent, interested in finding out what they thought about nature and that he wished to conduct an approximately 40 minute interview at the time and place of their choosing. No mention was made of the term "biodiversity" because the question as to whether the interviewee had ever heard of it was part of the survey instrument. Furthermore, no mention was made of the fact that the interview would include factual questions on the subject. This was admittedly slightly deceitful, but was thought to be necessary in order to avoid 'scaring' people away and to prevent the possibility of participants 'priming' themselves. In the event, with the exception of three individuals from the list of Kent Wildlife Trust members, nine skilled workers, two University estate workers and one member of the University catering staff, all those approached agreed to participate. Interviews were almost invariably arranged at the respondent's home or workplace and always at a time convenient for the respondent.[6] Cancellations were received in a friendly, understanding manner and alternative appointments arranged. In this way virtually all those approached were eventually interviewed.

When meeting interviewees the researcher made sure to dress in an appropriate manner and to be polite and sympathetic, yet neutral, at all times. Following introductions and a brief explanation that the research was part of a PhD. study and likely to contribute usefully to a wider understanding of the relationship between the public and the natural world, the interviewee was told that the interview was structured around a questionnaire and was asked to sit next to, or at right angles to, the interviewer so that they could complete it together. The interview began with a standard introduction (Q5, Appendix II) that stated that the interviewer was interested in what the interviewee had to say and not what the interviewee thought the interviewer wanted to hear. It was also made clear that the interviewee should seek clarification on any point they were uncomfortable with and that their data would remain absolutely confidential. Interviewees were

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[6] Two interviews were conducted in the interviewee's local pub.

then told they were to be asked four types of questions: questions about their activities, attitudes and knowledge relating to wildlife and some general questions about themselves. Finally, it was stressed that because the knowledge questions were designed to sample across a range which included people who knew absolutely nothing about the subject and those who were experts, they should not worry about these questions, particularly as the researcher was more interested in how they saw things than whether they got the right answers. "Indeed", it was added "...even the scientists themselves do not know the correct answer to many of these questions." Again, though this was not a totally honest statement on the part of the researcher, it was felt to be justified on the grounds that would help put the interviewee at ease and thereby facilitate a willingness to answer the factual questions.

The pace of the interviews varied according to interviewee. In all cases the researcher endeavoured to keep the process moving firmly forward, but some leeway was allowed when it was felt that the interviewee needed a less formal context in order to feel more comfortable. Questions from the interviewee, which moved away from the subject, were fielded briefly. Questions that addressed the interviewee's performance were met with affirmative encouragement (irrespective of actual performance), again in order to avoid discouragement. Any questions from the interviewee which addressed points or subjects which appeared later in the questionnaire, were put to one side with a statement that this would be covered in due course.

The piloting process had suggested that in order to obtain satisfactory responses to some particular questions a certain amount of prompting and explanation would be required. During the actual interviews this took the form of standard comments, either providing encouragement, an explanation of the question or in some instances reiterating what the interviewee had said and pointing them towards other parts of the answer. Where interviewees said that they had no idea about the answer to a particular question, they were asked to think for a moment and then to guess. By way of encouragement, the point made in the introduction, that finding out how they saw things was more important than their getting the right answer, was reiterated. Gently coaxing interviewees to provide an answer was thought to be potentially more productive than settling for a 'don't know' answer because it would suggest the context of understanding which lay beyond a simple lack of knowledge of a particular topic.[7] This meant however that non-responses would not be developed as a variable.

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[7] Van Es *et. al.* (1996) found 'don't know' responses to vary according to the environmental problem under discussion, but they did not include biodiversity loss in their study.

Upon completion, the interviewee was thanked warmly and, except in those cases where they asked for an explanation of what the research outcomes might be or the correct answers to certain questions, the researcher left immediately. In order to minimise the likelihood of future interviewees in the same group from priming themselves, the interviewee was asked not to discuss the interview with any one else. Upon leaving the interview the researcher stopped to note down any additional, particularly striking, comments or statements that the respondent had made and which had not been written down during the interview. The meant that despite having decided against the use of a tape recorder, some useful qualitative data were recorded. Without exception the interviews went remarkably smoothly. The researcher established good rapport with all participants, and despite most interviews taking longer than the interviewee had been advised, there were no signs of hostility and no dissatisfaction detected. In general there was a strong interest in the interview, with interviewees appearing to relish the fact that someone was interested in their opinions. With a few exceptions involving particularly loquacious individuals, questionnaires were completed in 45-70 minutes.

As a contextual factor of possible significance in relation to these data, major news developments concerning environmental and wildlife issues were monitored throughout the period of data collection. No significant events occurred, save the exception of the story of the cloning of a sheep "Dolly", which first appeared as a main news item at the beginning of March 1997, and which might have had some relevance in relation to the questions about genetics.

3:4:2 The questionnaire design (question codes in [square brackets])

i. The Activity set.

A set of activities relating to wildlife and the environment was developed. This aimed to explore interviewees' behaviour and support in relation to biodiversity, but because it seemed likely that many people would not recognise their behaviour as specifically oriented towards biodiversity, in practice these measures looked at activities connected to wildlife and the environment more generally. This set also drew on Hendee's (1969) distinction between "appreciative" and "consumptive" recreation, generally favouring the former as most suitable for inclusion, but recognising that many activities could been seen as belonging to both categories. For comparative purposes this question incorporated some items from a MORI/WWF survey reported by Weber and Corrado (1993). Two subsets were constituted. The first [A1] was of a variety of ten activities specifically related to wildlife:

A1. Roughly how often do you do the following?

A. Watch wildlife documentaries on TV *B. Walk in the countryside/on the coast*
C. Do practical conservation work *D. Visit zoos, natural history museums or safari parks*

E. Go on nature oriented holidays *F. Go and watch animals in the wild*
G. Go on a guided wildlife tour *H. Give money to wildlife organisations (in addition to annual subscriptions)*
I. Read books/magazines about wildlife *J. Discuss wildlife issues with family/friends*

ANSWER CATEGORIES:
i. once/week; ii. once/month; iii. twice/year; iv. once/year; v. once in 5 years; vi. hardly ever; vii. never

To avoid interpretative confusion, the scale of the frequency with which they were performed was, as recommended by Bradburn and Sudman (1979), a numeric referent-based measure (ranging from "once a week" to "never"). The activities themselves varied from the quite passive ("watching wildlife documentaries") to the highly active ("doing practical conservation work"), and from the relatively cheap ("going for a walk in the countryside") to the rather expensive ("going on a nature oriented holiday"). The objective of this question was to identify patterns across the activities, both within and between the selected groups. In exploring what might be the interviewees most important sources of learning about wildlife (or at least what they thought these to be), a secondary question [A2] asked them to identify from which of the activities listed in question A1 they felt they had learnt the most and the second most about wildlife.

A2. Of the activities listed above, from which do you think you learn/have learnt the most and second most about wildlife?

A. Watch wildlife documentaries on TV *B. Walk in the countryside/on the coast*
C. Do practical conservation work *D. Visit zoos, natural history museums or safari parks*
E. Go on nature oriented holidays *F. Go and watch animals in the wild*
G. Go on a guided wildlife tour *H. Give money to wildlife organisations (in addition to annual subscriptions)*
I. Read books/magazines about wildlife *J. Discuss wildlife issues with family/friends*

The second subset [A3] consisted of eleven general environmentally oriented activities demonstrating various levels of dedication and endeavour. Respondents were asked whether they had performed them during the last three years. Where appropriate, a "not applicable" category was included.

A3. Which of the following activities have you done in the past 3 years

A. Separated paper or glass from domestic rubbish and taken recycled it
B. Separated plastic from domestic rubbish and recycled it
C. Separated batteries from domestic rubbish and recycled them
D. Chosen not to use your car because of environmental reasons
E. Bought environmentally 'friendlier' products even though they were more expensive
F. Put food out in your garden for the birds
G. Deliberately gardened with a view to encouraging wildlife
H. Signed a petition about an environmental/wildlife issue - (Which?)
I. Written a letter to/visited your MP/councillor about a wildlife/conservation issue - (Which?)
J. Campaigned about an environmental/wildlife issue - (Which?)

Two supplementary questions asking about pet ownership were included in this question set [A4, A5]:

A4. Do you keep any animals at home?
A5. If so, which animals do you keep?

These questions were included to enable pet-ownership to be treated as a variable in relation to understandings and support. It was also thought that pet-keepers (and perhaps even keepers of particular species/groups) might have characteristic attitudes to, and understandings of, biodiversity.

The other main activity thought to be potentially important was the individual's involvement with environmental and wildlife organisations. A list of those UK organisations most involved with biodiversity and wildlife protection was provided, and interviewees asked to indicate which had been a member of during the last three years [A6]. It was thought that the number and type of organisations a person belonged to, or had recently belonged to, might be a pointer to a particular view of the natural environment and possibly indicate their degree of commitment, at least financial commitment.

A6. Are you, or have you been in the past 3 years, a member of any of the following environmental and wildlife organisations?

A. RSPB - Royal Society for the Protection of Birds
B. WWF - World-wide Fund for Nature
C. RSPCA - Royal Society for the Protection of Cruelty to Animals
D. Greenpeace *E. The National Trust*
F. Rambler's Association *G. A Local Nature Conservation Trust (e.g. The Kent Trust)*
H. FoE - Friends of the Earth *I. Others (Which ones?)*

ii. The Affective set.

Measuring a person's feelings about an object or issue is difficult. Physiological measures, such as brain activity, pulse rate or sweat production are generally unreliable and unsuitable in the survey context, whilst reported feelings are necessarily mediated by the individual concerned and by the context in which s/he is reported. Trying to measure the subjects' feelings about biodiversity or wildlife is no exception. Nevertheless, a set of questions relating to feelings was developed and interviewees in the pilot study had little difficulty in answering them. Although collectively referred to as the Affective set, most of these questions also tapped in to the interviewee's understanding of the topic. The first question [B1] was as follows:

B1. When you hear the term "wildlife", what does it mean to you? (Write down the first two things which come to mind)

This was also the very first question in the survey to ensure it was unaffected by any other. It was expected that the response might reveal something of the person's feelings toward wildlife, or at least how s/he pictured it. It had also been a question in the *Environmental News* postal questionnaire, so provided data for comparison. Questions B6 and B7, which were open questions asking about the interviewee's childhood relationship with nature and inviting them to describe a particular experience of nature, had a similar objective. A question asking the subject to think of nature and wildlife [B4] and to select three from a range of twelve categories of feeling, was a more direct attempt to measure feelings.

B4. When you think of nature and wildlife which of the following feelings are closest to your heart. (Choose no more than three)

A. Wonder	*B. Fascination*	*C. Mild Interest*
D. Curiosity	*E. Fear*	*F. Disgust*
G. Responsibility	*H. Mild Dislike*	*I. Love*
J. Indifference	*K. Usefulness*	*L. Protectiveness*
M. Others (which?)		

B6. How would you describe the relationship you had with nature during your childhood?

B7. Can you describe a particular experience of wildlife which sticks in your mind? (This can be a positive or negative experience)

The other open question in this set asked what the subject might do personally in order to conserve wildlife, if given the time and money [B3]. This question was designed to pick up on the subject's knowledge/understanding of what could be done, on the behaviour s/he might indulge in, and to give some indication of the feelings underlying both of these. The resulting data could also be compared with that concerning the activities in which the interviewee took part.

B3. If you had the time and money, which things might you do personally in order to preserve wildlife?

There were three remaining questions in this set. The first [B5] required the subjects to select from a list of eight options the most, second most and third most important means of preserving nature. In so doing, this question attempted to draw upon the individual's feelings and understandings about the nature of nature and of the human relationship with it. The second of the remaining questions in this set [B8] asked the interviewee to select from a range of five outcomes what they thought would be the likely result of the loss of half the world's plant and animal species by 2050. Although in the pilot the same answer category (C) had been selected almost unanimously, it was decided to include this question because it seemed to differentiate people with more extreme opinions.

B5. How do you think we can best preserve nature? (Please select which you think is the most important (1), the second most important (2) and the third most important (3) thing to do)

ANSWER CATEGORIES:
A. Leave it to its own devices *B. Study it closely* *C. Protect it with laws*
D. Manage it strictly *E. Put a fence around it and keep people away*
F. Use it sustainably *G. Educate people about it*
H. Develop more ways of collecting and storing it

B8. If, as some people predict, the world were to lose half of its species of plants and animals by the year 2050, why do you think would be the most likely outcome? (Tick one only)

ANSWER CATEGORIES
A. Life on earth would come to an end *B. Human beings would become extinct*
C. Humans would be severely affected but survive *D. Humans would be slightly affected*
E. There would be little noticeable difference

The final question [B2] was borrowed from work carried out by Arcury (1990) in the US, work classified under the heading of the New Environmental Paradigm (NEP) studies. It was thought that it could prove useful to include this question for comparative purposes because many studies have included this question, so a body of data already exists. Following the questionnaire pilot, in which the full twelve-item NEP scale was used, it was decided to use the six-item scale in order to save time. This was incorporated word for word, bar the substitution of "United Kingdom" for "United States" in item five, and the substitution of "has the right to" for the rather religious "was created to" in item six. Although in practice the precise wording of some items proved a little unsatisfactory, it was otherwise included verbatim in order to ensure the comparison was reliable.

B2. Please indicate your response to the following statements by putting a tick in the appropriate box

A. The balance of nature is very delicate and easily upset
B. The earth is like a spaceship with only limited room and resources
C. Plants and animals DO NOT exist primarily to be used by humans
D. Modifying the environment for human use seldom causes serious problems
E. There are no limits to growth for advanced nations like the United Kingdom
F. Mankind has the right to rule over the rest of nature

ANSWER CATEGORIES:
1. strongly agree; 2. mildly agree; 3. mildly disagree; 4. strongly disagree

iii. The Cognitive set.

The Cognitive set of questions, which made up the bulk of the survey instrument, was derived from the review process described in section 3:1:1. Its aims were to produce a general picture of the biodiversity literacy of the representatives of the different selected groups and to explore their associated understandings. Necessarily, only the 'bare bones' of the topic could be explored, with many concepts being excluded. It is worth considering each question in some detail in order to identify the aspects which relate to understanding, as well as the more obvious knowledge elements. The first question in this set simply asked:

C1. Have you ever heard the term "Biodiversity"?

As illustrated in section 2:1:5 the word has only very recently begun to be widely used in the scientific literature and remains relatively uncommon in the mass media. So whether or not a person has heard the term before could be interpreted as indicative of some sort of specialised contact with it. More important, is the question as to what is actually understood by the term [C2]. A question asking interviewees to select the most appropriate definition from a list of four alternatives was devised:

C2. Which of the following do you think probably best describes the term "Biodiversity"

A. Whatever biologists study
B. All the plants and animals on the earth
C. The variety of living things from the genetic to ecosystem level
D. Everything which is living and everything which has ever lived

This question passed through the pilot stage without any problems, but after several main survey interviews, it was decided that it should be changed because it was consistently eliciting the same answer [C2C] and, upon reflection, its value seemed limited. What was more appropriate was a question that considered what was embodied in the term 'biodiversity'.

As a contraction of 'biological diversity', biodiversity was recently defined by Wilson as:

> "The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels; includes the variety of ecosystems, which comprise both the communities of organisms within the particular habitats and the physical conditions under which they live."
>
> Wilson (1992, p. 393).

Spellerberg (1996) suggests that other levels of organisation could be added to this definition, namely the molecular, cultivar and breed, population, habitat, community and biome. Yet, these may be regarded as already implicitly included by Wilson's "all levels" in the above quotation. Species interactions and ecosystem processes however, might also be usefully be appended (Spellerberg 1996). WRI *et al.* (1992) include human cultural diversity in the definition of biodiversity. They do so on the grounds that if the behavioural diversity of non-human species is a component of biodiversity and *homo sapiens* is part of global biological diversity, then human behavioural diversity as expressed by culture should also be encompassed by the term. This argument is persuasive, particularly given the fact that concepts such as 'nature' and 'conservation' are themselves partially social and cultural constructs (Burgess & Harrison 1993). So widening the definition in this way may indeed be justified. However, to avoid confusion, the more solidly biologically focused meaning was employed. The definition provided by in the 1992 *Convention on Biological Diversity* is flexible enough to be interpreted as incorporating most other views. It describes biodiversity as:

> "....the variability among living organisms **from all sources** including, *inter alia*, the terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems." (*my emphasis*)
>
> *The Convention on Biological Diversity*. ratified December 1993.

This definition has been widely adopted internationally and nationally and provides the central definition in this thesis. Its principle parameter is that it relates to different levels of biological organisation - an appreciation of which, is an important component of a biological understanding of biodiversity. As Spellerberg (1996) points out, these levels are numerous, but it is usual practice to pick out three of them, the fundamental levels of genes, species and ecosystems (WCMC 1992). The adoption of these denominations may stem from their association with major fields of biological science i.e. Genetics, Systematics and Ecology, and from their historical development. They are certainly familiar enough to scientists to be easily recognisable and are sufficiently far apart in the hierarchy of increasing organisation to be conveniently distinguishable from one another, and cover most of the range of the levels of biodiversity. When it came to exploring what people understood of this parameter, the experience of the pilot exercise in which replies had been almost totally restricted to the variety of species, suggested that further guidance would be necessary on this question [C2]. The question therefore explained that in common parlance the term 'biodiversity' means 'the variety of life', but in seeking the interviewee's idea of the different levels of variety this might include, once one level had been mentioned (almost invariably the species level) the researcher pointed out that this was correct and asked if the interviewee could think of any other types of variety except from that at the level of the whole animal or plant. Some interviewees required further clarification on this point and the question was reformulated. Only when the respondent said that s/he was unable to think of any other types of biological diversity did the researcher go on to question C3. In effect, for this question, the boundary between prompting and directing was approached very closely.

C2. "Biodiversity" (Biological diversity) means all the variety of life on earth. Can you tell me all the different types of variety you think this might include?

In exploring beyond what might have been the mere knowledge (or deduction in response to the question) of the existence of the different levels of biodiversity, the next question asked in what ways biodiversity might be important [C3].

C3. In what ways might "Biodiversity" be important to humans and to the world in general?

The next group of questions explored the interviewee's understanding of genetics [C4-C8] and the concept of species [C6]. Genetic variation is probably one of the most difficult aspects of biodiversity to comprehend. A basic understanding might encompass something of the nature of DNA, genes, genotype and phenotype and the relationship between the two, as well as certain processes such as genetic mutation, gene flow and inbreeding and outbreeding depression. Furthermore, a knowledge of biodiversity on the genetic level is instrumental to a comprehension of that at the species level. For instance, it is helps in recognising which are the most biologically diverse genera and other taxonomic groupings or in understanding the role of diversity in and between populations of the same species. In not being able to examine all these areas, the genetics questions looked at where genetic information is stored [C4], what proportion of the genetic information an individual carries is actually expressed [C6], the mechanism of inheritance [C7] and the causes of genetic changes [C8]. Another question [C5] attempted to reveal whether the interviewee understood the difference between phenotype and genotype.

C4. Please indicate which of the following statements you think are true, and which you think are false. The information which tells the body to produce characteristics such as blue eyes or black hair:

A. is stored in cells in our bodies *B. is contained in DNA*
C. is controlled by the brain *E. comes from chemicals in the environment*
F. is carried on genes

ANSWER CATEGORIES *1. true; 2. false; 3. not sure*

C5. Which of the following groups of animals do you imagine to be the most genetically varied? and the least? Write "M" next to the one with the Most and "L" next to the one with the least

A. birds *B. amphibians* *C. insects* *D. mammals*

C6. What amount of the genetic information an individual person carries is actually expressed?
ANSWER CATEGORIES
A. nearly 100%; B. about 50%; C. about 10%; D. about 1%; E. much less than 1%; F. no idea

C7. Which of the following would your children - biologically - inherit from you?

A. Height *B. Half your DNA* *C. Sense of humour*
D. Eye colour *E. Your ability to cook* *F. Some of your facial features*

ANSWER CATEGORIES
1. definitely; 2. perhaps; 3. almost certainly not

C8. Which of the following may result in genetic changes?

A. Exposure to radioactivity *B. Eating certain foods*
C. The normal production of sperm and eggs

ANSWER CATEGORIES *1. yes; 2. no*

C9. What are the characteristics which define an animal or plant as a species? In other words, what do all "species" have in common?

This last question about the definition of a 'species' [C9] was initially as follows:

C9. Which of the following rules apply to a species of animal or plant?

A. There are very distinct differences between species
B. Members of a species can interbreed with one another but not with members of another species
C. If members of a species interbreed with members of another species the offspring are infertile

ANSWER CATEGORIES
1. always true; 2. usually true; 3. never true

However, after interviewing some Conservation Biologists, Wildlife Trust members and unskilled workers, it became clear that individuals either had very different understandings of the concept or real difficulties in understanding the question itself. It was therefore replaced with the C9 question asking respondents to identify the characteristics that define a species. Because "species" is such an important concept in relation to biodiversity, it was thought to be worth detailed consideration. Unlike other taxonomic categories, species are generally and practically regarded as existing in reality (Maxted 1996). They form the basic unit of biological classification (Bradbury 1991, Vines & Rees 1972) and except for individual organisms, they are the only **units** in the organisation of a community (MacArthur 1972). Furthermore, the species still comprises the prime focus of the study of evolution and biodiversity loss:

> "The origination and extinction of species are the principal agents in governing biological diversity in most senses in which the latter can be defined."
>
> WCMC (1992, xiii).

In practice the species constitutes the primary level for understanding biodiversity (DoE 1994a). Indeed, biodiversity is often used as a synonym for species diversity, particularly 'species richness'- i.e. the number of species in a site, habitat or existing globally (WCMC 1992). An understanding of what constitutes a species might therefore be considered absolutely central to an expert understanding of biodiversity. Closer consideration however, betrays profound problems and complexities in the operation of the species concept. A traditional definition is provided by Vines and Rees:

- A species is a group of organisms which do not differ from one another more than the offspring of a single pair do.
- Gradations from one species to a closely related one, do not occur. There are no intermediate forms, but sharp and distinct differences exist between each species and any other.
- Members of a species can interbreed freely with one another, but not usually with members of another species; if they do, the hybrid offspring are infertile.
- Usually, the geographical locations inhabited by a particular species, are distinct from those inhabited by most nearly-related species.

Vines and Rees (1972, pp. 51-52).

However, these seemingly reliable criteria are subject to numerous exceptions. One good example, is the significant exchange of genes that Templeman (1991) found to occur between *Bison* and certain species of *Bos* (domestic cattle), species which are located in different genera. Another is provided by certain amphibian groups wherein the relationship between several hybridising species is such that there is a move to refer to "complexes" rather than individual species, for example the *Rana lessonae- esculenta* water-frog complex (Berger 1977). There are also inconsistencies in the application of these criteria such that characteristics used to separate species in one group of organisms are used to separate genera in another (Maxted 1996). More significant however is the intense disagreement about the concept of 'species' itself. A multiplicity of definitions exist and these often have markedly distinct empirical consequences (WCMC 1992). The most fundamental distinction is between the view of a species as: "those populations of living organisms which can interbreed to produce viable and reproductively successful offspring" - the biological species concept, and "those populations of living organisms which are genetically similar by virtue of their common ancestry" - the phylogenic species concept (DoE 1994a). In practice, major differences in the classification and status given to populations and groups of populations arise from these alternative approaches (DoE 1994a).

To expect even lay experts to understand the subtleties of the various species concepts seemed unrealistic, particularly given the fact that the simple definition had been fundamentally misunderstood by most respondents in the pilot study. The role of the open question was therefore to explore the subject's understanding of species using a series of probes. Nearly all respondents made remarks to the effect that the members of a species looked the same. When prompted with "Yes, they *look* the same, but in what other ways are they the same and different from other species?" some identified behavioural characteristics and/or a reference to where they lived. Finally, those respondents who had not mentioned reproduction were asked "What is it that guarantees that a gorilla is a gorilla and a human a human?". Notwithstanding how they had performed on this question, all interviewees then had the basic concept of biological species explained to them, using the example of the great apes.

The questionnaire piloting had pointed to a strong species-based understanding of biological diversity and had suggested that 'species' remains the basic unit for its evaluation. So having established what a species was, most of the remaining cognitive questions explored various species-based parameters to biodiversity. Thus questions C10 and C14 respectively asked interviewees to rank the species richness of six types of habitat and five countries, whilst C21 did the same with levels of endemism in a different group of five countries.

C10. Please number the following types of habitat from 1-6 according to which you think supports the most (1) to the least (6) number of different species of plants and animals?

A. Deserts *B. Tropical Rain forests* *C. Marshes*
D. Grassland *E. Coral Reefs* *F. Seashores*

C14. Please number the following countries 1-5 according to which you think has the most (1) and the least (5) number of species of plants and animals?

A. Indonesia *B. Kenya* *C. Mexico*
D. United States *E. Mongolia*

C21. Please number the following countries 1-5 according to which you think has the largest (1) and the smallest (5) percentage of its land plant and animal species living only in that country?

A. Britain *B. Chile* *C. Australia*
D. South Africa *E. Greece*

Other questions considered species richness at the local, national and global level in terms of numbers [C19] and the proportion of global species that has been described by science [C20].

C19. Roughly how many species of plant and animal do you imagine there to be? (including mosses, fungi, plankton, insects + other invertebrates) (Please guess and circle your choice)

A. In the world:
ANSWER CATEGORIES
100,000; 1 million; 10 million; 100 million; 1 billion; 10 billion; 100 billion

B. In the UK:
ANSWER CATEGORIES
1,000; 10,000; 100,000; 1 million; 10 million; 100 million; 1 billion

C. In the large area of
mixed woodland nearest to your home (write a number)

C20. Roughly what proportion of the world's species do you imagine have actually been identified by science?

ANSWER CATEGORIES
A. nearly all; B. over half; C. about a quarter; D. 1 in 10; E. 1 in 1000; F. 1 in a million

This was an interesting aspect to explore because knowledge concerning the overall number of species on our planet remains fragmentary. So in one way the questions were very much about public perceptions and understandings. In fact, only about 1.7×10^6 species have been described (WCMC 1992, Myers 1993a) and less than 10^5 of these are said to be known well (Myers 1985, Pimm *et al.* 1995). Depending on the chosen method of extrapolation, estimated figures range between 2×10^6 and 1×10^8 (Tudge 1991, May 1992, Stork 1993, Pimm *et al.* 1995); May's calculation of 1×10^8 being based on the notion that each arthropod and vascular plant species supports at least one unique parasitic nematode, protozoan, bacterium, and virus (May 1992). Accordingly, the proportion of species so far described presently lies anywhere between 85% and 1.7% of those thought to be in existence. However, most methods of estimation indicate a global total of between 5 and 15×10^6 species (Stork 1993). Although the figure has continued to creep up over the past forty years (Bradbury 1991), most biologists agree that it could easily be 30 million or more (Wilson 1991).

Notwithstanding this gap in the scientific knowledge, a rough idea of the numbers of species likely to exist and of those so far described provides a useful starting point for building a mental picture of the world's biodiversity. This picture in turn provides a context in which to consider other parameters, such as extinction rates and species richness. For the particular question dealing with numbers of species [C19], it was decided to offer a wide range of numbers up to very high figures indeed; the idea being to gain an impression of interviewees sense of the species richness of nature.

Because of the obstacles involved in assessing how many species actually exist, calculations of the rate of their disappearance are fraught with difficulty. However, since biodiversity loss is so central to this thesis, some questions exploring this issue were seen as important to include, if only to reveal how extinction is viewed by the different groups. Known extinctions are relatively few in number, 700 or so since 1600 (Reid 1992). The vast majority have been of undescribed species, with calculations usually based on the relationship between the species-richness of a particular area of habitat and the size of that area, together with estimates for the rate of elimination of that habitat. A yet unproven "rule of thumb" is that an exponential decay function exists such that a 90% reduction in area eventually leads to a halving of the number of species present (Wilson 1992, Tolba & El-Kholy 1992). However, this formula has been widely criticised and needs to include numerous other elements that are unique to individual species and/or populations, such as geographical range and the opportunities and mechanisms for dispersal. Many of these elements are poorly understood. Others remain to be identified. The picture is further complicated by frequent "miniature holocausts" (Wilson 1992), whereby the destruction of the remaining refuge of an endemic community wipes out a disproportionately large number of species. Similarly, other pressures, such as the effect of introduced animals and plants, new diseases and hunting, and collecting by humans, can also eliminate species but are difficult to model accurately. Furthermore, it should be remembered that it is not just species diversity that is being lost. As the number of distinct populations of a single species falls, the amount of genetic variation it possesses also lessens. So biodiversity loss can occur irrespective of species numbers being diminished. And if species that disappear are sole representatives of their particular taxonomic group, then a loss of taxonomic diversity can be described over and above the species loss. Similarly, a loss of ecological diversity can occur where a unique assemblage of species is eliminated, even though these species exist elsewhere in different communities. Even estimating natural levels of extinction is therefore problematic, let alone anthropogenic levels. However, as discussed in Chapter 1, the natural extinction rate is generally accepted as being quite low, perhaps between one and ten species *per* year (Tuxill 1999), whilst estimates for the anthropogenic rate go as high as 100,000 times this.

Given such figures, it seemed useful to find out what interviewees thought these rates to be [C15], and having done so, to see whether they could name any examples of extinct species [C16 and C17] and remember what it was which pushed the epitome of extinction, the Dodo, into oblivion [C18].

C15. Approximately how many of all the species which exist in the world do you imagine become extinct each year? (Please guess and circle your choice)

A. Naturally:
ANSWER CATEGORIES
less than one; 10; 100; 1000; 10,000; 100,000; more than this

B. As a result of human activities
ANSWER CATEGORIES
less than one; 10; 100; 1000; 10,000; 100,000; more than this

C16. Name some plants and/or animals which became extinct before 1900

C17. Name some plants and/or animals which became extinct this century

C18. What do you think was the main characteristic of the Dodo that helped in its extinction?

Finally, understandings of the causes and consequences of extinction were tested by a further three questions [C11, C13 and C22]. The last of these, asking about the consequences of the Black Rhino becoming extinct, also tapped into an understanding of biological communities.

C11. What activities can you think of which have happened in the British countryside during the last 20 years which have led to reductions in wildlife?

C13 Please number the following items from 1-3 according to which you think is the most, second most and third most important threat to the world's wildlife.

A. Interbreeding with other species and subspecies *B. Natural disasters*
C. Destruction and disturbance of habitats
D. Introduced species e.g. rats, cats, goats *E. Hunting and collecting*

C22 What would be the most important consequences of the Black Rhino becoming extinct?

Two questions [C11 and C12], both with open format, also involved elements of comprehension at the community or ecosystem level. The first asked for activities that have happened in the British countryside in the past twenty years that have lead to reductions in wildlife. The second asked what happens to the plants and animals when a mature wood is cut down. Although the immediate answer to this question seemed obvious, i.e. they either die or go elsewhere, it explored the interviewees understanding of the concept of carrying capacity, seeking to discover whether s/he appreciated that even if similar habitats existed locally they might already sustain maximum populations of the species made homeless.

C12. Imagine that a large mature wood is cut down. What happens to the animals and plants?

The final set of questions [C23-26], asking interviewees to identify five species of British, wild bird, reptile and amphibian, wild flower and insect, were introduced as being some easy questions to 'cheer up' the respondent after the long interview. In fact, they were assessing the level at which respondents identified a species in each category and designed to compare performance across these categories. Having had the species concept explained to them a short time previously, it might have been expected that they would be able to identify species in each category according to this definition.

C23. Can you name 5 species of British wild bird?

C24. Can you name 5 species of British reptile and amphibian?

C25. Can you name 5 species of British wild flower?

C26. Can you name 5 species of British insect?

One last question was included in the cognitive set. This asked interviewees to identify whether they believed each of a list of five acts was either legal or illegal [C27]. The objective here was to pick up on people's knowledge of the law and to correlate this with sources of learning such as their wildlife related activities and newspaper readership.

C27. Which of the following is normally illegal to do in the UK without a licence?

A. Wearing alligator shoes *B. Importing carved ivory* *C. Killing a frog*
D. Digging up a wild plant *E. Shooting a squirrel*

ANSWER CATEGORIES
1. legal; 2. illegal

iv. The Attributes set.

This set of questions was placed at the end of the interview because it was relatively undemanding to deal with and therefore acted as a way of winding the interview down. Furthermore, these questions were of a personal nature and therefore thought best placed at the end in case any of them might irritate the respondent (for instance, asking someone their age). In addition to the socio-demographic data normally recorded in surveys i.e. gender, age, occupation and level of education attained, where necessary questions were asked about the subject's rural/urban residence status, the religion they had been brought up in, and their degree of adherence to it. Each of these additional variables were considered to have possible ramifications on the person's understandings and support *vis-à-vis* biodiversity, and to be likely to exhibit some correlations with one another. Amongst them, education and social class were thought possibly to be key parameters affecting people's understanding and support, which is why they were used in selecting groups. However, educational level was thought to need some further clarification, and so the levels achieved in biology and other sciences were recorded. Religious background and commitment were expected to be of less importance, but were included for interest since they had been found to be of importance by Young (1992). All these variables looked to be quite easily evaluated. Social class however, was more problematic.

In accepting that class-associated experiences may affect, amongst other things, the individuals' attitudes and values (Scase 1992; Giddens 1981), their culture (OUP 1972) and language (Bernstein 1965), social class was regarded as a key variable to include. Because occupational groups are seen as an expression of class relations (Scase 1992), membership of social class was construed from occupational groupings (Marshall *et. al.* 1988). Newspaper readership was included as an associated variable and to allow comparison of understandings across different newspaper readerships. Since the interest in class was in relation to social groups and cultures, classification relating to social production and its control (Dahrendorf 1959) was rejected in favour of Calvert's (1982) socio-economic groups. This occupationally based measure was also useful in that it reflected disposable income, a parameter which may have an influence on what people actually do in relation to wildlife. The question remains as to why occupational categories should be collapsed into class groupings, because as such they may be less meaningful. Indeed, Lipset and Bendix (1951) have argued that occupational categories are more appropriate than aggregated social classes when it comes to trying to give meaning to patterns of behaviour. Because of this, care was taken to categorize individuals, both by occupational group and social class.

3:5 Initial manipulation of the main survey data

Between April and December 1997, 126 interviews were conducted. Subsequent to additional changes to questions C3 and C9 following the completion of the first seven and nine interviews respectively (see Q5 Appendix II for details) all interviews followed an identical questionnaire (Q5, Appendix II). A file of any particularly pertinent comments made by interviewees, comments that the researcher had either managed to note during the interview or had written down immediately following it, was also established. After the first 30 interviews, questionnaire data were reviewed, coded and stored to an SPSS-PC data file, with all subsequent data treated in the same way (following Frude 1993). Once complete, the data set was checked for errors, and where appropriate (i.e. those cases prior to changes to questions C3 and C9), missing values were substituted by the modal value. Data are summarised in Appendix IVc).

Where deemed potentially worthwhile, an index score (signified by an 'X' suffix) was calculated for single questions or groups of questions. For the Cognitive set of questions this consisted of a measure of the number of correct answer categories selected or the degree to which the respondent's answer differed from the correct answer. In effect, these C*X indices were indices of ignorance, with a score of zero indicating equivalence to the best respondents' performance on that question. A number of other indices were also constructed by combining data from different variables, some requiring differential weightings of individual variables. Table 3.7 summarises the principle main survey data indices.

Table 3.7. Main survey data indices

Index code and name	Variables included
Wildlife related activities (WAX)	A1A,A1B,A1C,A1D,A1E,A1F,A1G,A1AI,A1J
Environment related activities (EAX)	A3A,A3B,A3C,A3D,A3E,A3F,A3G,A3H,A3I,A3J, A3K
Pet ownership (POX)	A5A,A5B,A5C,A5D
Organisational membership (MEX)	A6A,A6B,A6C,A6D,A6E,A6F,A6G,A6H,A6I
Identification accuracy score, birds (IAB)	C23o,C23f,C23g,C23s
Identification accuracy score, reptiles and amphibians (IAR)	C24o,C24f,C24g,C24s
Identification accuracy score, wild flowers (IAF)	C25o,C25f,C25g,C25s
Identification accuracy, insects (IAI)	C26o,C26f,C26g,C26s
Identification accuracy, overall (IAX)	IAB,IAR,IAF,IAI
Genetics understanding (GUX)	C4A,C4B,C4C,C4D,C4E,C5,C6,C7AC7B, C7C,C7D,C7E,C8A,C8B,C8C
Biodiversity understanding (BUX)	C1,C2A,C2B,C2C,C2D,C3A,C3B,C3C,C9A,C9B, C9C,C9D,C10A,C10B,C10C,C10E,C10F,C11, C12AC12B,C12C,C12D,C13,C14A,C14B,C14C, C14D,C14E,C15C,C15B,C16,C17,C19A,C19B,C 19C,C20,C21A,C21B,C21C,C21D,C21E

For those variables concerned with activities relating to wildlife and the environment in general [A1 and A3], the relative importance of each activity was estimated by giving a list of them to persons representing a range of social groups (16 and 25 individuals respectively for each question - none of whom had been interviewees). They were asked to rank the activities according to the level of commitment they thought participation in each might demonstrate or reflect. Responses were remarkably consistent, enabling individual activities to be given a weighted score and for a "Wildlife activity index" [WAX] and an "Environmental activity index" [EAX] to be calculated for each case by multiplying recorded values by weightings and summing the results (see Appendix III for details). Similarly, answers to questions C23-C26 (which asked interviewees to name species of British bird, reptile/amphibian, wild flower and insect) were weighted according to whether respondents were deemed to have identified at the level of taxonomic: order (1 point); family (2 points); genus (3 points) or species (4 points).[8] An "Identification accuracy score" [IA*] was formed for each question for each respondent by adding the weighted scores, and an overall "Identification accuracy index" [IAX] calculated by summing the four IA* scores. A completely accurate score for each IA* was 20, and for IAX, 80. Other indices were formed by grouping variable scores. Cognitive variables were organised into three primary indices: a "Biodiversity

[8] Problems were encountered in interpreting answers, for example whether "frog" meant the generic category of frog-like creatures, the family *Ranidae* or the single native species, the "Common frog" *Rana temporaria*, or whether "buttercup" referred to a yellow-flowered member of the genus *Ranunculus* or *R. acris* the "meadow buttercup". In the event subjective interpretative criteria were applied to each category but consistently so across all cases (see Data notes, Appendix II for details).

understanding index" [BUX], a "Genetics understanding index" [GUX] and the aforementioned "Identification accuracy index" [IAX]; the higher the score the better the performance.

3:6 Describing the main survey sample: the attributes data

Adoption of a group-focused method for selecting the survey population, together with the nature of the groups actually surveyed, meant that there could be no realistic expectation that the distribution of cases across the principle socio-demographic parameters would closely reflect patterns in the population as a whole. For example, the inclusion of groups of employed persons, notably those in occupations which usually employ mature or experienced individuals e.g. porters and senior government officers, was likely to skew the sample towards the middle age groups. Comparison of the aggregated data with 1991 Census Data for the Canterbury District (Table 3.8) shows this skew to have taken place, with the 46-55 age group particularly well represented.

Table 3.8 also suggests that the aggregated data set was skewed for other socio-demographic variables; towards higher occupationally based social classes, the better academically qualified, readers of the quality press and those in rural residence. For analytical purposes, because comparison across different groups and variables was considered to be of much greater interest than representativeness of the wider population, it was the fact that the full range of categories chosen for each variable was reasonably well represented, which was of paramount importance.

Data for the Conservation Biologists - the group of experts included primarily for comparative purposes - required special consideration in the context of the aggregated data set. With this group being comprised of young persons, highly educated in the biological sciences and highly committed to biological conservation, data relating to it would be likely to distort the overall picture for the interviewees, particularly in relation to Affective and Cognitive data, but also perhaps in relation to participation in some specific Activity variables. It was therefore decided these data would be excluded from the aggregate data set and considered only in relation to the inter and intra group analyses. Henceforth, the term "full respondent data" (FRD) will be used to refer to all cases, whilst and the term "aggregate data set" (ADS) used to refer to all cases minus those for the eight Conservation Biologists.

Some socio-demographic variables in the ADS were thought likely to be associated with one another. However, Chi-squared tests, together with the calculation of Spearman correlation coefficients (the most appropriate measure of association, Howell 1997, Foster & Parker 1995) revealed few of significance (see Table III, Appendix I). None were found between rural/urban residence, religion or gender and either educational level of any sort, social class, age or newspaper readership.

Table 3.8. Socio-demographic data for the main survey respondents and corresponding data for Canterbury District population (source: 1991 Census).

Variable and categories	**Main survey %**	**Canterbury District data %**	
Sex Male	54.8	47.2	
Female	45.2	52.8	
Age group		*Age group**	
<26	2.4	20-26	9.4
26-35	16.7	25-	
36-45	15.9	-44	38.0
46-55	34.1	45-59	22.3
56-65	16.7	60-64	6.3
66+	14.3	65+	24.0
Social Class			
I - professional	36.5	7.4	
II - intermediate	16.7	33.2	
III - skilled	22.2	40.9	
IV - semi/unskilled	22.2	15.0	
V - misc.	2.4	3.4	
Residence			
Rural	37	20	
Urban	63	80	
Newspaper readership		*% daily sales*[a]	
none	7.1	30.0	
popular tabloid	13.5	36.7	
middle-class tabloid	19.0	18.1	
right-wing broadsheet	33.3	11.7	
left-wing broadsheet	27.0	3.6	
Educational level			
primary	11.1		
secondary-o	22.2		
secondary-a	11.9		
college	19.0	7.0 (other data not available)	
undergraduate degree	15.1		
postgraduate degree	20.6		
Studied:	*Biology*	*Science*	
primary	53.1	31.0	
secondary-o	25.4	30.2	
secondary-a/college	11.1	23.0	
undergraduate level	1.6	6.3	
postgraduate level	8.7	9.5	

[a] Calculated from Peak & Fisher (1998). * Categories differ slightly between the two surveys.
(24.3 million households) Data give some idea of the relative importance of each readership group.

Spearman correlation coefficients suggested that a disproportionately slightly greater number of older interviewees regularly practised their religion and read local and national newspapers.[9] Both findings might be expected if they reflect the move away from organised religion amongst younger age groups and higher rates of newspaper readership amongst older citizens. Of other associations encountered, those between levels of biology, science and general education were expected with the first being a sub-category of the second, and both, sub-categories of the third.

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[9] AGExPRAC r^s=-.2616, *sig.≤.005*; AGExNEW2 r^s=-.2145, *sig.≤.05*; AGExNEWSR r^s=-.2147, *sig.≤.05*.

The positive association of both higher occupationally based social class and formal educational level with broadsheet press readership, and of higher educational level with higher social class was also anticipated.[10] However, because the positive association between social class and educational level in the UK is long-standing (Royle 1994) and well documented (Halsey 1995), as is the split of newspaper readership patterns along lines of social class (Tunstall 1996), it seemed probable that the association between educational level and newspaper readership was in large part due to the intervening effect of social class. This was confirmed by loglinear analysis.[11] In fact, as Table 3.9 illustrates, the association between type of newspaper read and social class broadly paralleled that found in the 1991 MORI Omnibus Poll (MORI 1991).

Table 3.9. Comparison of associations between declared newspaper readership[a] and social class for Aggregated Data Set and MORI Omnibus Poll (source: MORI 1991).

Social class	**popular tabloid %**	**middle class tabloid %**	**b/sheet "right wing" %**	**b/sheet "left wing" %**	**none %**
Main survey data					
I - professional	0	8.3	62.5	57.6	0
II - intermediate	0	12.5	22.5	24.2	11.1
III - skilled	35.3	50.0	10.0	6.1	44.4
IV - semi/unskilled	64.7	29.2	5.0	12.1	44.4
MORI data*					
A+B	6.8	24.2	50.9	47.7	16.9
C1+C2	53.0	58.7	39.5	44.2	51.6
D+E	40.2	17.1	9.6	8.1	31.5

[a] Percentages calculated for following newspapers only: Sun; Daily Mirror; Daily Star; Daily Express; Mail; Times; Daily Telegraph; Independent; Guardian (source: Lacey & Longman (1998).

3:7 Chapter summary

This chapter set out the development of the research strategy and detailed the design, piloting and application of the different survey instruments employed, together with the socio-demographic characteristics of the main survey respondent group and the initial manipulation of the data resulting from this survey. The principle feature of the chapter was the description of the process by which the main survey instrument was arrived at and applied. The next two chapters will present and analyse the data produced by this survey. These will be considered as an aggregated whole (Chapter 4) before group patterns are explored (Chapter 5). Where appropriate they will be supplemented by findings from the Keoladeo and *Environmental News* surveys.

[10] CLSFxNEWSR r^s=*-.6474, sig.≤.001*; EDxNEWSR r^s=*.5136, sig.≤.001*; CLSFxED r^s=*.7336, sig.≤.001.*

[11] The final model was found to have the generating class CLSFRRxEDRR plus CLSFRRxNEWSRR. Likelihood ratio chi square = 3.487 df=2 p=0.175; Pearson chi square = 4.064, df=2, p=0.131. (RR suffix indicates that variables were re-coded into dichotomous format as follows: CLSFRR (I+II:III-IV); EDRR (primary-college:undergraduate-postgraduate); NEWSRR (tabloid:quality press)).

Data analysis and discussion

Introduction

Chapters 4 and 5 present the survey findings, assess them in relation to the research questions, and discuss them in the context of group memberships, other research, and with reference to the wider literature. Any survey data are subject to caveats associated with the means by which they are collected, both in relation to their representativeness and in regards to their accuracy. Potential sources of distortion were referred to in Chapter 3, and although concerted efforts were made to avoid these, the possibility of their having influenced the data remains. In addition, the specifically environmental nature of the subject might have led respondents to exaggerate or even lie about their views and actions in order to provide a more socially acceptable response (Burgess, Harrison & Filius 1995). Similarly, the socio-demographic makeup of the samples may have served to emphasise certain variable associations over others. Nevertheless, the data do point to some interesting and provocative conclusions, and suggest areas that need further study.

Because the methodological framework is largely defined by the science-based understanding of biodiversity embodied in the reasoning expressed in the *Biodiversity Convention*, and in the UK, regional, and local Biodiversity Action Plan (BAP) processes and documents, data are initially treated as providing a reasonably sound basis for making generalisations about the wider populations from which the samples were drawn. Unless otherwise indicated, the data refer to the Aggregated Data Set (ADS), namely all 126 respondents to the main survey, less the group of eight Conservation Biologists.

Chapter 4. Survey findings: basic patterns.

"*Biodiversity*, isn't that what biologists do in University?"
Susie (care worker)[1]

4:1 The Cognitive data

Some 62% of respondents declared themselves to have already heard the term "biodiversity". If representative of the wider population, this might signify that the word has been encountered by a substantial number of people. Moreover, with the considerable amount of television wildlife programmes broadcast, the educational and campaigning activities of wildlife organisations, together with the substantial coverage of the *Convention on Biological Diversity* and its progeny during and following the Rio Conference in 1992, that nearly 40% of respondents said they had not heard the term could be seen as surprising. However, as evidence presented in Chapter 3 suggested, the word is not yet established in the public domain. With the exception of the period surrounding the Rio Conference, *The Times* hardly used 'biodiversity' in its pages (Figure 2.3). Moreover, *The Times* performed rather 'better' than the tabloids in its coverage of the Rio conference, producing 174 articles containing the keyword 'earth summit' in May/June 1992, compared to just 25 in the *Daily Mail*, 20 in the *Daily Mirror* and 8 in the *Sun* (Lacey & Longman 1997). Since the broadsheet press accounts for only about 22% of national daily newspaper sales (*The Times* = 6%), perhaps so many respondents declaring they have heard the word should be unexpected. Some 60% of respondents declared themselves broadsheet press readers and as such were relatively more likely to have encountered the term, but with nearly all the Elected Members, Government Officers and Kent Trust Members saying they had heard of biodiversity, it seems likely that these individuals served to substantially raise the overall level of awareness suggested by the aggregated data.

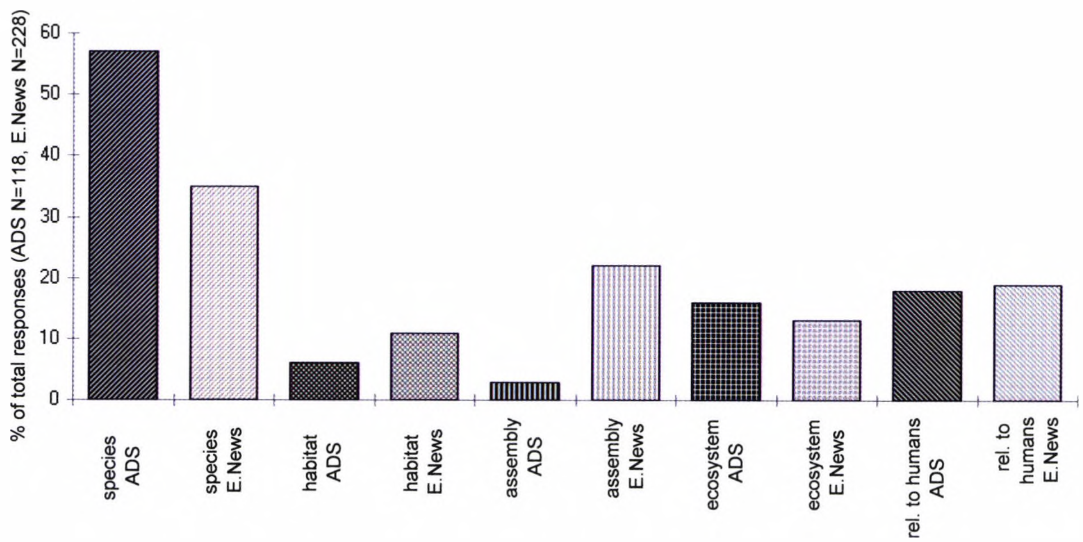
A lack of recognition of a word does not preclude an understanding of the concept(s) it embodies, any more than a declared familiarity implies that such an understanding exists - as is amply demonstrated by Susie's response above. This is why the question inviting identification of different levels of biological diversity [C2], began with an explanation that the term "biodiversity" meant biological diversity. The answers suggest that the respondents' understanding of the way biodiversity operates at various levels was very poor, being largely restricted to the level of species. Ninety-two percent (107) identified this category, with 27% (32) mentioning diversity at the level of habitat and only 1 in 10, referring to genetic diversity. A mere 5 respondents (4%)

[1] The names of all respondents quoted have been changed.

spoke of community diversity, and whilst 58% mentioned one level, just 27% mentioned two, 6% three, and nobody all the four levels identified by the respondent group as a whole.

The dominance of a species conceptualisation of biological diversity represented by these data is in agreement with the pattern of answers to B1, the open question asking respondents to say the first two things which came to mind when they heard the term “wildlife”. Each answer was coded in a general and a precise manner. Figure 4.1 summarises responses according to the level of biological organisation each answer approximated to,[2] and presents corresponding data from the *Environmental News* survey.

Figure 4.1 The percentage of responses to question B1 belonging to each category: main survey data (ADS) compared to corresponding data from the *Environmental News* survey (E.News).



Main survey answers were dominated by references to species of one type or another, with 57% of total responses (B1A+B1B) being in this category and little mention made of things classifiable at either the habitat or community level (6% and 3% of responses respectively). Fifteen *per cent* of answers fell loosely within the ecosystem category and 18% related to humans in an obvious way. This pattern broadly paralleled that found in the *Environmental News* survey data. It did so, notwithstanding the fact that the latter respondents probably comprised a more environmentally conscious and motivated sample. Both sets of data support the idea that a ‘species’ or ‘whole organism’ focus tends to dominate people's conception of wildlife, although slightly less so for the *Environmental News* respondents. A more detailed picture is given by the codings summarised in Table 4.1.

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[2] Note that where “birds” and “animals” were mentioned together, the “animals” response was allocated to the "mammals" category (as was done in the *Environmental News* survey).

Table 4.1 ADS responses to question B1: categories represented by three or more respondents

Category	No. of respondents	% of respondents	% in *E.News* survey (N=228)
"animals"	40	34%	36%
"named mammals"	28	24%	16%
"birds"	24	20%	41%
"countryside"	19	16%	21%
"autonomy/freedom"	15	13%	18%
"nature"	15	13%	14%
"mammals"	13	11%	31%
"plants"	9	8%	25%
"woods/forest"	8	7%	8%
"aesthetics"	7	6%	7%
"trees"	6	5%	7%
"Africa/safari"	6	5%	2%
"non-human/domestic life"	5	4%	2%
"habitat"	5	4%	5%
"insects"	5	4%	14%
"conservation/reserves"	5	4%	10%
"exploitation"	4	2%	14%
"flowers"	4	3%	12%
"television"	3	3%	-
"endangered"	0	-	12%

Again, as Table 4.1 demonstrates, the relative distribution of the main survey (ADS) responses is much like that found in the *Environmental News* survey despite a different data-gathering method having been employed i.e. a postal questionnaire. This suggests that these data might reflect perceptions existing in the general adult population of the research area (even those at a regional or national level). In both data sets the species category of response was dominated by animals, mammals (named or otherwise) and birds, with relatively few respondents mentioning plants, trees, insects and flowers, and virtually no reference to any other group of organism. The 'ecosystem' category was almost entirely represented by the somewhat imprecise answers "countryside" and "nature", so it is questionable whether it really did represent the concept of ecosystem. Similarly, the category of habitat was largely accounted for by "woods/forest" (8=62% of just 13 'habitat' responses). References to communities or assemblages of species were noticeable by their virtual absence, whilst of the subcategories of "relationship to humans", with the single exception of "autonomy/freedom" (mentioned by 13% of respondents), answers were recorded in low frequencies across several subcategories: "aesthetics" (7=6%); "non-human/domestic" (5=4%); "conservation/reserves" (5=4%); "exploitation" (4=3%).

Together with the responses to question C2, these data are in agreement with Kellert's (1993) conclusion drawn from his numerous surveys of perceptions of the natural world, namely that people's appreciation of the natural world is primarily focused on a limited number of species and landscapes. As with the *Environmental News* data these findings present a general perception of nature as being essentially comprised of 'feathered' and 'furry' species living in juxtaposition to humans, and a sense of 'otherness' of the natural world. This brings to mind the "equilibrium" ecology paradigm described above (p.34), with its associated preservationist approach to conservation and separation of human activities from natural systems.

Given this evidence in support of the proposition that species provides a key element of people's understanding of biodiversity, responses to question C9[3] - an open question exploring understanding of what defines a species as such - are of additional interest. The resulting data suggest that for the majority of interviewees their understanding of what they considered to be species (henceforth referred to as "vernacular species") relied on visual data, namely physical characteristics (identified by 78%) and behaviour (identified by 58%). Only 39 (36%) referred in any way to reproduction (arguably the single most important parameter of a basic understanding of species) and just 29 (26%) spoke of the organism's ecological environment or niche. One respondent, Malcolm, a member of the Kent Wildlife Trust, neatly summed up his and many others' confusion on the matter when he stated:

> "I've often wondered why, for example, greenfinches don't mate with goldfinches."
> Malcolm (Kent Wildlife Trust member)

That such partial understandings were manifold in the respondent set is supported by the fact that of only four definitive aspects of species distinguished (physical; behaviour; reproduction; ecology) in just 34% of cases were two or more mentioned; a mere 6 individuals (5%) noted three, and nobody identified them all.

The other questions relating most directly to how respondents' perceptions compared with the scientifically defined concept of species were C23-C26 asking them to name five species each of British wild bird [C23], reptile/amphibian [C24], wild flower [C25] and insect [C26]. Figure 4.2 represents the number of times each taxonomic grouping was represented within each category. It shows that as a whole the respondent sample was most accurate at naming bird species, almost as successful at naming flowers, and rather less so with reptile/amphibians and insects. Seventy-one percent (408) of valid answers[4] to C23 accurately named birds at the species level and 22% came close by describing them at the level of genus. For flowers, these proportions were closely similar, being 65% and 29% respectively; for reptiles/amphibians they were 64% and 15%; for insects 19% and 24%. Except for insects, where 57% of total valid answers were at the taxonomic level

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[3] Note that only 110 interviewees were asked this question.

[4] Valid answers being all answers less those deemed erroneous.

of family (49%) or order (8%), the majority of respondents described categories of organism at or near the species level reasonably well.

Figure 4.2 Number of instances in which each taxonomic grouping was represented in each category (max. 5 times/grouping/respondent), based on ADS responses to questions C23-26.

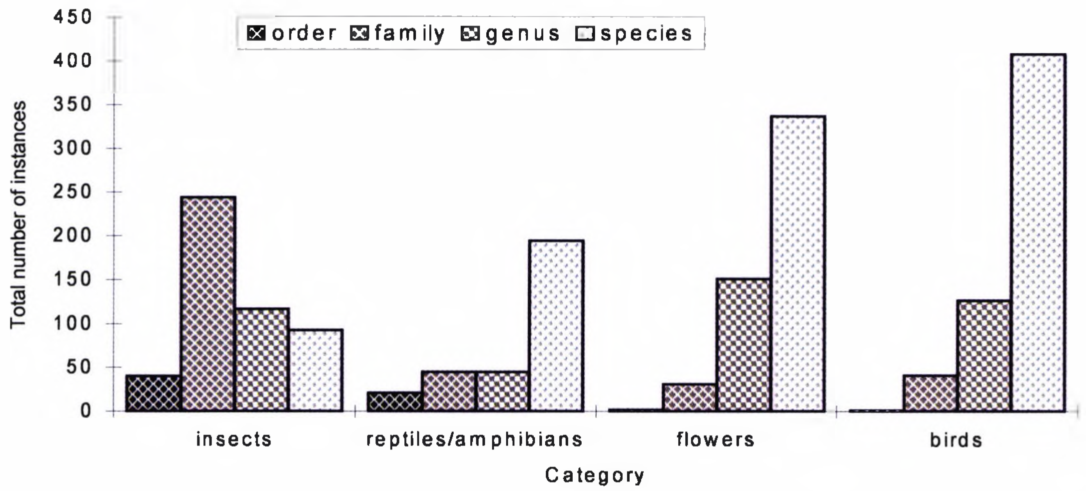

Table 4.2 provides details of these data, listing organisms respondents referred to most frequently[3] and indicating the extent of diversity covered by answers in each category. It shows that except in the case of reptiles/amphibians nearly all respondents named a full quota of 5 representatives for each category, even if these were not all valid and/or at the appropriate level. Of a possible maximum of 590 answers for each category, 98% were filled for birds, 94% for flowers, 99% for insects and 52% for reptiles/amphibians. The low proportion for the latter was probably largely due to there being such a restricted number of types and species to choose from, both at the level of order (i.e. snake, lizard, toad, newt and frog) and at the level of species. There are just 12 (or 13[5]) endemic British reptile and amphibian species (Arnold & Burton 1978). However, there was also confusion as to what a reptile or amphibian actually is, as evidenced by the number and variety of invalid answers, accounting for 9% of answers in this category. These not only included several vernacular species of fish and other water-loving creatures, such as crabs, mussels, swans, ducks, otters and seals, but also named earthworms, slugs, scorpions and even vole and hedgehog as reptiles/amphibians. Although a greater proportion of invalid answers were recorded for insects (84=17%), these were primarily spiders (46=9%), woodlice (17=4%) and centipedes (10=2%), taxa rather more easily mistaken for insects.

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[5] There is a question as to whether the Pool frog *Rana lessonae* exists in Britain as a relict of a native population or was introduced (Arnold & Burton 1978)

Table 4.2 ADS responses to questions C23-26. Categories of 'species' mentioned

	Birds	**Flowers**	**Reptiles/ amphibians**	**Insects**
a. Number of answers given (max. = 590)	579	556	337	582
b. Number of valid answers (% of a.)	577 (99%)	521 (94%)	306 (91%)	498 (86%)
c. Number of "species"	80	99	12	51
Those "species" mentioned five times or more (no. in brackets) - details below (no. of times these mentioned in brackets)	Robin (59) Blackbird (58) Sparrow (58) - House (5) Thrush (58) - Song (11) - Mistle (2) Tits (49) - Blue (35) - Great (7) - 2 sp. (4) Finch (39) - Chaffinch (11) - Bullfinch (8) - Greenfinch (6) Starling (22) Wren (17) Pigeon (12) Magpie (12) Crow (11) Seagull (11) - Herring gull (2) Swallow (10) Kingfisher (8) Woodpecker (7) Kestrel (7) Eagle (7) - Golden eagle Osprey (6) Jay (6) Yellowhammer (6) Hedge sparrow (5) Rook (5) Cuckoo (5) Jackdaw (5) Nightingale (5) Owl (5)	Bluebell (67) Daisy (51) Buttercup (49) - 2 sp. (2) Primrose (40) Dandelion (28) Orchids (28) - 5 sp. (9) Cowslip (21) Poppy (13) Rose (13) - Dog rose (6) Violet (10) - Wood (3) Campion (10) Celendine (9) Nettles (9) - Stinging (3) Snowdrop (8) Foxglove (6) Thistle (6) Wood anemone (6) Ox-eye daisy (5)	Snake (156) - Adder (67) - Grass (64) - Smooth (5) Frog (88) - Common (9) Newt (78) - Crested (12) - Smooth (12) - Palmate (3) Toad (77) - Common (9) - Natterjack (1) Lizard (50) - Sand (8) - Viviparous (5) Slow worm (36)	Ant (55) - 2 sp. (2) Fly (50) - Bluebottle (10) - House fly (3) Wasp (46) - Common (3) Bee (45) - 2 sp. (4) Butterfly (45) - Red admiral (9) - Tortoiseshell (5) - 9 sp. (10) Beetle (32) - Stag beetle (7) - 2 sp. (5) Lady bird (27) - Two spot (1) Dragonfly (21) Moths (20) - 4 sp. (4) Mosquitoe (19) Earwig (17) Crane fly (16) Aphid (9) Mayfly (8) Caterpillar (8) Gnat (7) Hornet (6) Grasshopper (6) Damsel fly (6) Hover fly (6)

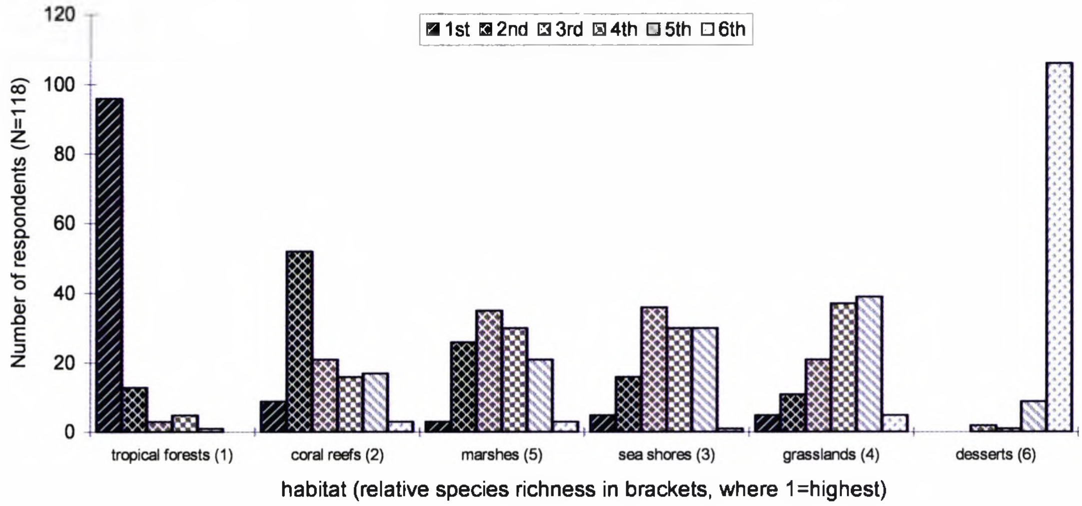
As to the species diversity recorded in these data, though unavoidably low for reptiles/amphibians, it was high for the other categories - 99 flower, 80 bird and 50 insect types/species. More revealing perhaps is the fact that the seven most frequently recorded vernacular species of insect, flower and bird accounted for 61%, 55% and 49% respectively of the valid answers in their category, whilst the top 14, accounted for 82%, 68% and 62% of valid answers. Although quite a large number of species were represented, relatively few made up the bulk of answers. In considering the most frequently mentioned vernacular species, with a few exceptions (e.g. kingfisher, eagle, osprey, cuckoo, nightingale, orchid, adder, dragonfly or hornet), they are organisms regularly encountered in gardens or on walks - simply those that people see most often. Even the exceptions are not altogether unexpected in so far as they are, for one reason or another, particularly impressive and easily remembered having once been seen.

On the overall Identification Accuracy Index (IAX), respondents performed quite well. Nearly half scored 60+, and just two individuals less than 40. Seventeen *per cent* achieved 70 or more, and three people the maximum score of 80. A substantial number (27%) correctly named 5 bird species and 70% named 3 or more, with only 5% scoring less than 15 on this index (IAB). If, as seems likely, many respondents were unaware of or failed to remember the existence of the tree sparrow *Passer montanus* and/or the mistle thrush *Turdus viscivorus*, references to "sparrow" and "thrush" will have actually been to the house sparrow *Passer domesticus* and the song thrush *Turdus philomelos*. These are the only other resident British representatives of each genus with this vernacular name. Since these two vernacular species account for 98 instances in which respondents' answers were classified at the level of genus rather than species (see Table 4.2), if respondents naming them are credited as having identified at the species level, IAB scores significantly improve. Those attaining the maximum score increase from 37% to 54% and those naming 3 or more species, from 70% to 81%. A similar case can be made for the IAR scores, where the answers "frog" and "toad" were classified at the level of genus but were likely to have referred to the Common frog *Rana temporaria* and the Common toad *Bufo bufo*, the only widespread and common British species of these genera. Upgrading respondents' answers on the basis of this observation notably increases IAR scores. It elevating 77 unspecified frogs and 67 unspecified toads from genus to species, raises the number of respondents scoring 19 points from 9% to 20%, and those scoring 20 points, from 9% to 20%. The general pattern of performance in this category changes little however, with scores remaining spread throughout the full range. The same reassessment granting correspondence of vernacular and scientific species could also be applied to the flower and insect categories, though less convincingly because each of the most frequently used vernacular terms encompassed several or many scientific species (e.g. primrose, orchid, ant, wasp, bee, beetle). The effect of these upgradings on the overall index (IAX) was small, with the percentage of respondents scoring 70+ increasing from 17% to 20% and the mean score going up from 60 to 61. So even allowing significant leeway in interpreting responses, the data reinforce the view that a significant proportion of respondents tended to have an inaccurate understanding of the species concept.

The understanding of the term 'species' which the answers to questions B1, C2, C9 and C23-26 reveal, is one which appears largely based on personal experience and superficial observation. It is also in agreement with Talbot's (1987) observation that the public tends to think of wildlife in terms of birds and mammals, and that there is barely any recognition of invertebrate forms (although s/he cites no data in support of this). Even among conservationists there are said to be not many who regard insects as worthy of very much attention (Morris, M. 1987), so this is perhaps to be expected. How respondents viewed the distribution and diversity of species was addressed by questions C10, C14, C19, C20 and C21.

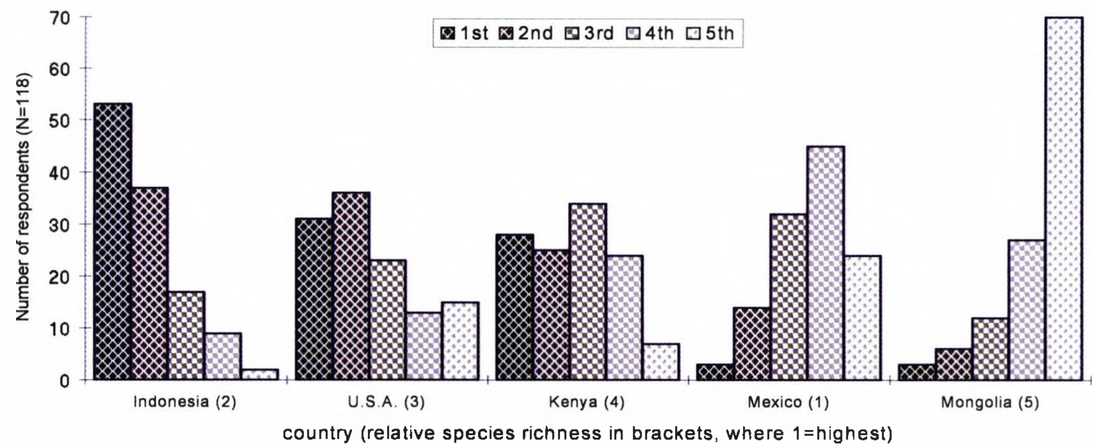
Figure 4.3 summarises the data for question C10, which asked respondents to rank 6 habitats by their species-richness. With the exception of marshes, ranked third instead of in its proper fifth place, the relative positions of habitats were correct. Most accurately placed were deserts and tropical forests. There was much greater uncertainty about the other habitats. Although 44% of respondents correctly placed coral reefs as having the second greatest number of species, another 31% were two or more places out. For grasslands these proportions were 31% and 17% respectively, for seashores 31% and 31%, and for marshes 18% and 54%. Figure 4.3 also shows respondents tended to substantially overestimate the richness of marshes and to underestimate that of coral reefs and seashores; only that of grasslands being over and underestimated in roughly equal measure.

Figure 4.3 Ranking of habitats according to species richness. ADS responses to C10.



Few individuals (12=10%) were completely accurate on this question (scoring zero). More than half (53%=63) scored 3 or more, 3% (4) scored more than 5, but nobody more than 6. Much of the inaccuracy was due to overestimation of the species richness of marshes and underestimation of that of seashores. Neither finding is surprising. Marshes often support very large populations of animals and plants, though of relatively few species, and this can encourage a perception of them as teeming with wildlife. Similarly, perceptions of the species richness of seashores will depend on the image of a seashore an individual has in mind. Animal species living on sandy shores for instance, which can be very numerous, are predominantly of burrowing habit and not immediately obvious at low tide. Moreover, the nature of the substrate helps explain why such shores may easily be understood as more closely akin to desserts than forests.

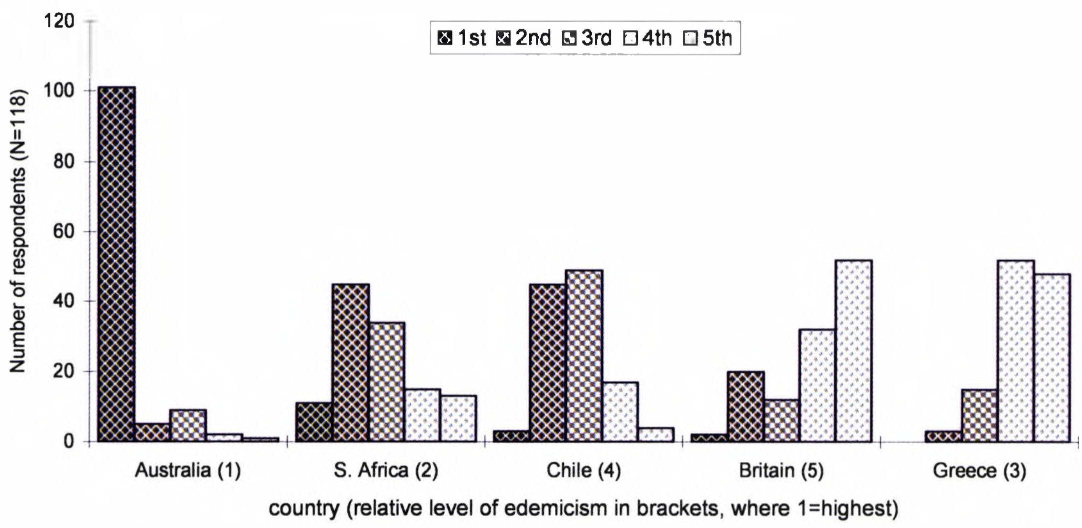
Figure 4.4 Ranking of relative species richness of different countries. ADS responses to C14.



Data for responses to question C14, exploring respondents' understanding of species richness in different countries, are summarised in Figure 4.4. With the exception of Mexico, ranked forth instead of in its proper second place, the overall relative positions of the countries were correct. Most accurately placed were Mongolia and Indonesia, with much more uncertainty about the species richness of the other countries. Just 20% of respondents ranked Kenya in its proper forth place, with another 45% setting it two or more places out. For the USA these proportions were 20% and 39% respectively, and for Mexico 12% and 58%. Respondents tended to overestimate the species richness of the USA and Kenya and to underestimate that of Mexico. The former may be explicable on the grounds that of the selection provided the USA is probably the country respondents were most familiar with and because its wide range of habitats are relatively well represented in the popular media. Similarly, Kenya has long been associated with wildlife tourism, and therefore species variety may well spring to mind when that country is mentioned. Popular images of Mexico however, tend to be of dusty towns and dessert, rather than a variety of habitats and abundant biological wealth. So the knowledge that Mexico has high species diversity is likely to be a relatively specialised one. Individual respondents performed quite poorly on question C14. On an index measuring the total number of places each respondent was out by, no individual was completely accurate, only 19% scored 2 or less, and 5 individuals had the worst possible score of 6. Once again, it seems most answers relied on perceptions of the response categories, rather than detailed understandings.

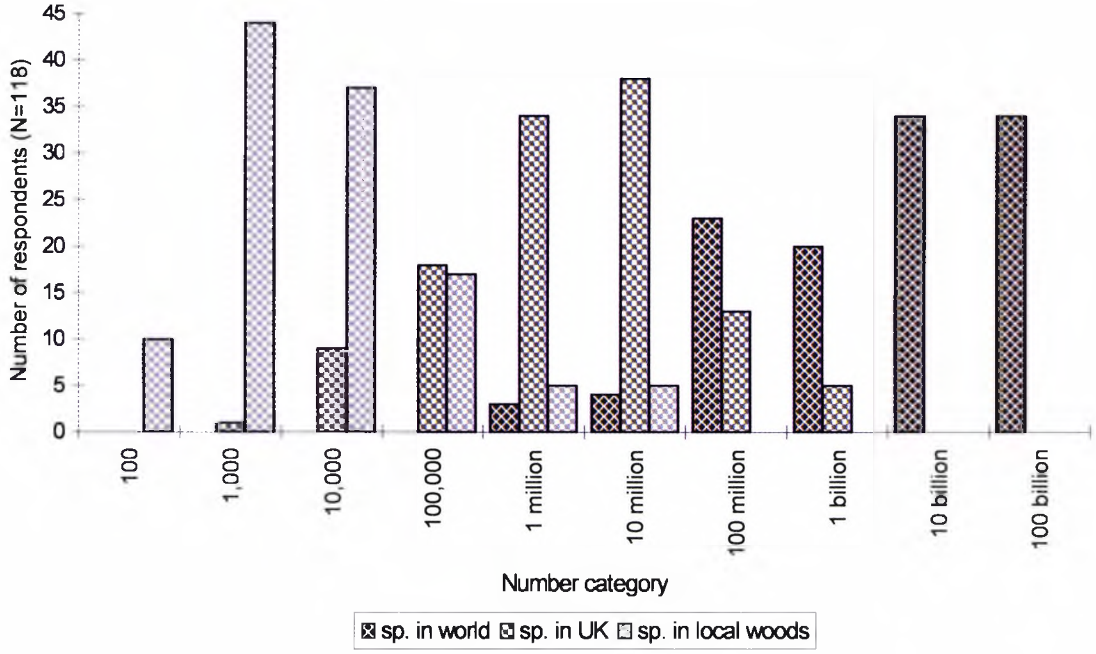
Question C21 was of a similar format, with respondents ranking five countries according to the proportion of plant and animal species they thought were endemic. Figure 4.5 represents the resulting data. With the exception of Greece, ranked fifth instead of in its rightful third place, the relative positions of the countries were correct. Most accurately placed was Australia, with 86% of respondents correctly putting it first. Britain was properly allocated fifth place by 44%, whilst South Africa was accurately positioned second by 38%, with another 38% setting it one place out. For Greece, these proportions were 13% and 47% respectively.

Figure 4.5 Ranking of countries according to % endemism. ADS responses to question C21.



Respondents tended to overestimate the relative percentage endemism of Britain and Chile, and to underestimate that of Greece and South Africa. Again, personal experience and received images might explain these skews. Greece is a country associated with many islands (which encourages endemism) but more generally identified with summer holidays, a time of the year by which it has been baked dry by the sun and appears somewhat devoid of life. The same might be said of South Africa, which shares Greece's Mediterranean climate. However, much of South Africa's endemism is due to high levels of plant diversity and geographical isolation from countries sharing a similar climate - both facts unlikely to be widely known. Respondents knowledge of Chile is also likely to have been slight, but the facts of its South American location, geographical isolation, mountainous terrain and long shape, might have combined to encourage overestimation of its endemism. The last three factors could also be applied to Britain, though to a much lesser degree. In the light of the data so far described however, a more plausible explanation for this is that respondents, having had a closer and more direct experience of Britain's wildlife, might tend to assume that much of what is indigenous is not found elsewhere. This would be particularly easy if they are not knowledgeable about the wildlife Britain shares with countries in its immediate vicinity. Overall however, respondents performed quite well on this question, 20% being completely accurate, 71% scoring 2 or less, and only 5% scoring 4 or more.

Figure 4.6 The magnitude of species diversity (locally, nationally and globally) ADS responses to C19.



Having considered parameters relating to the relative species richness of habitats and countries, questions C19 and C20 were designed to obtain an idea of respondents' perception of the actual magnitude of species diversity and the proportion yet to be described by science. Figure 4.6 represents the resulting data for C19. It shows that respondents grossly overestimated the number of species at all three levels, believing there are considerably more species than scientists estimate. For the world, only 3% correctly identified the category "10 million",[6] whilst 75% picked "1 billion" or higher, and as many as 29% chose the "100 billion" category – these respondents being some 4 orders of magnitude out. Indeed, if higher number categories had been available, even larger discrepancies might have been forthcoming. Data for the UK followed a similar pattern, with just 8% of respondents choosing the correct category ("10,000"), 76% selecting "1 million" or higher, and 14% being astray by 4 or more orders of magnitude. Respondents did however, have a better idea of the species richness of their local woods, 37% estimating at approximately the correct level (i.e. "1,000"), 23% being two or more orders of magnitude out, and just 4% exaggerating by 4 or more orders of magnitude.

[6] Assuming that the majority of estimates, which give a figure of 15-30 million, are of the correct magnitude.

As to respondents overall performance on question C19, no individual selected accurately across all three levels. A wide range of accuracy was encountered, and, except at the higher scores, respondents were quite evenly spread across this range. If this pattern does not simply result from an inability to conceptualise very large numbers (Dunning 1997, Meffe 1994), they indicate a tendency to profoundly over-estimate the diversity of species, particularly at the global and national levels. The fact that respondents also substantially exaggerated the proportion of global species identified by science [C20], also supports this inference. Nearly one in five thought that the proportion was "nearly all" (it is thought to be nearer "1 in 10" of 15-30 million), almost two thirds chose "nearly half" or more, and an additional 20% selected the "a quarter" category. A similar pattern of large overestimates for global species numbers was found by Dunning (1997) in informal surveys of university undergraduate students. His mean figure for a total of 551 students was 5×10^{13} species, although 31% gave an "approximately correct" answer, compared to 4% in this sample.

Respondents' understanding of the importance of biological diversity, and the rates, causes and consequences of its disappearance, showed a similar pattern of partial and distorted understandings amongst the respondent group. Responses to question C3 (asking respondents about the importance of biodiversity) pointed to a commonly held appreciation of the importance of biodiversity for ecological stability, and to rather less recognition of its utilitarian and aesthetic consequence. Whilst 74% of those who answered this question[7] referred to ecological significance, only 32% identified the importance of uses, and just 26% mentioned the value of biodiversity to human well-being or its aesthetic significance. It seems that although the ecological relevance of biodiversity for humans was widely acknowledged in the ADS, its potential as a resource, either to be exploited extractively or otherwise, was less obvious. This suggests the type of concern respondents might have over the loss of any one individual species, would be likely to relate to its ecological function. However, those data concerning responses to the question asking what the most important consequences of the extinction of the black rhino would be [C22], indicate otherwise. Twenty-six *per cent* of respondents could not think of an answer, 15% thought there would be little or no effect, 31% identified an aesthetic loss to humans, and just 28% suggested there might be ecological repercussions. One respondent summed up the general reaction to this question when he said.

> "I guess it would be a sad day to lose such a beautiful animal, but it wouldn't really make much difference. It would say more about us as humans - that we couldn't stop it."
>
> Roy (government officer)

[7] Because this question was changed it was asked of 111 interviewees rather than 118.

Except for a few respondents (4) who joked about the possible effects on human populations deprived of the aphrodisiac effects of rhino horn, no observations were made about the utilitarian value of the rhino (for example, to tourism). Similarly, the comments that related the demise of the rhino to ecology, demonstrated a meagre understanding of the mechanisms at work; for example.

> "Well, I'd imagine there would be some sort of knock-on effect on the habitat. Rhinos eat grass, don't they? So there would be more for the other animals."
>
> Adrienne (Kent Wildlife Trust member)

No interviewee seemed to know or was able to deduce that the black rhino plays a significant role in the control and dispersal of certain plant species (Leader-Williams 2000, pers. com.) or that its loss from the wild could lead to the extinction of these species together with those insects and other organisms that depend upon them. So despite respondents expressing a general appreciation that biodiversity is important to maintaining ecological stability, how this effect operates in practice seems to have been very poorly understood. This conclusion is also supported by the data from question C12, an open question considering the effects on the animals and plants of cutting down a mature wood. Almost all interviewees responded with the logical view that the plants and animals would either die (86%) or disperse (85%), but only 42% mentioned the process of woodland regeneration, and just 21 individuals (18%) remarked that animals able to disperse might not have suitable habitat available to them. Furthermore, when pressed, all but 3 of these 21 respondents revealed they were thinking of the presence of other mature woodland in the area, rather than whether this habitat would already be supporting populations of these species at their carrying capacity. Their understanding of the ecological processes involved was therefore extremely poor. In fact, only one person mentioned all 4 possibilities identified by the ADS respondents as a whole.

Responses to the group of questions dealing with the rates and causes of species extinction [C13, C15-C18] were similarly lacking in accuracy. Answers to C13, which asked respondents to choose and rank the three most important threats to the world's wildlife, are summarised in Figure 4.7. It shows respondents correctly identified "destruction and disturbance of habitats" as a major cause. Ninety-eight percent selected this category, and 84% rightly allocated it as being the most important. The importance of the effect of "hunting and collecting" was somewhat overestimated (ranked second instead of forth), as was that of "natural disasters". The threat from of "introduced species" and "interbreeding with other species and subspecies" were both underestimated, with the former being ranked in third place instead of second, and the latter, in fifth place instead of third. These findings are not surprising, given the relatively large amount of publicity given to habitat destruction, the effects of the poaching of certain big game species and the trade in wildlife products, and given the fragmentary understanding of ecological processes demonstrated by the answers to questions already discussed. Respondents generally performed quite well on this question.

Figure 4.7 Most important threats to world's wildlife (1st-3rd). ADS responses to C13.

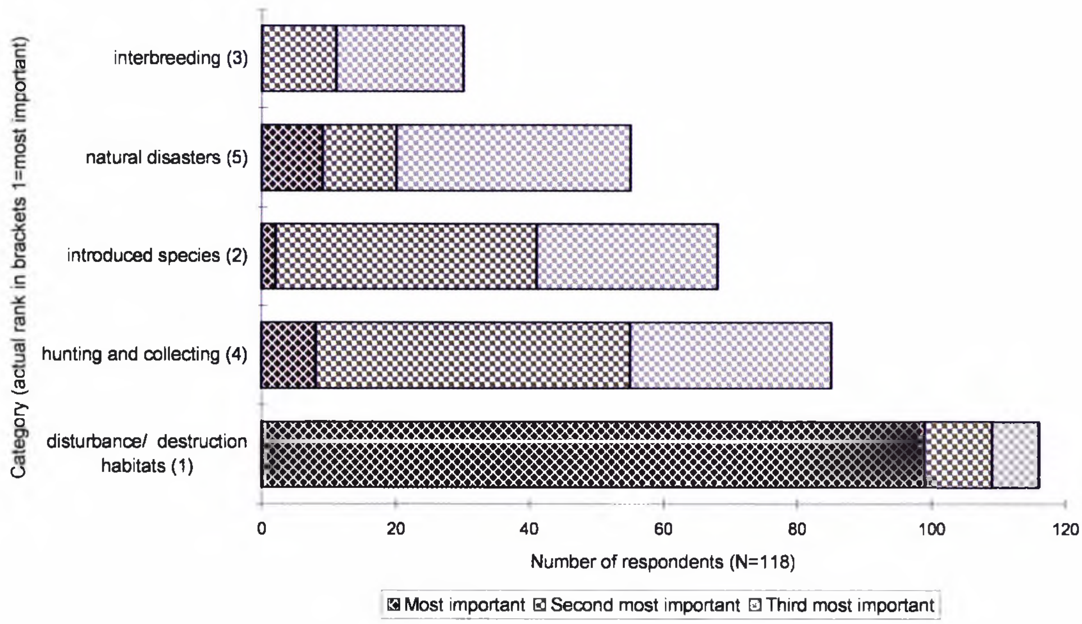
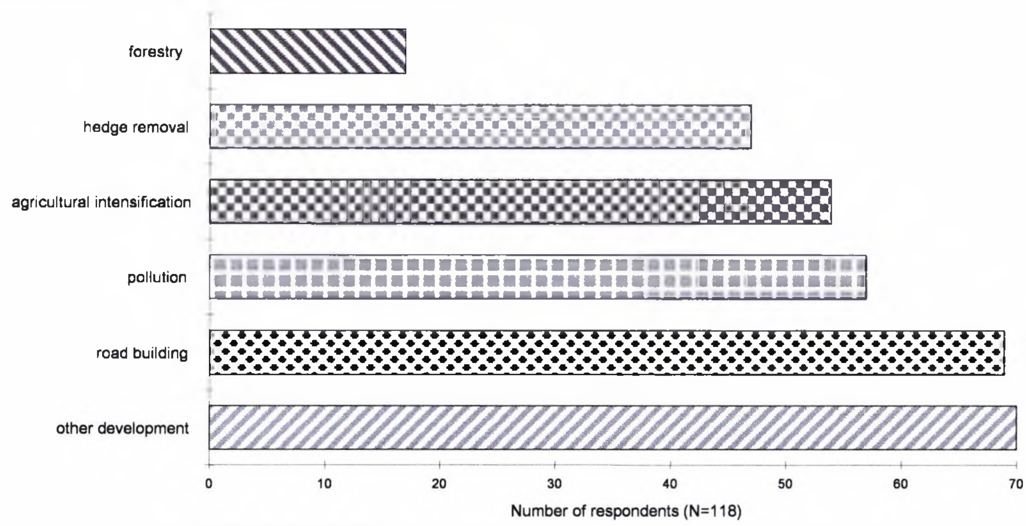


Figure 4.8 Activities which have led to reductions in wildlife in the British countryside during the past 20 years. ADS responses to C11.

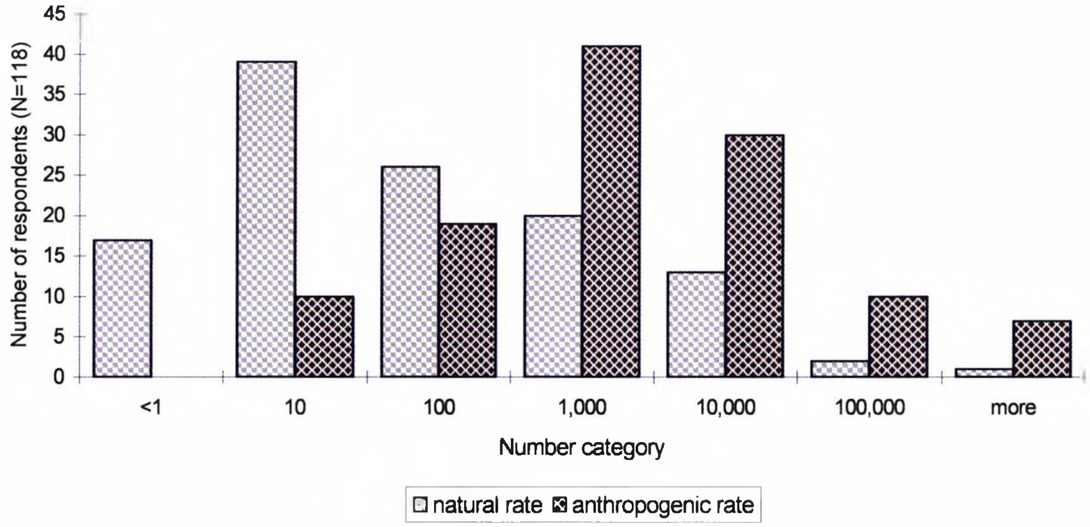


Data from the open question asking respondents to name activities which have happened in the British countryside during the past 20 years and which have led to reductions in wildlife [C11], suggest a reasonably good comprehension of the reasons for the loss of domestic wildlife. Summarised in Figure 4.8, the answers were spread quite evenly across a range of activities and the great majority of interviewees (80%) were able to come up with two or more such activities.

The specific incidence of road building, hedgerow removal and, though to a lesser extent, forestry, seems likely to reflect the fact that each has been the subject of specific public debates over the past few years.

Respondents did not perform well on questions C15-C18, which dealt with rates of natural and anthropogenic species extinction, to name extinct species, and to explain why they thought the dodo became extinct. Answers to C15, summarised in Figure 4.9, show respondents to substantially overestimate the natural rate of extinction and underestimate that caused by human agency. Although they tended to correctly identify natural rates to be lower than anthropogenic ones, for the former, over half chose categories two or more orders of magnitude higher than the expert estimate (<1 species p.a.), and nearly one third chose categories three or more orders of magnitude higher. For anthropogenic extinction rates, 60% chose categories two or more orders of magnitude lower than the expert estimate (~100,000 p.a.) and 25% three or more orders of magnitude lower. These findings resemble Dunning's (1997), where total extinction rates were on average exaggerated by a factor of 2-4, but are not directly comparable because his data derive from an open question seeking an overall estimate.

Figure 4.9 Estimated rates of natural/anthropogenic extinction (no. species/yr.). ADS responses to C15.



Nearly all interviewees had great difficulty in naming extinct species [C16, C17]. Even when given considerable leeway in regard to what constituted a 'species', with "dinosaur", "mammoth" and "sabre toothed tiger" being accepted initially, only 18% were able to name three pre-1900 examples. Although only one respondent identified a fictional creature - the unicorn - as being extinct, and 4 named extant species, just 21(17%) correctly identified one (10%) or two (7%) extinctions post-1900, and no-one named three. Overall, no respondents named a full quota of extinct species, and only 2 identified three species pre-1900 plus two species post-1900. Table 4.3.

shows those 'species' mentioned most frequently. The data are dominated by famous extinctions - dodo, dinosaur and mammoth - and their general pattern closely reflects those for the same question in the Keoladeo survey, though, not surprisingly, the latter, concerning an internationally important ornithological conservation site, included rather more birds.

Table 4.3 Extinct 'species' mentioned. ADS responses to C16/C17.

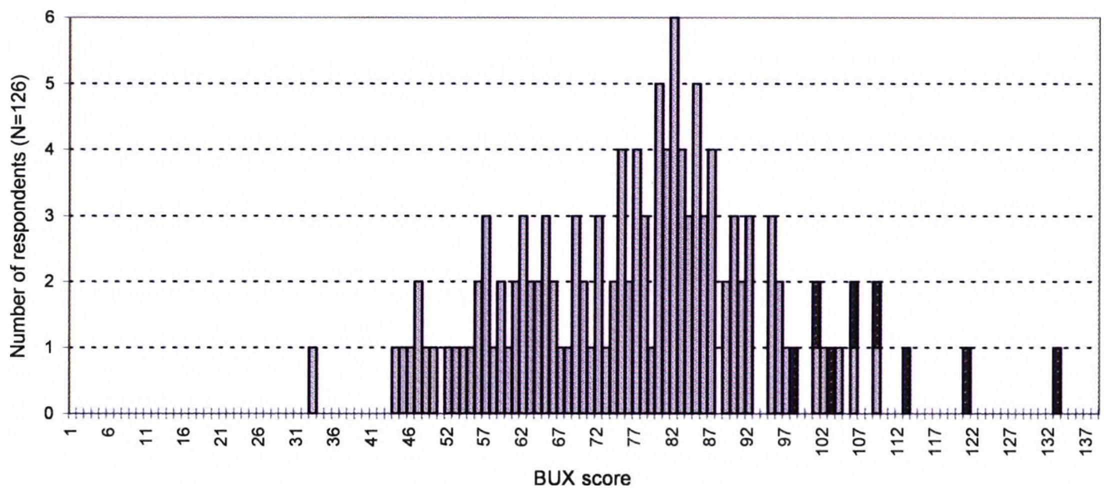
'Species'	No. ADS respondents (N=118)	%	No. Keoladeo respondents (N=128)	%
Pre-1900				
Dodo	79	58%	73	57%
Dinosaurs	46	33%	35	27%
Mammoth	20	16%	18	14%
Great auk	10	8%	26	20%
sabre-toothed tiger	8	7%	0	2%
Stellar's sea cow	2	2%	4	3%
Elephant bird	1	1%	3	2%
moas	1	1%	9	7%
Archaeopteryx	1	1%	1	1%
Post-1900				
Passenger pigeon	8[1]	7%	36[2]	28%
Tasmanian wolf/tiger	7	6%	21[3]	16%
tiger subspecies	3	3%	0	0%
Quagga	1	1%	8	6%
Syrian ass	1	1%	0	0%
lion sub-species	1	1%	0	0%
Ivory-billed woodpecker	0	0%	5	4%

[1] In 2 of these cases the extinction was incorrectly identified as having been pre-1900.
[2] Eight of these were references to "carrier pigeon" which means any homing pigeon. Also, in 15 of these cases the extinction was incorrectly identified as having been pre-1900.
[3] Three of which were reference to the "Tasmanian Devil", an extant carnivorous marsupial (*Sarcophilus harrisi*) rather than the "Tasmanian wolf/tiger" (*Thylacinus cynocephalus*).

Despite a scientific definition of species having been provided, interviewees continued to employ a "vernacular" concept of species in their answers. If the data are considered strictly in the light of the scientific concept of species, only a single species, the dodo (*Raphus cucullatus*), was identified frequently (by 67% of respondents), with the passenger pigeon (*Ectopistes migratorius*), Tasmanian wolf/tiger (*Thylacinus cynocephalus*), and great auk (*Pinguinus impennis*) alone being mentioned by more than two interviewees. So, with the exception of the dodo, respondents could recall almost no extinct species, particularly ones lost this century. Even in regard to the dodo, probably the best-known species extinction of the millennium (at least in the UK) partial understandings were prolific amongst the respondent group. Thirty-two percent were unable to put forward any explanation for its demise, 19% attributed it to the bird's own stupidity, and 11% suggesting that it was due to its flightlessness. Just 9% indicated that it was caused by habitat destruction and 8% proffered its inability to compete as the reason for its premature end. Thirty-four *per cent* correctly identified hunting as a principle cause, but only 5%, mentioned the effect of introduced rats and cats. There was a general sense that dodo was somehow culpable in its own disappearance, if only through its inability to adapt. So the perception that led scientists to first name it *Didus ineptus*, still seems to persist.

Respondents' performance on the Biodiversity Understanding Index (BUX) is represented by Figure 4.10 - which includes data for the Conservation Biologists. All but one ADS score was above the quarter way point of 34.5 and, with the exception of 3 individuals, all were below the three-quarter-way point of 103.5. The distribution of scores approximates to a normal distribution (mean 75, median 77.5, standard deviation 14.9). Given that many of the questions in this set were of an open format, this distribution can be regarded as a reasonably reliable summary of the respondent group's knowledge and understanding of biodiversity across those topics considered. It shows a small group to have scored well, and on par with the Conservation Biologists, but 34% to have scored at or below the halfway mark.

Figure 4.10 Main survey respondents' scores on the Biodiversity Understanding Index [BUX] (Conservation Biologists indicated by darker shading).



The remaining Cognitive questions [C4-C8] explored understandings of genetics - one of the most fundamental aspects of biological diversity. The answers portray a disjointed comprehension of the subject, with a good understanding expressed of the role of DNA and genes in carrying biological information [C4], but some confusion as to the process of inheritance [C7], the range and expression of genetic information [C5 and C6], and the mechanism of mutation [C8]. The great majority of respondents correctly allocated true or false to statements concerning the location of information expressed in phenotypic features, and said they were sure of their answers. For DNA this proportion was 88%, for the brain 86%, environmental chemicals 92% and genes 98%. Only the cell as a site of information was mis-designated to any substantial degree, with

45% answering incorrectly. Similarly, 72%, 68% and 66% respectively, made no errors concerning the biological inheritance of height, eye colour, DNA and the ability to cook, but 63% thought a sense of humour could be biologically transferred to children, and 29% said the same for cooking ability. These findings are broadly in line with those of Durant, Evans and Thomas (1989), who found 80% or more of their respondents to answer inheritance questions correctly. Moreover, many might have ignored the biological designation and answered the questions by considering the characteristics of their own children. Others were also confused about the mechanism of inheritance. Two comments particularly well illustrate this.

> "Well, both my boy and girl are just like me, and we laugh at the same things too."
>
> Patricia (caterer)

> "Both my children have half from each parent, and then it just depends which half is dominant. I think they have my eyes and sense of humour and her hair and ability to cook."
>
> Steven (electrician)

Perhaps some respondents were unable to distinguish biological inheritance from the process of mental learning, but data from question C6, where 67% of respondents selected "nearly 100%" (27%) or "50%" (40%) of genetic information as being expressed in the individual, suggest that a key element underlying responses may have been a poor understanding of the relationship between genotype and phenotype. Only 4 (3%) respondents correctly identified the amount expressed as "1%". This confusion may have underlain responses to question C5, for interviewees appeared to either guess their answers or base their responses upon perceived morphological variation amongst each animal group. Thus the largest contingent chose "amphibians" as being the least genetically varied group (33%) and "insects" as the most (56%), with "mammals" the second most popular category for both least and most variation (29%, 28%). Although there are problems involved in defining what is meant by genetic variation, for this question, it was taken to be the range of DNA content. For the four categories presented, this is smallest amongst birds and greatest amongst amphibians (WCMC 1992). What was most notable about the data from these genetics questions is that they suggest respondents based their answers on personal observations, on their understandings of phenotype, rather than genotype.

The accuracy of answers to question C8, concerning the process of mutation, varied with answer category. Nearly all respondents (96%) correctly identified "exposure to radioactivity" as a source of genetic mutation, but 23% mistakenly credited "eating certain foods" as a cause, and only 60% correctly associated the "normal production of sperm and eggs" with such changes. Erroneous answers may have derived from a perception of biological mutation as necessarily bad and/or as something caused by factors external to the organism. Whatever the reason, the findings bolster the view that a not inconsiderable proportion of the respondents had a deficient understanding of the way genes operate.

Figure 4.11 ADS respondents' scores on the Genetics Understanding Index [GUX].

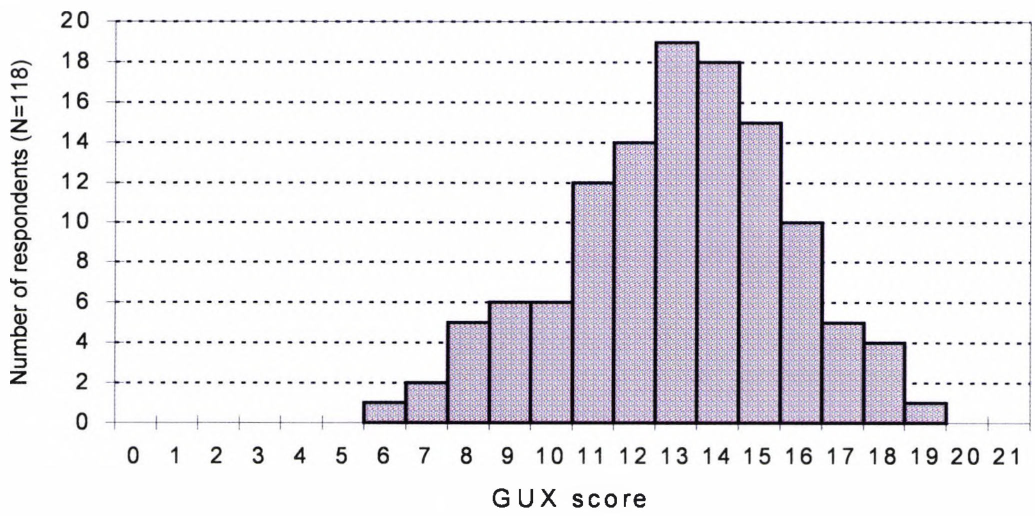


Figure 4.11. represents respondents' performance on the Genetics Understanding Index (GUX). It shows that no one scored the maximum (21), and just 8% scored 17 or higher. The great majority of scores (75%) lay in the 11-16 range, with the overall mean, mode and median all equal to 13 (S.D=2.68), approximating to a normal distribution. Though derived from a series of closed questions, and therefore more liable to respondents' guesswork, the fact that respondents appeared to give careful consideration to their answers during the interview, suggests this index might reflect individuals' understanding. However, because few questions dealt directly with the genetic aspects of biodiversity, responses must be treated with care when considering them in relation to biodiversity. Those who performed well on these questions could have understood little about biodiversity, and indeed, the Pearson correlation coefficient for GUX x BUX, though significant at the 5% level, was relatively small (0.223). This indicates only a weak positive association between scores on the two indices, and suggests the GUX and its constituent variables should not be utilised in reference to respondents' understanding of biodiversity. The lack of association between GUX scores and any Identification Accuracy Index [IA*], tends to support this view.

The final question in the Cognitive set [C27] considered the legality of a range of activities involving wildlife. Knowledge of the illegality of importing carved ivory and digging up wild plants seemed good, with 90% and 82% respectively selecting the correct answer. Otherwise, under half (45%) correctly identified killing a frog as illegal, 75% rightly thought the same treatment for the grey squirrel was legal, and 82% accurately selected the wearing of alligator shoes as legal. Most respondents did well on this question, with 28% answering all sections correctly, 61% getting one or less answer wrong, and 90%, two or less out of five. With the exception of responses to the part of the question concerning killing a frog (as suggested by earlier observations, some may have considered frogs not to be animals and therefore to be outside the remit of legislation relating to animals) respondents seemed to have quite a good understanding of wildlife law as represented by this measure, albeit a rather simplistic one. Wildlife organisations and legislators might find this conclusion encouraging. It might also suggest that creating and publicising laws relating to biodiversity might be an effective means of bringing issues of biodiversity loss to people's attention. Otherwise, little can be deduced from these data.

Associations between different variables in the Cognitive set were explored using appropriate statistical tests (Table IV, Appendix I). Spearman correlation coefficients[8] suggested small but significant associations between many variable pairs, with nearly half of 92 permutations being found significant. When the intervening effect of the other cognitive variables were controlled for by the calculation of partial correlation coefficients, just 8 pairwise combinations were designated as valid and statistically significant at or below the 5% confidence level, all represented by modest coefficients (Table V, Appendix I.) This suggests that with few exceptions individuals in the ADS respondent group did not perform consistently well (or badly) on the same groups of questions. It can be interpreted as a manifestation of the complexity of the understandings of biodiversity evaluated by the Cognitive set of questions, and as a measure of the success of the survey instrument in embracing a range of distinct elements included therein. The fact that 5 of these correlations involve C1 (asking whether the respondent had ever heard the term "biodiversity") appears to support this view. This question is a general measure for people's understanding of the subject area; those enjoying a better overall understanding being more likely to be familiar with the term and *vice versa.* It is probably no accident therefore that those who had answered in the affirmative to C1 tended to perform well on questions dealing with the importance of biodiversity [C3], the species richness of countries [C14], and to be relatively good at identifying extinct species [C16/17] - questions on which the great majority of respondents did not do very well.

Another, way of considering the relationship between variables that comprised the Biodiversity Understanding Index, is to look at the association between each and the overall BUX having first subtracted those data relating to the particular variable in question. Table 4.4 shows the resulting Spearman correlation coefficients (r^s) and indicates that a good performance on an individual

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[8] Scattergram analysis found distributions for virtually all Cognitive data variable pairings to be unsuitable for the calculation of Pearson correlation coefficients, so Spearman rank correlations were calculated (following Norusis 1993). Relationships involving the dichotomous variable C1 were also treated to the Mann-Whitney Test, but since all pairings showing significant rank differences corresponded with significant Spearman correlations as well, r^s coefficients were adhered to for comparative purposes.

question was positively and significantly associated with a good performance on the overall understanding index for all but two pairings (C19XxBUX and C20XxBUX). This encourages the view that the variables used for BUX comprised valid components of the overall understanding the index embodies. Furthermore, the highest correlation coefficients almost invariably relate to questions of an open format (less vulnerable to the effects of a respondent's guesswork). The correlation for C1 is an exception, but if acting as a general biodiversity understanding index, since it is unlikely that interviewees would have lied about having heard the word 'biodiversity', the accuracy of responses to this particular closed question is likely to have been high.

Table 4.4 ADS Cognitive variable correlations with the BUX. Spearman correlation coefficients

BUX variable performance index - subject of question	**Spearman correlation coefficient - with BUX** (less data for that variable)	**Type of question in main survey**
C16/17x - naming extinct species	.5584****	open
C2x - levels of biodiversity	.5166****	open
C9x - characteristics of a species	.4770****	open
C11x - changes to British countryside	.4489****	open
C1x- heard of "biodiversity"	.4087****	closed
C3x - importance of biodiversity	.4087****	open
C14x - species richness, countries	.3835****	closed
C12x - effects of felling wood	.3822****	open
C10x - species richness, habitats	.3297****	closed
C13x - causes of extinction	.2993***	closed
C15x - rates of extinction	.2167*	closed
C21x - endemism, countries	.1825*	closed
C19x - number of species existing	.1418 - not significant	closed
C20x - % species identified	.1403 - not significant	closed

Significance * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Associations involving Cognitive data variables not included in the Biodiversity Understanding Index also provide insights into respondent's understanding of biodiversity. Of the possible pairwise combinations of the four identification accuracy indices [IAB, IAR, IAF and IAI], all but those between Birds and Reptiles/amphibians [IABxIAR] and Birds and Flowers [IABxIAF] showed small positive partial correlations when controlling for the other two, with the strongest being between IAR and IAI, and the next strongest between IAR and IAF, followed by IABxIAI, and IAFxIAI.[9] Substituting upgraded indices made no difference to this pattern. It suggests that respondents' performance on the reptile/amphibian identification index was the best of these measures for assessing their individual ability to identify at the level of species. This contention is supported by the fact that of the Spearman correlation coefficients calculated between these four indices and the index for question C9 (concerning the characteristics defining a species), only that

[9] Partial correlation coefficients IARxIAI = *.3529, sig. ≤.001;* IARxIAF = *.2725; sig. ≤.005;* IABxIAI = *.2028, sig. ≤ .05;* IAFxIAI = *.1875, sig. ≤.05.*

involving IAR was significant and positive.[10] In other words, respondents who performed well on the Reptile/amphibian identification accuracy index [IAR] also tended to identify more characteristics defining the concept of species and to do so at a significantly high frequency. Simple linear regressions undertaken between BUX and each identification accuracy index also served to encourage valuing IAR over the others. A relatively strong linear relationship was found between IAR and BUX, a weaker one between IAI and BUX, a slight one for IAFxBUX, and none for IABxBUX.[11] It is also worth highlighting the lack of a significant association of the Bird accuracy index [IAB] with any indices relating to questions that make up the BUX, even when upgraded on the basis of vernacular definitions of species. The implication is that the good overall performance on this index was likely due to common bird species being readily distinguishable as such, rather than a scientific understanding of the species concept.

4:2 The Activity data

Figure 4.12 summarises data for the regularity of wildlife-related activities [A1]. Those activities said to have been most frequently engaged in were "watching wildlife documentaries" and "walking in the countryside/on the coast", for which more than half (55% and 66%) chose the "once a week" response category,[12] and nearly all (86% and 92%) chose either "once a month" or "once a week". Discussing wildlife issues with family/friends and "reading about wildlife" were the next most frequently reported activities. Going on nature-oriented holidays and on guided wildlife tours were the least reported. Clearly, these last two activities are likely to be related to one another in so far as nature oriented holidays often include guided tours. The level of participation in practical conservation work was also low, with 79% of respondents selecting the "never" or "hardly ever/once in 5 years" option and just 8% the "once a month" or "once a week" categories. Of the remaining activities, "visiting zoos/museums" was largely associated with the "once a year" category (67% of interviewees), most other responses being "hardly ever/once in 5 years". Giving money to wildlife organisations was also associated with the mid-range of answer categories, the largest proportion of responses lying in the "once a year" category (36=30.5%), possibly as a result of the inclusion of donations along with subscription renewals. Besides "read about wildlife", only "going to watch animals in the wild" exhibited a pattern of regularity relatively consistently spread across all categories of participation, with 6-19% of respondents being located in the range of categories from "once a week" to "hardly ever/once in 5 years".

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[10] IARxC9X, $r^s = -.2544$, *sig.* ≤ 0.05 (C9X being an "ignorance index").

[11] IARxBUX, *R Square* = *.25134*, *F* = *38.607*, *sig.* $\leq$*0.001*, *T* = *6.213*, *sig.* $\leq$*0.001*; IAIxBUX, *R Square* = *.12617*, *F* = *16.748*, *sig.* $\leq$*0.001*, *T* = *4.092*, *sig.* $\leq$*0.001*; IAFxBUX, *R Square* = *.05434*, *F* = *6.435*, *sig.* $\leq$*0.05*, *T* = *2.537*, *sig.* $\leq$ *0.05*; IABxBUX, *R Square* = *.01262*, *F* = *1.482*, *sig.* *.2259*, *T* = *1.217*, *sig.* *.2259*.

[12] This category includes any frequency from 'once every two weeks' up to once or more a day. All categories similarly encompass lower and higher frequency ranges.

Figure 4.12 Regularity of respondents' wildlife-related activities. ADS responses to A1.

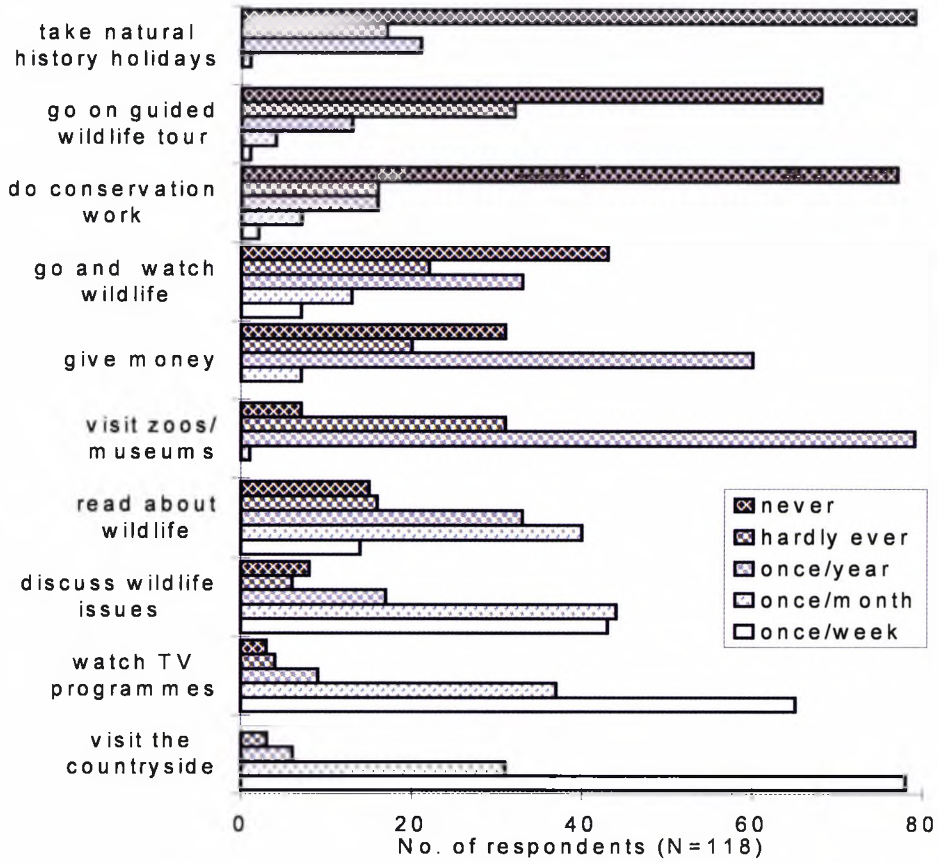
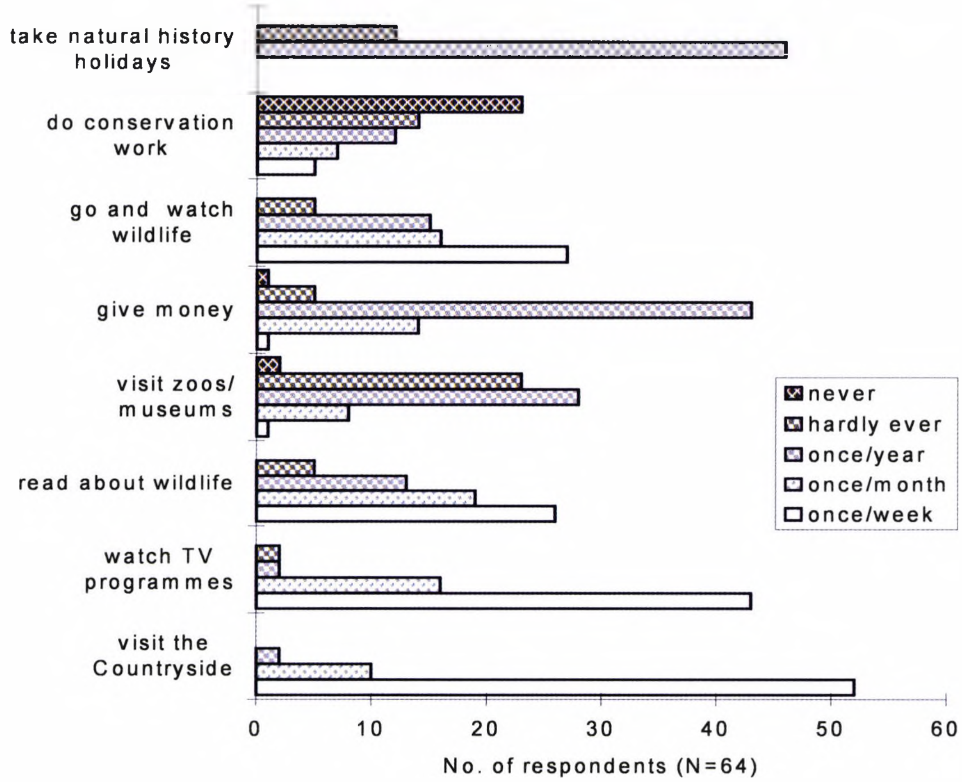


Figure 4.13 Regularity of respondents' wildlife-related activities. Keoladeo responses to Q15.



This overall pattern is remarkably consistent with that for the Keoladeo survey (presented in Figure 4.13, although in the latter instance, reported frequencies of all activities were generally higher, and those for natural history holidays, watching animals, and doing conservation work, markedly so. However, this was not surprising, given that respondents were visitors to an international wildlife site.

This correspondence across data sets obtained differently suggests the pattern may be more generally representative. In considering how participation in different activities was associated, Spearman correlation coefficients (r^s) were calculated for all pairwise combinations (Table VI, Appendix I). Of 45 combinations, nineteen were significant at the 5% level or less. Figure 4.14. illustrates those significant at or below the 1% level.

Figure 4.14 Major associations amongst wildlife-related activity variables, as indicated by significant Spearman correlation coefficients (≥0.2). ADS responses to A1.

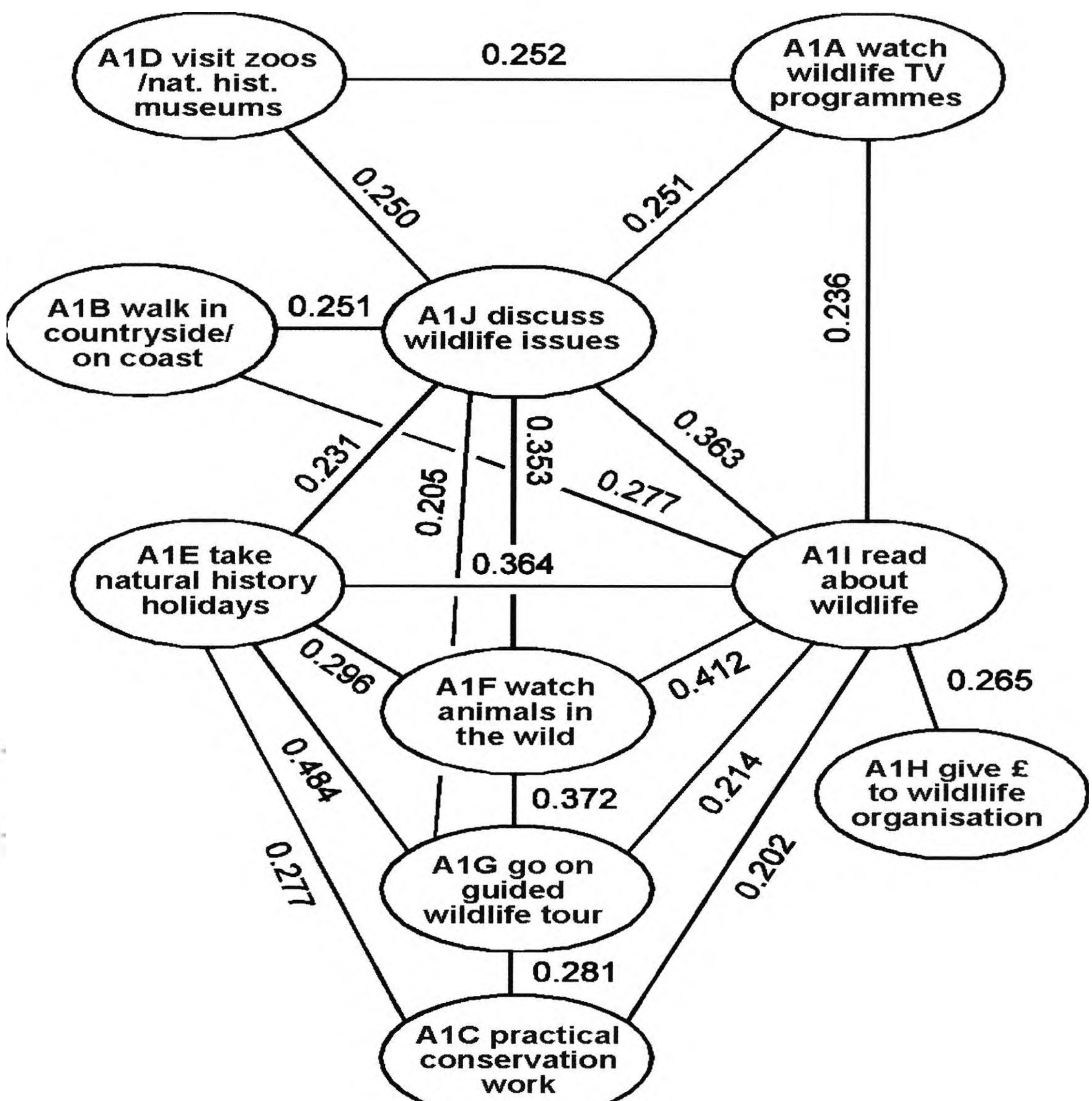


Figure 4.14. shows a general lack of strong association between any two activities, with those most closely related - going on natural history holidays, guided wildlife tours, watching animals in the wild and doing practical conservation work - being logically connected. Participation in nature holidays often involves guided tours, some holidays/tours are based around practical conservation work, and nature holidays and wildlife tours are often specifically oriented towards watching animals. Similarly, reading about wildlife might be expected to be positively associated with participation in nature holidays or watching animals in the wild, because it might be used to inform these activities, either prior to or following the event. Discussing wildlife issues is also related to other activities in a way that might be expected. The other notable part of the diagram is the relationship alluded to by the association between visiting zoos/natural history museums, watching wildlife TV programmes and discussing wildlife issues. It points to the existence of a group of persons within the sample who, although not participating in going to see wildlife *in situ*, have an interest in the subject expressed in their participation in these relatively undemanding activities. Similarly, those claiming to often go and watch wildlife do not seem to watch wildlife television programmes with greater or lesser frequency than typical ADS respondents.

The association between participation in natural history holidays or guided tours and "read about wildlife", is not surprising, since reading can serve to inform the other two, or reflect the interest they signal. Neither is the association of guided tour participation with watching animals unexpected, or that between reading about wildlife and giving money to wildlife organisations - subscribers receiving literature regularly and membership subscriptions often accompanied by donations. What is more interesting is the suggested link between actually seeing animals 'in the flesh' (whether in zoos, museums or in the wild) and discussing wildlife issues. The weak connection between watching wildlife TV programmes or walking in the countryside/on the coast and any other activity, is also noteworthy, since those who watch wildlife documentaries most frequently might be expected to participate more actively in seeing wildlife. These data suggest otherwise.

Table 4.5 shows Spearman correlation coefficients between individual Wildlife Activity Index [WAX] components and the index calculated without variable weightings [WAXu] (less the contribution from the variable in question). It further clarifies these data by providing an idea of the relative association between each variable and the level of activity across the activities as a whole. Those correlations attaining the highest and most significant coefficients are not surprising. The interest of the most active individuals is reflected in their reading and their discussions about wildlife. Similarly, the tendency for correspondence between watching animals, going on nature oriented holidays and guided wildlife tours, helps explain the strength of their associations with the WAXu. In addition to its weak correlation with watching wildlife documentaries, the most interesting finding suggested by Table 4.5 is the lack of association of the WAXu index with the activity of visiting zoos, natural history museums or safari parks. Possibly many who undertake such visits and do little in the way of the other wildlife-related activities, do so more for personal or family entertainment rather than an interest in wildlife.

Table 4.5 ADS A1* variable correlations with WAXu (unweighted wildlife-related activity index) as indicated by Spearman correlation coefficients.

WAX variable and subject of question	**r_s - with WAXu (WAX variables unweighted) - less variable data**
A1I - read books/magazines. about wildlife	.5584****
A1J - discuss wildlife issues with family/friends	.4765****
A1F - go and watch animals in the wild	.4384****
A1E - go on nature oriented holidays	.4150****
A1G - go on a guided wildlife tour	.3893****
A1B - walk in the countryside/on the coast	.3209****
A1C - do practical conservation work	.2222*
A1H - give money to wildlife organisations	.2056*
A1A - watch wildlife documentaries	.1879*
A1D - visit zoos, natural history museums or safari parks	.0872 - not significant

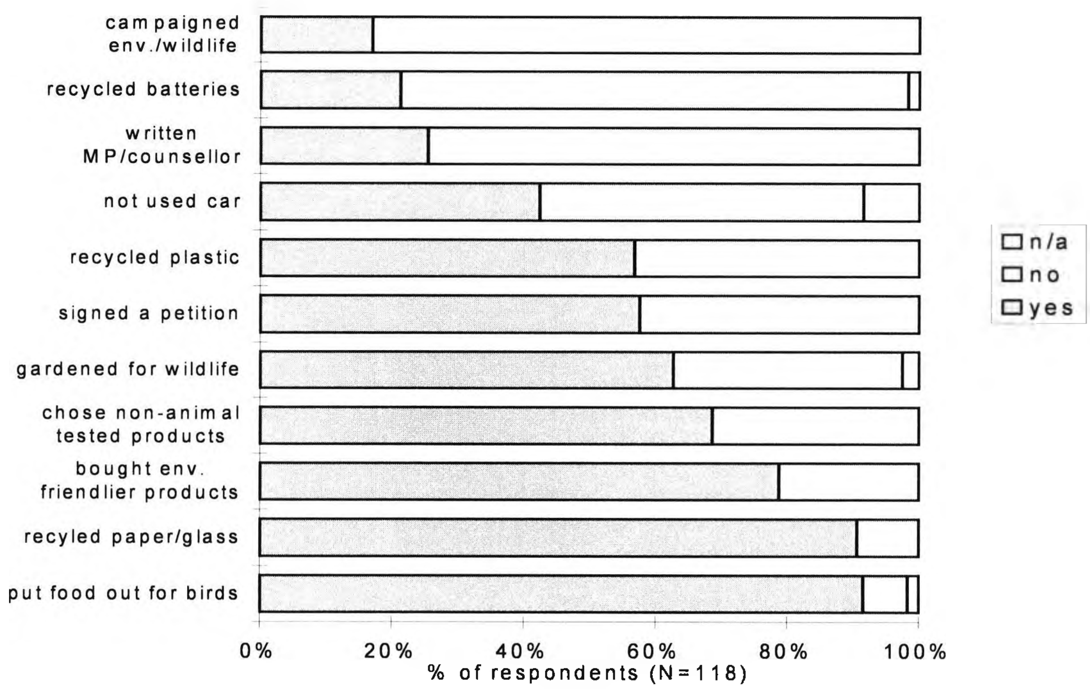
Significance * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Data relating to participation in the general environment-related activities as reported by ADS respondents are illustrated by Figure 4.15. They could be interpreted as suggesting that a high proportion of the sample were quite active in participating in these behaviours. However, it must also be remembered that to be included in the "yes" category respondents had only to declare they had carried out that activity once in the previous three years. Even if the question was answered honestly, these data do not necessarily reflect much commitment to these activities. Their value derives from considering the different activities in relation to one another, variations in their patterns across the different survey groups and in their use in an index (the Environmental Activity Index [EAX]).

That the popularity of activities appears inversely proportional to the amount of effort each seems likely to involve, is worth noting. So is the significant association between the wildlife activity index [WAX] and EAX[13], an association that indicates respondents reporting themselves most active in relation to wildlife tended to do likewise for these environment-related activities. This suggests that a significant proportion of individuals in the respondents group may hold attitudes that inform much of their behaviour, including that related to wildlife and the environment.

[13] WAXxEAX r^{P} =*.5588, sig. = 0.000.*

Figure 4.15 Respondents' participation in environment-related activities. ADS responses to A3.



Finding patterns within the environment-related activities, proved difficult. Spearman correlation coefficients (Table VII, Appendix I) and Mann-Whitney U values calculated for all pairwise combinations, found significant associations for just 10 out of a possible 55,[14] suggesting a lack of strong patterns across these activities (Figure 4.16).

No association illustrated in Figure 4.16 is particularly strong or surprising. Indeed, that between recycling paper/glass and recycling plastic was to be expected because those so engaged tend to recycle more than one material. The positive association between "avoided buying products which have been tested on animals" and "bought environmentally friendlier products", and between both these variables and "signed a petition about an environmental/wildlife issue" is also unsurprising. All three activities are compatible and involve a small but considered action on the part of the individual. Similarly, occasionally forsaking the use of one's car for environmental reasons is compatible with, and of a similar 'order' to, buying environmentally friendlier products, as is the positive association between writing a letter to MP/councillor about an wildlife/conservation issue and campaigning about an environmental/wildlife issue. The association between gardening for wildlife and writing to a MP/councillor about a wildlife or conservation issue is less immediately obvious, but since both are likely to be conducted from home, it may have something to do with persons who have the time to do so. Correlation coefficients calculated between individual components of the overall index [EAX] and the index without variable weightings [EAXu] shed

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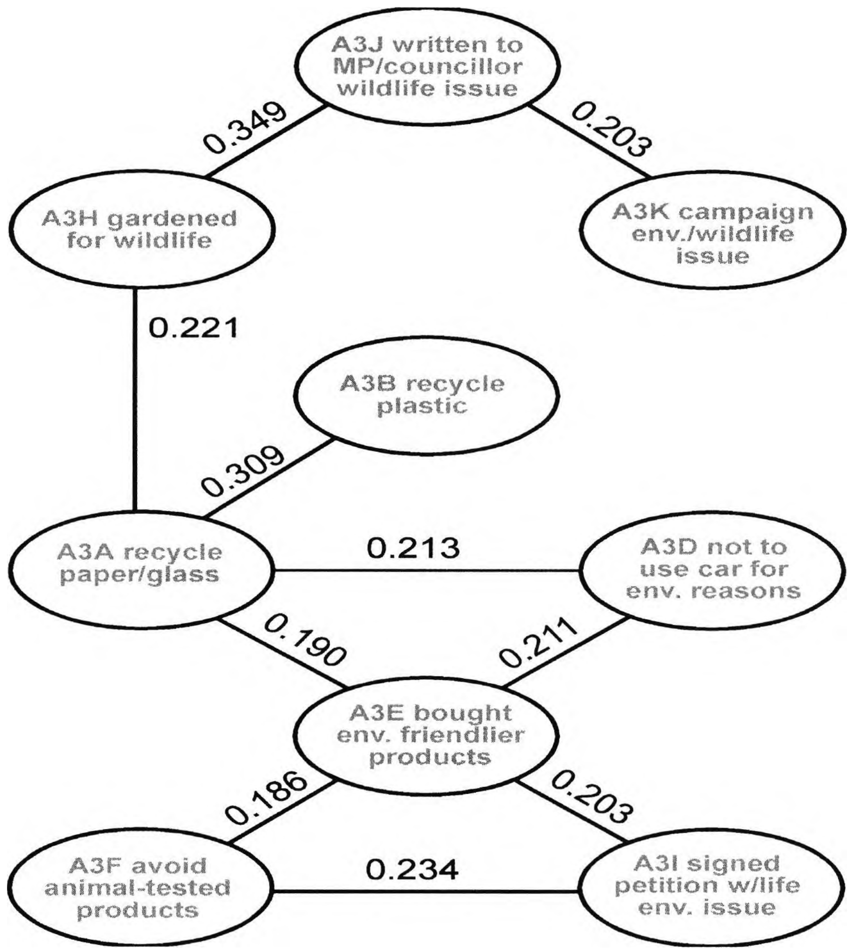
[14] Associations exactly paralleled by significant Chi square values in cross tabulations.

little further light on the data (Table VIII. Appendix I). No coefficient was high, reaffirming an absence of strong patterns across different activities, and just 4 were significant at the 5% level.

Figure 4.16 Major associations amongst environment-related activities, as indicated by Spearman correlation coefficients (≥0.2). ADS responses to A3.



Although the data are not directly comparable, the general pattern in relative levels of main survey respondents' participation in wildlife and environment-related activities, resembles that derived from combining UK data from Shaw, Mangun and Lyons (1985); Harrison (1991), Young (1992), Weber and Carrado (1993), DoE (1994c), Worcester (1994), Taylor (1997); Dalton and Rohrschneider (1998). These are represented in Table 4.6, which shows the percentages of respondent samples admitting to each activity and includes figures with the selected Kent Wildlife Trust member data removed in order to gauge any skewing effect of this group's data. It presents a broadly consistent picture of high frequencies of TV viewing and walking in the countryside, moderate levels of recycling, reading, avoiding products tested on animals, giving money to organisations, avoiding the use of one’s car, and a low participation rate in writing to MP/councillors, doing practical conservation work, or campaigning. The general pattern closely replicates that found in the U.S. study by Steel (1996), although the ADS results record higher levels of participation in most activities mentioned, particularly product purchasing, recycling and feeding garden birds, as well as those activities suggesting greater levels of commitment, namely of writing, campaigning and doing practical conservation work. This pattern changes little with removal of the Kent Wildlife Trust member data, but the fact that the percentage of respondents reporting an organisational membership also remains high when these data are removed (i.e. 55%), suggests that the main survey sample as a whole consisted of persons more environmentally concerned than normal.

Table 4.6 Levels of participation in wildlife and environment-related activities: ADS data[1] compared to those from other UK studies.

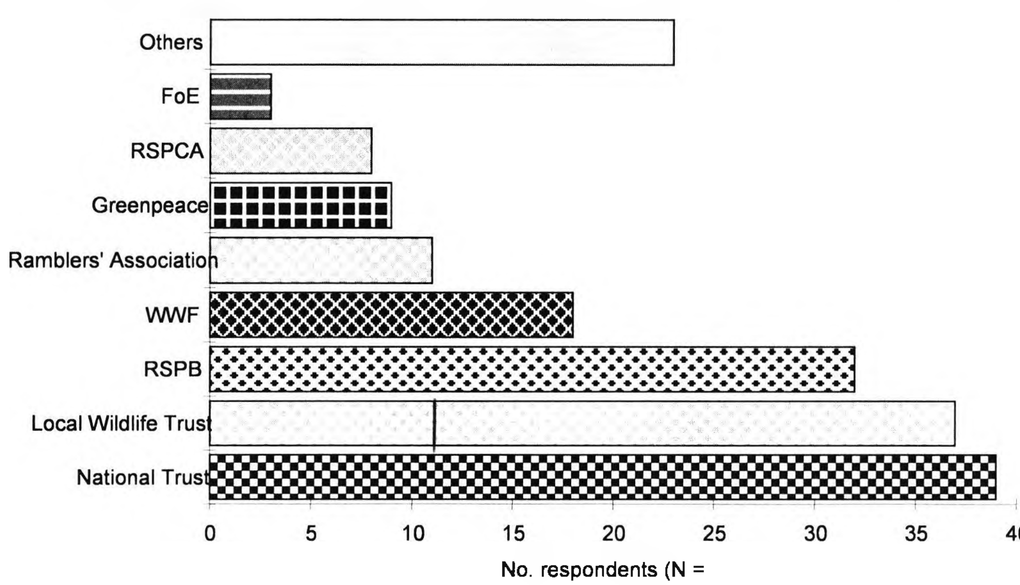
Activity	% ADS	% ADS (- WLT mems.)[2]	% UK other studies[3]
A1B - walk in the countryside/on the coast	97	96	81[a]
A1A - watch wildlife documentaries [env./Third world]	94	95	[86[d]]
A3G - put food out in the garden for the birds	93	90	37[b]-40[a]
A3A - recycled paper/glass	91	82	60[c]
A3E - bought env. friendlier products	79	78	57[e]
A1I - read books/mags. about wildlife [the environment]	74	66	[68][e]
A3F - avoided products tested on animals	69	71	53[f]
A1D - visit zoos, natural history museums or safari parks	68	71	~10/yr[b]
A3H - gardened to encourage wildlife [avoid pesticides]	64	58	[57[e]]
A6 - member of wildlife/env. organisation	62	51	5[f]-8[e]
A3I - signed a petition about an env./conservation issues	58	55	42[f]
A1H - give money to wildlife organisations [env. org]	57	61	[49[e]]
A3D - chosen not to use car for env. reasons	46	42	35[c]
A3J - written to MP/councillor about env./wildlife issue	25	21	4[e]-8[g]
A1C - do practical conservation work	21	16	<7[b]
A3K - campaigned about env/wildlife issue [go on demo]	17	15	[4[f,g,h]]

[1] Where the frequency categories from "once a week" to "once a year" were coded as 'yes'.
[2] Only data for the 26 selected Kent Wildlife Trust members were removed.
[3] Where: [a] Shaw, Mangun and Lyons (1985); [b] Harrison (1991); [c] Young (1992); [d] Weber and Carrado (1993); [e] DoE (1994c); [f] Worcester (1994); [g] Taylor (1997); [h] Dalton & Rohrschneider (1998).

The next cluster of Activity questions concerned pet keeping [A4-A5]. Many respondents (92=78%) reported keeping a pet at home, 46% saying they had more than one, and 25% more than two. These were mainly cats (41% of respondents) and dogs (36% of respondents). The questions had been included because it was thought relationships might exist between patterns of pet-keeping and other activities; the argument being that a 'closeness' to animals as demonstrated by pet ownership might also be reflected in a 'closeness' to wild animals demonstrable in terms of wildlife-related activities. However, almost no significant relationships were encountered between data from pet keeping questions and any Wildlife Activity Index or Environment Activity Index component variables - not even one between dog ownership and walking in the countryside/on the coast. Associations were found between cat ownership and higher frequencies of visiting zoos/natural history museums, reading wildlife books/magazines and discussing wildlife issues,[15] and were reflected in an association with the WAX.[16] These might point to an interest in cats which extended to seeing captive big cats at the zoo, or perhaps concern for the effect of cats upon native wildlife, but generally these data suggest pet-keeping as an influence on or as a component of ADS respondents' behaviour in regard to biodiversity, is of little immediate relevance.

Data concerning membership of wildlife/environmental organisations were more revealing. Because they relate to social groups, they are considered more thoroughly in Chapter 5. However, since the joining of a wildlife/environmental organisation (unless arranged by someone else), or even renewal of an annual subscription (unless made by direct debit), can be regarded as active positive behaviours relating to wildlife or the environment insofar as they indicate support for a cause (Rose 1993), the basic survey findings are considered at this point. A large proportion, some 62% of the ADS, declared themselves to have been a member of a wildlife or environmental organisation within the previous 3 years; 77% of this subgroup (47% of the ADS) said they had belonged to two or more such organisations, and 48%, to three or more (30%). Figure 4.17 represents numbers declaring membership of specific organisations, the line in the bar representing eleven members of The Wildlife Trusts (specific trust not designated) encountered by chance (in effect 12% of ADS respondents not selected on the basis of this membership).

Figure 4.17 Organisational memberships of ADS respondents (during last 3 years).



[15] Mann-Whitney U for independent samples: A1D by A5B - Mean rank "none"=54.25, "yes"=66.89 *sig.* ≤ *0.05*; A1I by A5B - Mean rank "none"=53.52, "yes"=67.92 *sig.* ≤ *0.05*; A1J by A5B - Mean rank "none"=53.18, "yes"=68.*40 sig.* ≤ *0.05*.

[16] Mann-Whitney U values: WAXxA5B = 1290.0 *sig.* ≤ *0.05* (Mean rank, none=53.70, yes=67.67).

With the exception of Wildlife Trust members, the proportions of organisational memberships encountered in the main survey sample are roughly comparable with the national figures set out in Table 4.7. If these Trust members are temporarily removed, 51% (45) of the remaining ADS respondents still reported membership of one or more organisations, suggesting the high level of memberships were not simply due to the skewing caused by this group selection.

Table 4.7 ADS membership of environmental/wildlife organisations compared to national figures (sources: Tolba & El-Kholy 1992; Rawcliffe 1998; and figures supplied by organisations).

1999	NT	WLT	RSPB	WWF	R. Assn.	G/peace	FoE
National membership[a]	2,559	320	1,110	250	129	179	153
% of 1999 UK pop.[b]	4.3%	0.5%	1.8%	0.4%	0.3%	0.3%	0.1%
approximate ratios	28	3	12	2	2	2	2
Membership this study	39	37	32	18	11	9	3
% of ADS	33%	31%	27%	15%	9%	7.6%	3%
approximate ratios	24	23	20	12	7	6	2

[a] figures in 1,000s (1999).
[b] taken to be 59.1 million (Anon 2000)
Where: RSPB = Royal Society for the Protection of Birds; WWF = World Wide Fund for Nature; G/peace = Greenpeace; N.Trust = National Trust; R.Assn = Rambler's Association; WLT = The Wildlfe Trusts.

Of the multiple memberships represented by three or more respondents (Table IX, Appendix I) most included any two of the Kent Wildlife Trust, the RSPB and the National Trust. Twenty-two respondents declared RSPB and Kent Wildlife Trust memberships, 18 did the same for the Kent Wildlife Trust and the National Trust, 15 the RSPB and the National Trust, 10 the National Trust and WWF, and 7 the Kent Wildlife Trust and WWF. Twelve multiple memberships included the RSPB, the National Trust and the Kent Wildlife Trust, and other combinations also tended to include National Trust membership, with seven of nine Greenpeace members, seven of eleven Rambler's Association members, and half the eight RSPCA members declaring NT membership. Otherwise, only dual membership of the Rambler's Association and the Kent Trust was reported in notable numbers (7). These patterns are to be expected, with individuals' combined memberships reflecting general areas of interest and possibly their specific view of wildlife. The near lack of association between either Greenpeace or RSPCA membership and membership of any overtly wildlife-oriented organisation[17] is also worth highlighting. It suggests the respondents primarily interested in wider environmental issues or in animal welfare may not care about wildlife in such a way as to want to join a wildlife organisation. Whether and how their knowledge of biodiversity differs from that of the wildlife enthusiasts remains to be seen. At a general level the index measuring each individual's number of organisational memberships [MEX] will be employed in this section.

[17] Just 6 respondents were members of Greenpeace and either the RSPB, a Wildlife Trust or WWF, just 4 were members of RSPCA and also in the RSPB, a The Wildlife Trusts or WWF.

With questions A1 and A3-A6 having looked at what people report themselves to do in relation to wildlife and the environment, question B3 had sought to obtain information as to what they might be prepared to do - their potential behaviour and/or desired activities. It was an open question asking what, given enough time and money, the person might do in order to conserve wildlife. Answers were easily categorised in an ordinal manner. Just four respondents (3%) gave a "don't know" reply, one person indicated he would do nothing, and the remainder fell into three categories, each representing increasing levels of commitment: a simple "give money" (proffered by 20% of respondents), "own a protected area" (42%) and "do conservation work" (33%). The latter category included 32 respondents who had also indicated that they would own a protected area. The small range and specific nature of the answers is not surprising in that they are probably the most obvious things to do in relation to wildlife. Indeed, giving money might be suggested by the wording of the question itself. However, nobody mentioned the possibility of gardening for wildlife, writing or campaigning, all of which had been mentioned earlier in the interview [question A3]. So it is noteworthy that a high proportion of interviewees (75%) declared themselves willing to become involved in conservation in a way that involves a real commitment in terms of responsibility. Yet their view of conservation was essentially a protectionist one. Seventy percent indicated an interest in owning a wildlife site, and a third said they envisaged themselves doing practical conservation activities. If the low levels of actual participation in these activities declared in response to question A1C reflect a real lack of appetite for them, these findings are incongruent and might be explained as attempts to please the interviewer. Otherwise, they can be taken as an indication of a reservoir of willingness to participate in practical conservation work. Of course, the word "might" in question B3 could have resulted in answers which reflected understandings of the sort of things that can be done rather than indicating a real likelihood of action on the respondent's part. Yet many interviewees seemed to express a genuine desire to possess and manage a wildlife site, a position typified by Doreen, a caterer, when she stated:

> "It would be really nice to have my own small wood, and I could visit it every day and look after it and encourage birds and things".
>
> Doreen (cook)

Interestingly, few associations[18] were suggested between B3 and each sub-question included in the Activity questions A1, A3, A5 and A6. Amongst wildlife-related activities only higher frequencies of "walking in the countryside/on the coast" were associated with potentially higher levels of commitment as measured by B3,[19] more frequent visitors perhaps having an above average desire

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[18] Using Spearman correlation coefficients *sig.* ≤ 0.05, and Mann-Whitney tests where appropriate.

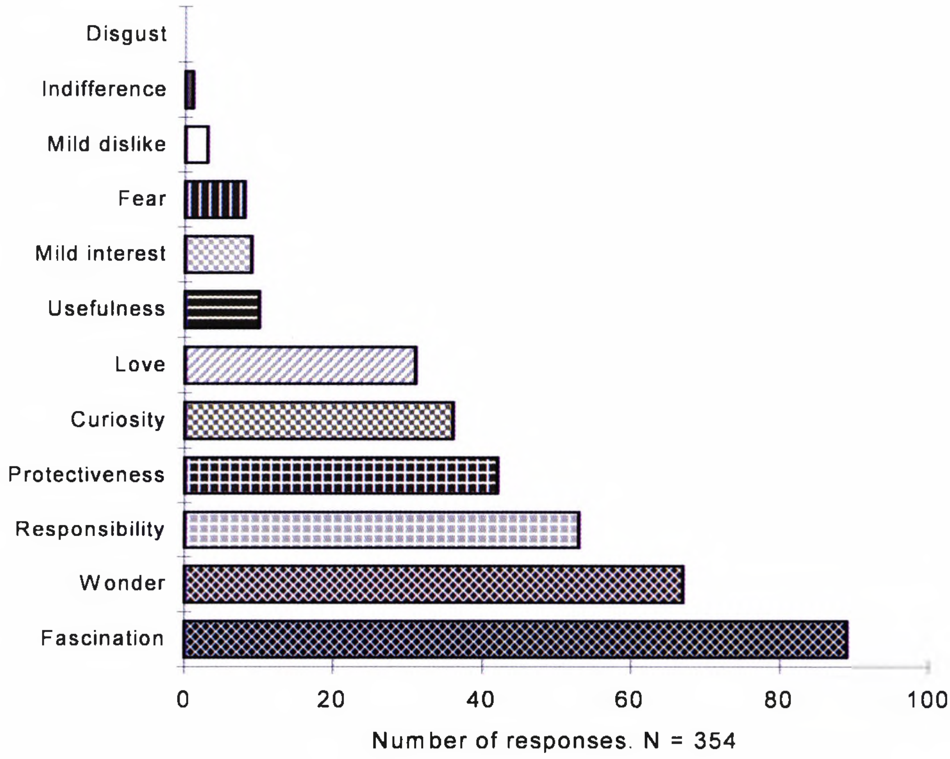
[19] B3xA1B $r^s = .2574$ *sig.* ≤ 0.005.

to have their own wild place. Of the environment-related activities, just "campaign about a wildlife/environment issue" was positively associated with B3[20] - here two variables both appearing to record levels of commitment (the one - actual, the other - potential) being positively associated. Somewhat unexpected was a lack of association between B3 and membership of any single wildlife/environmental organisation, suggesting that membership of these organisations may have little bearing upon respondents' potential commitment to practical wildlife conservation; a thought-provoking issue to be explored more fully in the examination of data differences between groups.

4:3 The Affective data

Of those answers to B1 encompassed by the category "relationship to humans", just seven, those grouped under "aesthetics" could be interpreted as demonstrably affectively expressive. These were: "beauty"(2); "a spiritual connection"(2); "wonderful"; "fascination"; and "a feeling of belonging". It was the recognition, during the questionnaire pilots, of this lack of success in tapping in to the domain of respondents' feelings, which led to a more direct consideration of feelings being targeted with question B4.

Figure 4.18 Categories of and numbers of responses (three by each respondent) ADS responses to B4.



[20] B3xA3K $r^s = .1863$ *sig.* ≤ 0.05.

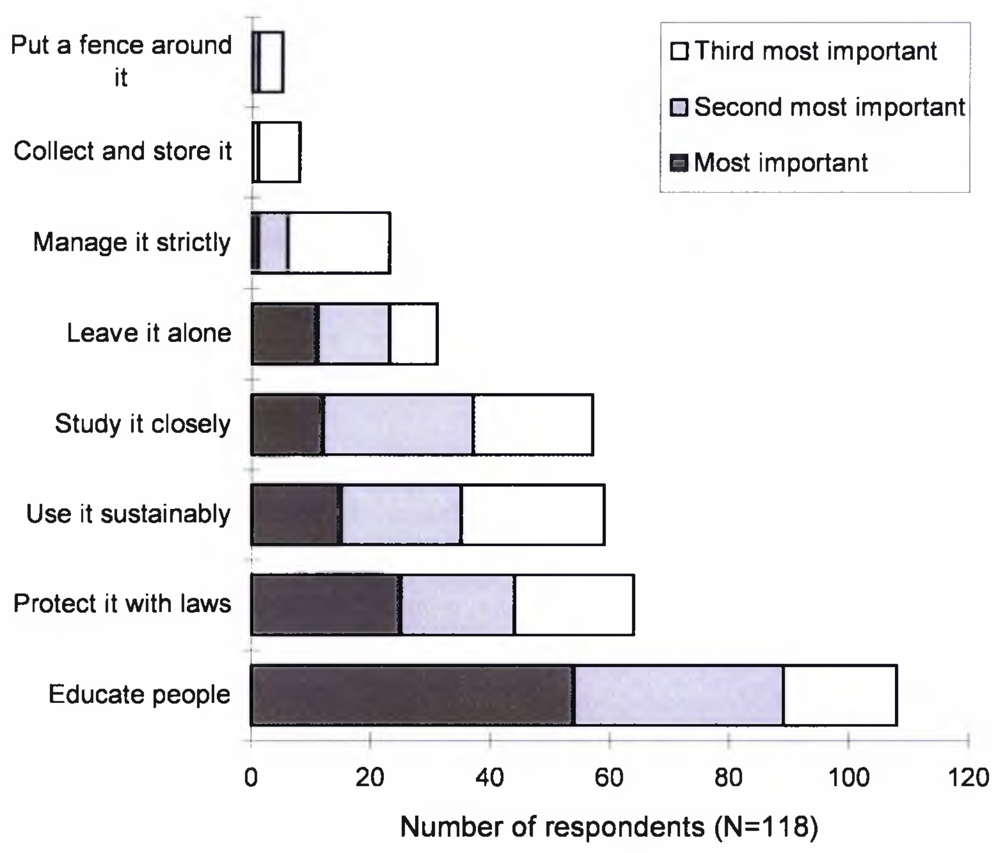
Data concerning responses to question B4 are summarised in Figure 4.18. Because the term 'biodiversity' had been recognised as unsuitable in this context, interviewees were asked to record their feelings in response to the word "wildlife" by making three selections from a list of twelve words including a range of feelings of different kinds and intensity. Their answers suggest a high degree of interest in, attraction to, and concern for, wildlife amongst the ADS respondent group. Over 75% chose "fascination", 57% - "wonder", 45% - "responsibility", and 36% - "protectiveness". No category representing negative feelings was chosen by more than 7% of respondents ("fear"), and the most negative of all ("disgust") was not selected. In addition, the most popular categories "fascination" and "wonder" arguably represent the two strongest, positive, feelings of the twelve (with the exception of "love"). The category "love" may have been avoided by some as an essentially human-oriented emotion, and therefore as inappropriate for feelings about wildlife. Indeed, several interviewees expressly stated this view, including Beryl, a pensioner, who said:

> "No, not love - you can't really love it. That's what humans do to each other."
>
> Beryl (wildlife trust member)

Table X (Appendix I) illustrates permutations of B4 categories mentioned by three or more respondents. It is dominated by the fascination-wonder-responsibility combination (17% of all responses), and by the fascination-wonder-curiosity and the fascination-wonder-protectiveness combinations (11% and 9% of responses respectively). These three combinations represented over a third of responses, whilst 40% included both "fascination" and "wonder". Responses were also highly varied. In addition to the 14 permutations set out in Table X (Appendix I), another 22 different ones were represented. Of these , 19 were represented by a single case. This made a summary index for this variable difficult to develop. However, except for 3 respondents who expressed consistently negative feelings by their selection, and 9 who communicated decidedly mixed feelings, all respondents declared solidly positive feelings about wildlife in response to B4. A few (6%) appeared to hold a fairly utilitarian position (selecting "usefulness" coupled with a category expressing interest and/or "protectiveness"), but the great majority (69%) displayed interest coupled with feelings of responsibility or protectiveness. Whether the interview context had discouraged the expression of negative feelings about wildlife, is open to question. The fact that such a range of category combinations was produced, together with the dominance of the most positive categories, points to the general pattern as having some credence.

Responses to question B5 asking interviewees to identify and rank what they thought were the best ways to preserve nature, are summarised in Figure 4.19. They are dominated by "educate people about it" which 89% of respondents mentioned as amongst the three most important things to do, and which 46% chose as the most important - more than twice those who selected the next most popular category - "protect it with laws" as their first choice. Such a distinctly high incidence of choosing education is an important finding, and was unlikely to have been precipitated by the interviewer's interest in biodiversity education, as no indication of this was given prior to or during the interview. Moreover, B4 data were gathered prior to Cognitive questions being asked, so any recognition of a lack of knowledge on the part of the respondent which these questions may have engendered, and which might have thereby pointed to a need for education, had not yet developed. These data agree with findings by Symons (although hers were gathered amongst children considering environmental improvements) who found "the way forward" to be identified as only achievable through education (Symons 1994, p.15). Similarly, of the 2000 respondents to the 1993 DoE survey (DoE 1994c), 55% and 65% respectively thought the environmental information presently provided by i) government and ii) manufacturers, was "much less" than there needed to be. It might be said that the importance given to education reflects the consistently high position it has on people's general list of priorities, as reiterated by Taylor (1997). Yet, since the subject matter of question B4 dealt so specifically with nature and wildlife, the findings are probably significant.

Figure 4.19 The best way to preserve nature (1st-3rd most important). ADS responses to B5.



The frequencies with which the second, third and forth most popular categories were mentioned ("protect it with laws", "use it sustainably" and "study it closely") differed little from one another. Looked at from the point of view of the most numerous combinations of B5 variables (Table XI, Appendix I) they reaffirm the importance accredited education and seem to reflect a general view of protection as a necessarily holistic and active process. They suggest recognition on the part of the respondents of the need to approach conservation on a broad front i.e. to understand, exploit sustainably, legislate for, and communicate, the natural world. This appears to reinforce the elements of responsibility and protectiveness in the data findings from question B4. A large proportion (65%) of respondents chose either of the 'hands-on' categories "manage it strictly" and/or "use it sustainably". Relatively few responses were in the "leave it alone" category (26% of respondents - and only once selected as first choice), and hardly any were in the category "put a fence around it and keep people away" (4% of respondents). The overall pattern appears to reflect the movement away from the protectionist approach to conservation by scientists and practitioners, and perhaps a favouring of the 'use it or lose it' paradigm over the management approach.

Attempts to find correlations between data for the B5 group of variables (feelings about wildlife) and the B4 variables (how to preserve it) found few valid, significant associations. Of 96 possible combinations there were just 3. Disproportionately higher numbers of those who selected "fascination" or "wonder" chose "study it closely" - possibly as a reflection of personal interest, whilst those choosing "wonder", tended not to chose "protect it with laws" and vice versa - perhaps marking a distinction between some more pragmatically and some more romantically oriented respondents.[21]

In response to the open question B6, most interviewees (72%) reported having had a good or close relationship with nature during their childhood, with only 6 (5%) saying they had had no relationship at all, and none describing the relationship as bad. When asked to recount a particularly memorable experience of nature, of the 101 who did (92%), the majority (80%) provided a positive experience and the rest a negative one. Negative experiences were mainly of being bitten, stung or chased by animals (8), or of shooting (6) or running over (4) them. Positive experiences were much more varied, but 47% involved specific observational encounters with animals - mainly mammals (16), birds (10), snakes and lizards (9), and going on safari (9). Many were presented as having a special quality, either seeing something for the first time and/or the privilege of watching animals in their natural environment. Another ten respondents cited the

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[21] B4AxB5B Chi square = 4.392 df.1 *sig.* $\leq$ *0.05*; B4BxB5B Chi square = 4.593 df.1 sig. $\leq$ 0.05; B4AxB5C Chi square = 5.137 df.1 *sig.* $\leq$ *0.05*.

rescue and/or rehabilitation of a wild animal as their memorable experience, and just five referred to plants (all as "flowers"). Visits to places/reserves (6) and zoological gardens (5) accounted for most other answers to B7. The strong emotions and sense of wonder and fascination identified by question B4 permeated all these descriptions. It is worth presenting a selection to illustrate this.

> "The first time I got a wild bird to feed out of my hand." Jonathan (estate worker)
>
> "The peace and tranquillity of the Dorset coast." Sally (hairdresser)
>
> "Rescuing an adder from a pit - it took 3 hours!" Richard (porter)
>
> "Observing swans build a nest, hatch their chicks and all leave safely." Jimmy (porter)
>
> "All the dead animals of the winter of 1949." Jackie (care worker)
>
> "Killer whales playing around a ship in Antarctica - just fantastic!" Lewis (plumber)
>
> "A heron fishing in the University goldfish pond." Imogene (caterer)
>
> "The drumming of snipe on the Sturry Road." Kevin (The Wildlife Trusts member)
>
> "Watching the mating rituals of the hen harrier." Don (The Wildlife Trusts member)
>
> "Being a POW with dysentery in a tent - two wild elephants putting their trunks in and smelling me from head to foot." Robert (The Wildlife Trusts member)
>
> "Finding a privet hawk moth caterpillar." Jane (The Wildlife Trusts member)
>
> "The first time I found the only site in the country for the May lily, by using a map reference - then seeing it in flower - wonderful!" Katherine (The Wildlife Trusts member)
>
> "Seeing two weasels fighting" Ian (wildlife trust member)
>
> "I caught a sand lizard, and it laid an egg, and it hatched, and I let them go." Christopher (The Wildlife Trusts member)
>
> "Badger watching in the garden." Helen (government officer)
>
> "Watching sea otters play for hours - off the South coast of Ireland." Jo (government officer)
>
> "Seeing a kingfisher on a stream." Roy (government officer)
>
> "Swimming with sea horses - in Spain." Guy (government officer)
>
> "Collecting identifying, and pressing wild flowers." Sheila (elected member)
>
> "A field of buttercups at Box Hill." Vicky (elected member)
>
> "Seeing mountain gorillas in Zaire." George (elected member)
>
> "Being shown a hedgehog." Ella (elected member)

What is striking about these experiences, is that although some were quite special, often relying on considerable expense and travelling, many were relatively simple, easy to access experiences, either taking place locally, at work or almost literally on the back doorstep. That profound experiences of nature and wildlife were had locally, is paralleled by the high levels of enjoyment of wildlife recorded by Shaw, Mangun and Lyons (1985) within a mile of respondents' homes. As to the subject matter of these memorable experiences, they broadly reflected the proportions of different taxa referred to in answers to question B1 (Table 4.1). Some 39% concerned mammals, 19% - birds, 14% - nature, and 9% - flowers.

Figure 4.20 represents the age of respondents at the time of their particular wildlife experience. The distribution of ages is remarkably wide (from 1-60 years) and includes thirty-three different age categories. If these data are representative of the wider population, they could be interpreted as evidence that people can have memorable experiences of wildlife throughout their lives. The large cluster of cases (57) between the ages of 7-13 years old, representing 48% of respondents, does not contradict this, but might additionally point to the wildlife-related experiences enjoyed by this age group as being particularly vivid or as having a special influence upon subsequent attitudes towards or memories of wildlife.

Figure 4.20 Age of respondents at time of memorable wildlife experience. ADS responses to B7.

Data from B8 assessing interviewees' view of the consequence of a 50% global biodiversity loss by the year 2050, were mainly in the "humans would be severely affected but survive" category (83=70%), with the bulk of the remainder being "humans would be slightly affected" (18=15%), and only 12 respondents (10%) selecting more drastic consequences. That 90% (95) thought that there might be at least severe consequences, is noteworthy, particularly as many also stated they did not know what these consequences would actually be. One response typified the general sense of unease expressed in response to question B8, that of Tony who argued that:

> "I imagine there might be changes in climate affecting crop production, and leading to more starvation. It would be very unpleasant for those concerned, but humans would survive because they are so good at doing so."
>
> Tony (government officer)

It seems that, for Tony, the implication was that the effects of such a large amount of biodiversity loss would fall mainly on other people. His view may have been informed by the knowledge that most of the biodiversity loss would occur in the developing world. However, there did appear to be a tendency amongst the ADS to minimise the possible consequences for fundamental aspects of their own lives, perhaps as a relatively "distant problem" in the same way Taylor (1997) thought his respondents saw environmental issues. As Jackie pointed out:

> "I suppose we would have a lot less choice of foods to chose from."
>
> Jackie (carer)

Significant associations amongst variables in the Affective set were almost completely absent, even with variables re-coded into fewer categories. No relationship was found between any of the categories of feelings or views on preserving nature and either positive or negative childhood experiences of nature, the type of memorable wildlife experience described, or the respondent's age at the time. Just one association, that between increased levels of potential commitment to wildlife conservation and the reporting of a positive childhood experience of nature, was encountered.[22] This might be expected, and encourage wildlife educators if true of the wider population. The other association was that a significantly greater proportion of those reporting themselves to believe that the effects of losing half the world's species by the year 2050 would be slight rather than drastic chose the "use sustainably" category.[23] Perhaps such individuals are more optimistic about the role of sustainable utilisation in conserving key species. At this juncture however it is the lack of associations across the variables in the Affective set which should be stressed. This probably reflects the difficulty of accurately assessing people's "feelings" about any issue, and the sheer complexity and unique character of the feelings held and expressed by each individual. The nature of the questions and answers for the Affective questions also made the formation of indices problematic, and broad correlations between Affective data and others were neither easily accessible nor adequately credible. As a result, only an index relating to the NEP

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[22] B3xB7 r^s=.2368 *sig.* ≤ 0.01.

[23] Seventy per cent of "slight" (16 of 23) as opposed to 25% of "drastic" (3 of 12). Crosstabulation B8RxB5F, *Chi*-Square=6.63, df=2, *sig.* ≤ 0.05.

questions (discussed in Chapter 5) and respondents' possible levels of commitment to wildlife conservation, as reflected in answers to question B3, were considered in this context.

4:4 The role of the Attributes variables

In further elucidating main survey data, respondents' performance on Cognitive, Activity and Affective questions and derived indices were considered in relation to the Attributes variables through bivariate correlations (Tables XII, XIII, XIV, Appendix I). Amongst these, 'place of residence' (whether urban/rural) had the fewest significant coefficients, just 3 out of 68 permutations and all with small values. Despite their easier access to the countryside the rurally based ADS respondents did not even tend to walk in it or go and watch animals any more frequently than their urban counterparts. This virtual lack of difference according to urban or rural residence is in line with findings from studies with a rather more general focus on the environment. Amongst rural residents, greater levels of environmental concern have been recorded by Young (1986, 1987), GALLUP (1987) and Freudenberg (1991), and higher degrees of awareness and support for environmental reform, by Buttel and Flinn (1978). Urbanites have also been found to perform better on some environmental knowledge scales (CoEQ 1980; Arcury & Johnson 1987). However, most studies have not provided evidence of any urban/rural divide, for example, those commissioned by the Department of the Environment in 1986, 1989 and 1993 (DoE 1994c), and the Eurobarometer surveys (CEC 1983, 1986). Moreover, those differences, which were encountered, were subsequently found to have largely disappeared during the early 1990s, so that levels of concern (Young 1992) and activism (Tranter 1997), and people's environmental attitudes (Kowalewski 1994) are now considered to be unaffected by urban/rural residence, as was found in the main survey data.

Associations between ADS data and respondents' gender were suggested by a handful of significant correlation coefficients. None of these involved Affective variables, and there were just 5 out of 44 permutations involving Cognitive and wildlife/environment-related Activity variables. Of the associations the coefficients alluded to, some were of interest despite their values being low (0.2-0.25). Male respondents tended to go to watch animals in the wild and to watch TV wildlife documentaries in disproportionate numbers, whilst significantly more females reported avoiding products tested on animals.[24] It might be that the male respondents watch more television overall, but when looked at in conjunction with their more frequent live animal viewing, these data might signal a real tendency for a particular male-centred interest to watch wildlife. The finding for women was not unexpected given the higher levels of environmental concern expressed by

[24] A1FxGEN r^s=-.233 *sig.* $\leq$*0.05*; A1AxGEN r^s=-.207 *sig.* $\leq$*0.05*; A3FxGEN r^s=.232 *sig.* $\leq$*0.05*.

females in the *Environmental News* survey (section 3:3:1) and elsewhere (Young 1992; DOE 1994c) and the higher levels of 'green' consumerism found amongst women by Witherspoon (1994). However, this concern was not reflected in participation in any of the other environment-related activities, implying that the issue of animal testing may hold a special place for a significant number of the ADS women - quite probably in reference to their behaviour in buying cosmetics, the consumer product group for which animal testing has probably been given the highest profile by campaigners and retailers alike (e.g. the Body Shop®). The general equivalence in the performance of males and females is in agreement with research by Shaw, Mangun and Lyons (1985), which found percentages of residential participation in the "enjoyment of wildlife" to be unrelated to gender, and with studies of environmental concern (CEC 1983, 1986; DoE 1994c) and "green behaviour" (Taylor 1997). Other studies have associated female gender with self-reported actual environmental commitment (Schahn & Holzer 1990; Stern & Dietz 1994) and certain types of concern (Borden 1978), but these specific topics were not a focus of the main survey. Perhaps the most surprising result relating to respondents' gender is the near lack of associations with Cognitive questions. A better recall of environmental facts has been found amongst males (Parkes 1973) and they have often been found to perform better on environmental knowledge scales (Gifford, Hay & Boros 1982/83; Arcury, Johnson & Scollay 1985; Arcury, Scollay & Johnson 1987; Arcury 1990; Schahn & Holzer 1990; Hausebeck, Milbrath & Enright 1992; Witherspoon 1994). Yet, for the biodiversity-related concepts covered in this survey, levels of interest and knowledge do not seem to differ amongst the sexes. This might relate to the particular subject matter. It is also worth adding that the only notable significant coefficient involving a Cognitive variable occurred between females and a good performance of the flower identification index (IAF) - the only variable on which women might be expected to do better than men (according to the stereotypical image of the sexes).[25]

Age was another socio-demographic variable that exhibited few associations with Affective, Cognitive and Activity variables. There were almost none with Cognitive variables, and just 11 significant correlation coefficients from 68 permutations overall, all less than ± 0.28. Amongst these, of greatest interest was a distinct pattern of greater participation in several environment-related activities by older respondents (recycle paper/glass; avoid using car; avoid animal-tested products; garden for wildlife; and written to MP/councillor - Table XIII, Appendix I). The association of recycle paper/glass with higher age groups is perhaps unexpected in so far as younger citizens might be thought likely to have had more experience of and education in such pro-environmental behaviours. Yet it may also be true that a "waste not want not" ethic persists amongst the older generations who consequently respond more actively to the provision of

[25] IAFxGEN r^s=.252 *sig.* ≤ 0.01.

recycling facilities - although no such association was suggested for recycling other materials. Older respondents choosing to forego car use for environmental reasons is unsurprising in that many pay reduced fares on public transport and/or might be more likely to see the car as a luxury rather than a necessity. The link of higher age groups with wildlife gardening is also predictable for the simple reason that they will tend to have more free time to take an interest in their garden. Indeed, the same might be said of the tendency for older respondents to write to their MP/councillor about environmental/wildlife issues. In contrast, the positive correlation between avoiding products tested on animals and the higher age groups is surprising, given that the growth of interest in animal rights is a relatively recent phenomenon and might therefore be expected to be more widespread amongst the young. Perhaps it demonstrates older ADS respondents were better informed and/or more sensitive about this issue.

The only association involving the Affective variable B5H [collect and store it] was with higher age groups, and this might reflect 'paradigmatic' changes in approaches to nature that have occurred over the past few decades, older respondents tending to retain the more traditional view of preservation akin to that once practised by most museums and zoological gardens. Other significant Affective correlation coefficients relating to age, are between the feelings of "fascination" and "mild interest" about nature and wildlife with the younger respondents, suggesting a greater declared interest in nature and wildlife amongst these interviewees. This contrasts with a greater proportion of older respondents choosing B4I ["love"], perhaps as result of their tending to have different sentiments towards nature, perhaps their simply being more ready to express or declare this feeling.

The pattern of significant correlation coefficients involving socio-demographic variables and other main survey question data were dominated by the inter-related variables of occupationally based social class, educational level and newspaper readership (126 of 544 permutations = 23%, Tables XII XIII, XIV, Appendix I). These generally had higher values (up to ~0.6), with the largest proportion (59=47%) concerning Cognitive variables - principally variable data derived from open format questions (those found to be most closely related to the overall BUX). Because class, education and newspaper readership are often closely connected, they will be considered together with the Cognitive, Activity and Affective questions in turn.

For Cognitive variables, besides 4 associations involving gender, age or urban/rural residence, all 64 of 168 possible permutations (38%) concerned social class, newspaper readership, or educational level. Educational level, a key factor in obtaining professional employment, seems likely to be the most important variable operating here, with nearly all Spearman correlation coefficients being greater for general educational level than social class and newspaper readership, and the overall pattern in general accord with the importance of education found by many other studies involving knowledge scales (e.g. Miller 1983; Arcury, Johnson & Scollay 1985; Arcury 1990). Contrary to expectations however, the largest coefficients are for general educational level, then science, and the lowest are for biology. Even including the data for the Conservation Biologists changes this picture very little - although the small number of respondents involved (8) makes this likely. One explanation is that few respondents were educated at specialised undergraduate or postgraduate levels - just 7 science undergraduates, 6 science postgraduates, and only 1 biology undergraduate and 4 postgraduates. This meant that scores for two or three of these individuals could have had a disproportionate affect on data patterns. In addition, few of the cognitive elements explored in the main survey and the key ecological concepts identified by Cherrett (1989) have been included in science or biology GCSE examination syllabuses for many years, if at all (Hale & Hardie 1993). Furthermore, interviewees with degree level biology education might have studied subjects such as biochemistry or physiology, rather than ecology.

The relatively large coefficients involving social class might be regarded as simply an effect of the link between social class and educational level. However, it might also be true that the context of local and regional government associated with many respondents in the higher social groups (i.e. the senior officers and elected council members), may have provided a milieu in which the subject of biological diversity was, if not high on the agenda, relatively frequently discussed in relation to such items as Biodiversity Action Plans, 'sustainability', planning decisions or strategic development. Similarly, although newspaper readership appears to be influenced by social class (thereby suggesting associations involving newspaper readership might be partly spurious), since the broadsheet press is much better source of information and discussion about biodiversity issues than the tabloid press (Lacey & Longman 1997), newspaper readership correlations could reflect the educative function of different types of newspaper.

Significant Spearman correlation coefficients calculated between Activity variables and social class, educational level and newspaper readership (Table XIII, Appendix I) suggest that these socio-demographic variables might have rather less relevance to what people do in relation to biodiversity than what they know or understand about it. Many correlations involving wildlife-related activities failed to indicate significant associations. Educational levels in both biology and science showed associations with one variable each, raising questions about the relationship between learning about science and biology and the sort of nature-focused behaviour it might encourage in later life, particularly in the case of biology. Why levels of biology education did not appear to be reflected in an adulthood in which disproportionately more time is spent with wildlife suggests these activities might be more profoundly influenced by other processes. This might parallel Witherspoon (1994) findings that levels of scientific knowledge lack an association with 'green consumerism'. In fact, the two associations encountered involving science and biology education were a negative one with more frequent watching of wildlife documentaries and higher levels of biological education, and a positive one between science education and doing practical conservation work. The former is consistent with the quite strong negative associations between higher frequencies of watching TV wildlife documentaries and higher social class, general education and broadsheet newspaper readership. The latter is in agreement with the tendency for members of higher social classes and the better educated to be more frequent practical conservation workers, points to greater interest/training in science amongst those who actually go out and physically work to conserve nature, and resembles a similar finding from UK Countryside Commission surveys (Harrison 1991). Both 'clusters' seem to suggest that those doing practical conservation work and those watching wildlife TV documentaries might be characteristic subgroups within the ADS.

The remaining associations involving Attributes variables related to activities oriented to actually seeing wildlife and nature. The activity of going to watch animals in the wild was exhibited an association with a higher general level of education, but not social class, suggesting that the character of a respondent's interest rather than the capacity to meet the costs of this activity might be the key factor operating here. Not surprisingly, higher frequencies of "go on natural history holidays" (an often quite expensive activity) were associated with higher occupationally-based social class and broadsheet press readership, whilst "going on guided tours" was associated with higher social class and educational level. So for these particular activities, income might well have been an important factor influencing participation.

Results for environment-related activity variables showed a broadly similar pattern to those for wildlife-related activities. No significant correlations were encountered involving A3G [put food out for the birds], as would be expected given that just 10 respondents had said they did not do this. None were found for A3E (bought environmentally 'friendlier' products even though they were more expensive), A3I (signed a petition about environmental/wildlife issue), and RES (place of residence - urban/rural). Though the virtual lack of associations with place of residence was a unexpected given the recent upsurge in political activity under the umbrella of 'The Countryside Alliance', the survey was conducted before this occurred. Perhaps the single correlation of rural residence with "discuss wildlife issues" was a measure of an early stage of this process.

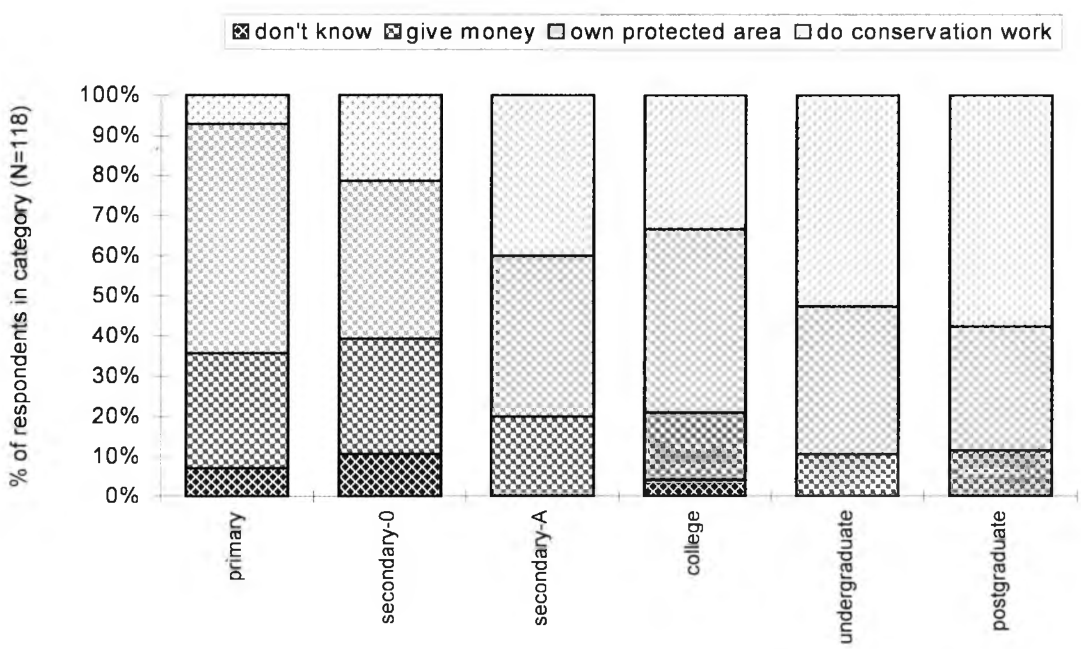
A positive linear association of recycling paper/glass with broadsheet press readership, higher social class and the better-educated respondents is also indicated in Table XIII (Appendix I). The same relationship was previously encountered by Young (1992) for social class and education, and by Arbuthnot (1977) for education. The association with education and newspaper readership might arguably be due to a greater awareness and concern deriving from readership of the broadsheet press (with the association with higher levels of education stemming from that between newspaper readership and education). However, the greater volume of newsprint associated with the broadsheet press might play a role in encouraging paper recycling, as might a better appreciation of the importance of recycling learnt in an educational context. It was anticipated that the pattern of associations for the recycling of other materials would parallel that for paper/glass, but for the recycling of plastic, positive significant associations were exhibited only with a higher level of general and scientific education. The temptation is to interpret this as an indication of a greater appreciation of the need to recycle plastic by those better educated as to its environmental costs, but data for battery recycling (arguably amongst the most environmentally toxic components of common domestic waste) are not associated in this way. It is difficult to separate the effects of individual socio-economic variables in relation to ADS respondents' recycling behaviour because other parameters indirectly related to class, education and newspaper readership may influence this. These include the opportunity to recycle certain materials, the location of recycling facilities, the amount of materials produced or simply the availability of space to store materials prior to transferring them to recycling bins, as Boldero (1995) found.

The relatively strong associations of choosing to forego car use for environmental reasons with social class, general educational level and broadsheet press readership are relatively unsurprising, given that the wealthier groups might be expected to be better able to afford public transport alternatives or taxis. Respondents might simply be better able to afford to leave their car at home. The more highly educated might also be better informed of the desirability of doing so because they tend to read the broadsheet press wherein transport and pollution issues are more regularly reported (although affirmative responses required respondents to have avoided using their car for environmental reasons only once in the past 3 years - not necessarily a mark of any great commitment to car abstinence). A similar explanation can be provided for the link suggested between "campaigned about an environmental/wildlife issue" and both broadsheet press readership and higher general educational levels. Those involved in campaigns might be more concerned to be well informed and *vice versa*, whilst education might help equip people in a way that facilitates such involvement. The significant correlation coefficients involving the Environment-related Activity Index are therefore to be expected. Those with education are worthy of mention because they agree with data relating to 'green' behaviour found in studies by the Commission of the European Communities (CEC 1986), Finger (1994) and Taylor (1997). In addition, the relatively strong association between broadsheet newspaper readership and the EAX, points to the possibility of this press having a role in influencing people's environment-related behaviour, at least in relation to transport, recycling, and campaigning, those variables which mainly account for this relationship.

Correlations of other Activity variables with socio-economic data variables, namely those concerning pet keeping (those concerning organisational membership are dealt with elsewhere), found only one association between a pet ownership variable and any socio-economic variable. This comprised a disproportionately higher level of dog ownership amongst the semi/unskilled category of social class (61% declared themselves dog owners, as opposed to 25-35% in the other categories).[26] Although associations between patterns of pet ownership and urban/rural residence, level of biology education and perhaps gender, were expected, none were.

Few significant Affective x Attributes bivariate correlations were encountered amongst those possible (34=18%). Particularly impressive is the fact that the category, B5G ("educate people about it") was selected irrespective of the influence of any of the socio-demographic parameters represented, perhaps demonstrating a widespread recognition of the need for educational activities in this area, at least in the ADS. Of immediate interest amongst significant coefficients involving social class, education or newspaper readership was that of B3 with educational level such that the proportion of respondents declaring they might do conservation work increased with higher levels of education. Figure 4.21 illustrates these data, showing this proportion to increase from 7% (1) amongst those educated at the primary level, to 58% (15) of those educated to postgraduate level.[27]

Figure 4.21 Variation of responses by level of education. ADS responses to B3.



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[26] Chi square = *11.02, df=4, sig. ≤.05..*

[27] EDxB3 r^s = 0.2992, *sig. ≤.0001.*

It is tempting to conclude from Figure 4.21 that willingness to participate in conservation activities is directly related to education. However, those educated to a higher level might be more likely to know (or more capable of imagining) what sort of activities conservation might involve. Alternatively, they might simply have more leisure time and therefore feel more able to make a practical contribution. Furthermore, not only does declaring a possibility of action not necessarily mean respondents will actually participate, but many of those educated to a lower level might have given a more realistic answer because they more readily accepted that they would be likely to spend their free time engaged in other sorts of activity.

Similar but weaker associations were also found between B3 and increasing levels of occupationally defined social class, as well as quality newspaper readership. Again these might have derived from respondents' perceptions and/or their imaginative abilities rather than a commitment which would be realised in practice, but in the latter instance it is arguable that part of this declared commitment might have been engendered by the content of the broadsheet press whose coverage of environmental and wildlife issues is greater that that by the tabloids (Lacey & Longman 1997).

Contrary to what might have been expected, no associations were found between any Affective variables and the respondent's gender or urban/rural residence. For example, the sort of links that stereotypical perceptions might assume, between "love", "protectiveness" or "responsibility", and the female gender, or between "usefulness" or "manage it strictly" and the male gender, were not forthcoming. By contrast, the near lack of associations of any Attribute variable with either "mild interest", "fear", "mild dislike", "indifference", "usefulness", "put a fence around it and keep people away", and "develop more ways of collecting and storing it", were anticipated because of the low frequencies with which these categories were selected. A few significant correlation coefficients are of interest. A positive childhood experience of nature is logically linked to higher levels of subsequent biology education, whilst "mild dislike" can sensibly be seen to reflect lower levels of general and science education. Similarly, the association involving "collect and store it" with higher age groups might reflect the 'paradigmatic' changes in approaches to nature which have occurred over the past few decades, such that older respondents tend to retain the more traditional view of preservation akin to that once practised. This is also suggested by the association of "love", with higher age groups, and the fact that this category was selected by a disproportionately large number of those belonging to lower occupationally-based social classes, and those attaining lower general, scientific and biological educational levels. With the same pattern also recorded for "leave it to its own devices" and "manage it strictly", these groupings suggest distinct affective configurations amongst respondents representing certain categories and which point to the older ecological "equilibrium" paradigm. They stand in marked contrast to the positive correlations between "use it sustainably" and newspaper readership, social class, and educational levels - general, scientific and biological, correlations that included the highest coefficients relating to any B4 and B5 variables. Respondents belonging to higher social classes who read quality newspapers appear to be rather more familiar with and appreciative of the concept of sustainability. Many of these respondents were however officers or members of local or regional government, agencies through which Local Agenda 21 is being implemented. They can therefore not only be expected to have been cognisant of the term "sustainability", but as operating in an environment in which sustainability has been widely promoted as a desirable objective.

4:5 Discussion

Where comparisons are available, main survey data findings broadly agree with those from indirectly related studies - many of which involved samples of UK citizens stratified by age, gender, and social class. They may therefore be seen to reflect levels of knowledge, understanding and support existing in the wider population. Although the respondent sample was skewed in terms of age, social class, education, and press readership, if the patterns they reveal mirror those in the wider society, they tend to confirm and support the view expressed by other investigators that people generally have a rather poor and partial understanding of the concept of biodiversity (see Brussard, Murphy & Noss 1992; Hart Associates 1993, cited in WWF-USA 1996; Thomas & Chetwynd 1995; Pollock 1995; Wals, Weelie & Geesteranus 1997; CGBD 1998; Wals 1999). Indeed, the relatively highly educated composition of the respondent sample suggests that the actual situation is likely to be rather worse than that described by the main survey data. Furthermore, where comparative data were available across the three surveys (main survey, *Environmental News* and Keoladeo survey), they were remarkably consistent, providing additional support for the argument that many findings reported here might be more generally valid.

The overall picture is one where despite many people declaring themselves to have heard the term biodiversity (62% of ADS and 80% of Keoladeo respondents), their knowledge and understandings of the concept as expressed through responses to survey questions were both highly fragmentary in nature and substantially lacking in respect to key parameters. These findings tend to support the 'deficit' model of public understanding of biodiversity. Evidence from the main survey, notably the Identification Understanding Indices, questions B1 (what the respondent thought of in response to the term "wildlife"), C9 (the characteristics defining a species) and C16 and C17 (naming extinct species), suggest that a species focus governed responses. It also indicated that respondents had an understanding of 'species' largely derived from visual observation, yet lacked a clear comprehension of what a species actually is. Thus, for example, in contrast to the situation for insects, it was the marked physical differences between regularly observed bird species which appeared largely responsible for birds being the most accurately identified taxon at the species level. A similar finding might have been expected for mammal identification, had it been included. This perception was termed a “vernacular” understanding, and is one that is perhaps akin to what Spellerberg (1996) describes as a “popular” view of biological diversity, one essentially derived from observations, but not the same as the “symbolic” understanding postulated by Wals, Weelie and Geesteranus (1997).

The conclusion that it is primarily visually derived data that inform people's understanding of biodiversity is consistent with the idea there exists a “hegemony of vision”. This idea, described by Macnaghten and Urry (1998), maintains that vision has played a crucial role in the history of western culture and, since the eighteenth century, has dominated natural history as sciences of ‘visible nature’ (Foucault 1970), notably in the form of the visual taxonomies begun by Linnaeus. As such, the survey findings might be seen as giving credence to the view that individuals construct their own understandings of the natural world from the information immediately available to them. Indeed, that a vernacular, visually-based understanding of biodiversity prevailed in the respondent groups (and possibly in the wider population), is further supported by the relatively good performance of respondents (both ADS and Keoladeo) on those questions relating to the relative species diversity of habitats and countries. It may have been images that respondents held in their ‘mind's eye’ (of forests, desserts or seashores, and of the variations of habitat and landscape associated with the different countries), which most forcefully directed their answers. This interpretation can however be challenged with the evidence provided of the substantial over-estimations made of the number of species found locally, nationally and globally (both for the ADS and Keoladeo data). Certainly, given the difficulty of observing many species and the demonstrated tendency of respondents to conflate many species into one for some taxa (e.g. “bee”, “eagle” and “buttercup”), personal observations might be expected to generate underestimates rather than overestimates. In addition to possible effects due to the difficulty people have in dealing with large numbers (Dunning 1997, Meffe 1994), evidence provided by Burgess (1993) suggests that important images operating here are likely to be those presented in the mass media, where the sheer variety and preponderance of different forms of organism is frequently celebrated. In fact, Burgess reports how, when taken into the countryside, people often express a profound sense of disappointment at not being able to see the myriad animals and plants they see on their television screens. The implication is that the gross overestimates by survey respondents derived from a different set of images, those presented on TV, rather than misunderstanding numerical scales or their own observations in the field. Perhaps in response to this question, a lack of direct experience led interviewees to access other sources of reference. Against a background of low levels of knowledge and understanding about biodiversity, this seems very plausible. However, the question therefore needs to be asked whether, in the presence of a working knowledge of the subject area, such 'constructed' images would have been favoured. In other words, is it in the absence of accurate knowledge or understandings that people resort to 'vernacular' understandings based on their own experiences? If so, the development of accurate understandings would dispel such views.

With respondents' perceptions appearing to be firmly focused at the level of 'vernacular' species, the expression of understandings of ecological processes also seemed likely to be partial. The first indication of this was the relatively small numbers who identified habitat or community diversity in response to the main survey question C2 (27% and 4%, respectively) and the relatively few who mentioned a habitat or community in response to B1 (see Figure 4.2). Despite most respondents exhibiting a perception of biodiversity as being important to ecological stability (74% of responses to C3), and an ability to identify activities which lead to reductions in wildlife, evidence from variables which explored understandings of the ecological processes involved [C12, C13 and C22], pointed to a very poor comprehension of the subject of ecology amongst most respondents - a finding which agrees with Talbot's opinion that most contributions of wildlife are not generally recognised (Talbot 1987). Thus ADS respondents underestimated the importance of introduced species as a threat to the world's wildlife, none offered a satisfactory view as to what the ecological effects of the extinction of the Black Rhino might be, and just 3 of the 118 ADS respondents demonstrated something approaching a basic understanding of the ecological constraints affecting the consequences of felling a wood.

With a general lack of understanding of ecological processes, and the perception of vastly greater amounts of species richness in existence than are likely to be found, it is not surprising that respondents showed little concern over the effects of species extinction, either over losing the Black Rhino or the predicted demise of half the world's species. This is perhaps further supported by the fact that respondents were unable to identify more than a handful of extinct species (Table 4.3), and, of scientifically defined species, could only name the dodo in large numbers. With levels of anthropogenic species loss also grossly underestimated, natural background rates overestimated, and, where proffered, meagre and partial explanations put forward for the dodo's demise, it appears that in line with Ayres (2000) finding, survey respondents did not understand the process or recognise the wider ramifications of species extinction. A GALLUP survey in 1987 (GALLUP 1987) did find the "extinction of animals" to attract the highest percentage of answers in the "it is a constant source of worry" category (39%) amongst a range of environmental issues.[28] It was also responsible for the overall highest percentage of responses when combined with the "I occasionally worry about this issue" response category (i.e. 80%). However, just 3% (of 507 respondents) selected "extinction of animals" or "cutting down forests" to be issues which made the respondent "very angry". These were way behind "dumping nuclear waste" (19%) and behind six, mainly animal welfare, issues.

Data recording levels of concern therefore need to be considered in their proper context. For instance, respondents in Taylor's (1997) study only placed "the environment" in fifth position in order of importance, putting it behind "health", "education", "old age pensions" and "police and law enforcement".[29] Likewise, none of the issues relating most directly to biodiversity, namely "tropical forest destruction", "loss of plants and animals in the UK", "loss of plants and animals abroad" and "loss of trees and hedgerows", were amongst the five environmental issues attracting most concern in a 1993 study commissioned by the Department of Environment (DoE 1994c). They came sixth, seventh,, joint tenth, and joint eleventh respectively, with "environment/pollution" being the third most frequently mentioned "most important issue" behind "unemployment" and "health/social services".[30] Such studies, considered in the light of similar ones (e.g. CEC 1983, 1986; MAFF 1991), suggest levels of concern about the environment are high and increasing, and that different forms of biodiversity loss are ranked quite highly amongst environmental issues. Unfortunately, the value of research that relies on self-declared levels of concern, is open to question, particularly as they have been found to depend upon the means of measurement (Van Liere & Dunlap 1981). Not only is the notion of "very concerned" or categories such as "it is a constant source of worry" interpreted by different individuals in different ways, but admitting to a high degree of concern is a very easy, cost-free, even thoughtless, act (Pollock 1995), one which in practice might be a poor indication of what a person really thinks. It certainly provides little information as to what s/he knows or understands.

The circumstantial evidence provided by answers to question C22 points to the main survey respondents' view of extinction as being an unfortunate event without major ramifications beyond an aesthetic loss to humans. Two comments provide a clue as to why this might be the case. One respondent argued that:

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[28] The issues being (in descending order of importance): extinction of animals; air pollution; dumping of nuclear waste; cutting down of whole forests/woods; litter; oil spillage at sea; loss of wildlife areas; crop spraying with herbicides/ pesticides; acid rain; nuclear power stations; over-fishing of seas; hedgerow removal; noise pollution from trucks/ aeroplanes; loss of wild flowers; tree felling; refuse disposal; replacing natural woodland with conifer plantations; straw burning.

[29] A stratified sample of 1032 interviewees.

[30] A stratified sample of 2,036 interviewees.

> "Well, everything becomes extinct in the end anyway. We just speed up the process a bit."
>
> Don (Wildlife Trust member)

another that:

> "....all those animals went extinct and it doesn't seem to have affected things, has it? So even if we lost half the species why should it make any noticeable difference?"
>
> Nick (elected member)

Although this does not in itself constitute much weight of evidence, perhaps the perception of the inevitability and lack of impact of extinction reflected in them, if sought, would have been found more widely distributed amongst the interviewees.

The understanding of biodiversity held by the respondent group as a whole therefore appeared partial, 'vernacular', visually-based, necessarily constructed, apparently largely set in a view of nature as being separated from humanity, and also profoundly lacking as to important areas of the subject. Most notable amongst these were: ecological and other processes, the definitive criteria for the species concept, and the magnitude of species diversity and rates of extinction. This pattern was virtually unaffected by the gender, age or urban/rural residence, but, in line with several studies which have considered environmental knowledge, it showed an association with lower occupationally-based social class, tabloid press readership and lower levels of formal education. Education was thought likely to be the most influential of these, with general levels of education identified as being of greater importance than science or biology education - although data for undergraduates and postgraduates were drawn from relatively few individuals whose precise subject areas of study had not been recorded. There remains of course the suspicion that the data have been skewed by the process of 'educated guesswork' favouring a better performance by those more capable of intelligent reasoning and hence able to derive correct answers with a significantly higher rate of success (Nadeau & Niemi 1995). However, the pattern was noticeably stronger for those answers to Cognitive questions with an open format, those questions least susceptible to this process. This encourages the view that the data might be regarded as credible.

Patterns of behaviour recorded by the Activity variable data describe the respondent group as largely comprised of people belonging to one or more wildlife/environmental organisations, and overall levels of participation in many wildlife and environment-related behaviours to be higher than average. The general overall pattern of this participation resembled that of the Keoladeo visitor sample and that of the UK population as indicated by combining data from several other studies (Table 4.6). Most frequently indulged in were: walking in the countryside, watching wildlife documentaries, putting food out for the birds, gardening for wildlife, and being a member of an environmental/wildlife organisation; Least frequently indulged in were: doing practical conservation, going on natural history holidays/guided wildlife tours, and campaigning about environmental/wildlife issues. It is worth noting that with the possible exception of organisational membership and gardening for wildlife, the latter are those activities potentially of greatest benefit to biodiversity conservation.

Bivariate variable correlation coefficients involving Activity variables found to be significant were essentially logical, explicable, and further elucidated by considering the influence of socio-demographic variables. Of these, general educational level, social class and newspaper readership appeared to be of particular importance, particularly in relation to recycling, gardening for wildlife, and the experiential activities of doing practical conservation, and going on natural history holidays/guided tours. Higher respondent age was correlated with some environment-related activities (recycling paper/glass; car use, wildlife gardening; letter writing; and avoidance of animal-tested products), but not other wildlife-related activities. Otherwise, perhaps the most interesting finding was the correlation between higher levels of watching wildlife TV documentaries and the male gender, tabloid newspaper readership, and lower occupationally based social class and educational levels.

Overall, the findings suggest that if representative of the wider population, with few exceptions, people tend to participate in an extensive range of wildlife-related activities largely irrespective of age, gender, urban/rural residence, political persuasion (as indicated by newspaper readership), social class or educational level (including the especially relevant subjects of science and biology). This appears to confirm the view that behaviour somehow positive towards wildlife and nature is both widespread and much of it frequently engaged in. As to those activities which can be regarded as being most supportive *vis-à-vis* biodiversity however, the data suggest that, with the possible exception of gardening for wildlife and belonging to organisations actively involved in conserving biodiversity, levels of participation are rather low. Thus, not only were just 8% of the ADS in the "once a month" category or higher for doing practical conservation work, but, like gardening and organisational memberships, this activity was linked to higher social class and higher levels of education. Given the socio-demographic skew in the main survey sample, the wider picture seems likely to be one of even less active support.

Results from the Affective set of questions, though perhaps mostly indicative of the unique character of feelings held by any one individual, consistently found respondents rating nature and wildlife in a positive light. References were primarily to feelings of "fascination", "wonder", "responsibility", "protectiveness", "curiosity" or "love", whilst nearly three quarters of respondents reported having had a close or good childhood relationship with nature, and over two thirds described a positive memorable wildlife experience. These data support existing evidence that people have a generally positive view of living things, and firmly point towards the "Naturalistic" and "Moralistic" dimensions amongst those set out by Kellert (1993) in relation to Wilson's notion of "biophilia" (Wilson 1984). Kellert describes the "Naturalistic tendency" as encompassing "a sense of fascination, wonder, and awe derived from an intimate experience of nature's diversity and complexity" and as perhaps being one of the "most ancient motive forces in the human relationship to the natural world"; whilst his "Moralistic" dimension is seen to produce "the desire to protect and conserve". (Kellert 1993, p.52-56). It seems that such feelings are more readily associated with particular organisms (Bennett-Levy & Marteau 1984; Ulrich 1993; Mundkur 1994), and this might have been reflected in the mammal/bird bias suggested by data from questions B1 and B6. Particularly noteworthy too was the fact that the ages respondents reported having had memorable experiences at, were both very widely distributed and showed a definite peak between the ages of 7 and 13. It could simply be the case that higher levels of relevant educational provision are made for children in this age range. However Leech's (1996) review found that programmes associated with field centres, nature reserves and other sites, were fairly evenly distributed across all age cohorts. Interestingly, the 7-13 age cohort corresponds with Piaget's 'concrete operational' stage of child development, during which the logic of classes of object and their relations are said to govern learning and children develop their inductive powers (Kolb 1984). So although the main survey evidence is not strong, it might be that the 7-13 year old age group has special significance for learning about the natural world.

Answers to the question exploring respondents' views on the most important means of preserving wildlife were also particularly noteworthy. The answer category "educate people about it" was by far the most frequently identified, with the great majority of responses also including "protect it with laws", "use it sustainably" and/or "study it closely". Finally, except for an association of positive experiences of nature during childhood with higher levels of potential commitment to wildlife conservation, there were hardly any significant correlation coefficients between variables in the Affective data set.

Few of the patterns found in the Affective data were consistently associated with any Attribute variable. Those that were, related particularly with levels of general, science and biology education, occupationally based social class and newspaper readership. The most notable included the association suggested between the feeling of "mild dislike" towards nature/wildlife and low levels of general and science education; and that of "love" with lower social class and all three categories of education. Views of wildlife and nature preservation were similarly represented, with the responses representing older conservation paradigms ("leave it to its own devices" and "manage it strictly") being disproportionately represented amongst lower social classes, the lower educated and the tabloid readership, and with the more recent paradigm ("use it sustainably") being linked to the opposite groupings. These latter attributes were also associated with an expression of greater potential commitment to conservation [B3]. However, closeness of the respondent's childhood relationship with nature, the having of positive wildlife experiences, and the respondent's age at the time of having a memorable experience of wildlife, showed almost no significant associations with socio-demographic variables, except a small positive one between a "positive wildlife experience" [B7] and higher levels of biology education and broadsheet newspaper readership. The encouraging suggestion here is that most people have positive experiences of wildlife and nature and do so irrespective of their social position or level of general education. Gender differences, often encountered elsewhere in relation to the environment (e.g. Borden 1978) were not met with in these data.

The Affective data suggest that highly positive views of wildlife and nature may be widespread, derive from formative experiences, and, for many individuals, be coupled with a desire to actively participate in conservation. The high degree of verbal commitment and affect agree with Maloney and Ward's (1973) study of ecology. How this translates to the subject of biodiversity is, however, difficult to estimate. At a species level for instance, many of the components of a biologically rich habitat, such as flies, spiders and molluscs, are unlikely to be looked at with much favour by most people. It seems probable that feelings such as wonder, fascination, responsibility and protectiveness, will not commonly be directed at these sorts of organisms. So the assumption that these data provide grounds for optimism in respect to biodiversity conservation, is questionable.

4.6 Chapter summary

The above analysis of the main survey data points to rather partial understandings of biodiversity existing amongst the ADS respondent group, to low levels of support as demonstrated by direct actions to help conservation, but reveal a considerable amount of concern and interest expressed in relation to nature and wildlife. The data also suggested a desire to know more about the subject and to participate more in practical conservation activities. They bring to mind many of the key elements referred to in the discussion of background developments and debates in Chapter 2. A knowledge/understanding 'deficit' in relation to the subject of biodiversity is accompanied by perceptions which seem to have been formulated on the basis of previous experiences and existing knowledge, whilst responses also appear to reflect the rift between the public, naturalists and scientists. The importance of significant life experiences and direct contact with nature has also been emphasised, as have the important role accredited to education and means of mass communication, and the influence of paradigmatic changes in approaches to wildlife conservation.

The findings discussed in this chapter do, however, derive from data subsets that have been considered largely in isolation from one another. In attempting to explore the attitudinal dimensions of the data and the relationship between knowledge, attitudes and behaviour, the value of findings in one subset will need to be related to data from others. Their importance should also be considered within the overall data patterns. It is these sorts of relationship that are the subject of the next chapter.

Chapter 5. Exploring attitudes.

Chapter 4 considered each data subset, their internal patterns, and their relationships with Attributes variables. This chapter addresses the second research question, that which seeks patterns in knowledge, understanding and support, and considers how they are affected by membership of specific socio-demographic and other groups. It explores broad patterns of association between the Cognitive, Affective and Activity data subsets, compares these with evidence from related research, and identifies patterns within both the aggregated and full data sets using more sophisticated techniques. In so doing it looks at the influence of socio-demographic and other grouping variables, the relationships between attitudinal components, and the possibility of developing attitudinal measures for considering public understanding and support *vis-à-vis* biodiversity.

5:1 Associations across data subsets.

Associations between the Cognitive, Activity and Affective data subsets were explored using appropriate statistical tests[1] (Tables XIV-XIX, appendix I). Most striking about those involving wildlife-related activities is the virtual absence of associations between a good performance on any Cognitive variable and higher frequencies of participation in either watching wildlife TV programmes, walking in the countryside/on the coast, visiting zoos/natural history museums, or giving money to wildlife organisations. Not even the Biodiversity Understanding Index [BUX] scores showed an association with these activities. If indicative of the situation in the wider population, these findings challenge the view that wildlife documentaries, zoos or museums provide worthwhile biodiversity education, as least in relation to those parameters evaluated in this survey. Other studies support this argument in relation to zoos and museums; with evidence suggesting informal visitors are neither more informed nor more appreciative following a zoo visit (Kellert 1989, McGregor 1994) or after a trip to the Natural History Museum (Birkenshaw 1994).

Of the other wildlife-related activities, discussing wildlife issues lacked association with all but one Biodiversity Understanding Index constituent and the BUX itself, suggesting that for main survey respondents (less Conservation Biologists) a knowledge of biodiversity was not strongly related to more frequent discussions of wildlife issues. This is not inexplicable. Either biodiversity might be discussed without much knowledge or understanding of the subject, or, as seems more likely, a substantial number of individuals in the respondent group discuss wildlife-related subjects that do not directly concern biodiversity. Some associations were found between

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[1] Predominantly Spearman correlation coefficients (r^s), a few Pearson correlation coefficients (r^p), and some Mann-Whitney U tests.

Cognitive variables and participation in nature holidays or guided wildlife tours, and these were consistent with the relatively strong relationship between participation in these two activities.[2] All were positive and included relatively good performances on the Biodiversity Understanding Index [BUX], reptile/amphibian identification accuracy index and the overall Identification Accuracy Index [IAX]. Performance on questions dealing with detailed aspects of biodiversity was however, no better than average. Success of this sort was enjoyed by those reporting higher frequencies of participation in doing practical conservation work, watching animals in the wild, or reading about wildlife. It was active, well-read, respondents who tended to do better on basic questions about biodiversity, particularly, on what proved to be one of the more difficult questions in both the main and Keoladeo surveys, the naming of extinct species. Those reading more frequently about wildlife also tended to do well on all four IAX constituent variables, which may have reflected a special interest in wildlife identification, or have derived from the materials they read - possibly those received through organisational memberships. This would be consistent with findings from studies that have associated increases in wildlife knowledge with exposure to wildlife magazines (Fortner & Mayer 1983; Pomerantz 1985).

Besides reading, it was more frequent participation in activities which are direct experiences of nature and wildlife ("do practical conservation work" and "go and watch animals in the wild"), those activities which arguably involve the greatest dedication and effort, which appeared most closely associated with a more comprehensive understanding of biodiversity. This would be expected on the grounds that people's behaviour reflects their interests. It seemed particularly true of practical conservation work, which was associated with 8 of the 14 Biodiversity Understanding Index [BUX] constituent variables, compared to 6 in the case of "go and watch animals in the wild", 5 for "read books/magazines about wildlife, and 4 for "go on a guided wildlife tour". Cognitive variables associated with doing practical conservation work were also dominated by those from open survey questions, questions that, because of their format, were less likely to have been subject to guesswork. This may indicate that knowledge of biodiversity and participation in activities more closely connected to wildlife might develop side by side. A more provocative interpretation would be that "hands on" wildlife activities are especially conducive to learning about biodiversity. Certainly the strength of associations between different wildlife-related activities and the BUX tended to be greater for activities involving real-life contact with wildlife in the wild (Table XV, appendix I).

The lack, or near lack, of significant correlation coefficients between Identification Accuracy Indices and watching wildlife television or visiting zoos/museums, is somewhat surprising. People

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[2] A1ExA1G $r^s = .484$, *sig.* ≤ 0.001.

who watch considerable amounts of wildlife TV should be expected to be able to identify accurately at the level of species, but this was apparently not so amongst main survey respondents. The relatively poor showing of IA* variables in relation to natural history holidays and guided tours, is also unexpected. Perhaps it derives from these activities relating more to a general sense of closeness to nature rather than consideration of particular species. The survey question did ask about 'nature *oriented* holidays', so a significant number of respondents might have interpreted this as including countryside sightseeing and/or camping. It might also be the case that these sorts of experiences occur largely irrespective of the individual's understanding of species, which means they will have little bearing on performance when it comes to identifying species.

Few associations were suggested between environment-related activities and Cognitive variables (Table XVI, appendix I). There were almost none between individual Cognitive variables and either signing a petition or campaigning about an environmental or wildlife issue. Looked at together with the lack of association between either signing a petition or writing to an MP/councillor and the Biodiversity Understanding Index [BUX], these data suggest that a knowledge or understanding of biodiversity may have had little to do with participation in these activities. Unfortunately, because survey questions had not asked for details of this participation, it cannot be known whether they concerned biodiversity issues. Campaigning in relation to biodiversity might be expected to be paralleled by a better than average biodiversity literacy, and the fact that the data indicated this not to be the case suggests that the campaigns in question did not have biodiversity as a primary focus. The environment-related activity most closely associated with BUX component variables (gardening for wildlife) was also associated with the flower and reptile/amphibian identification indices. This made sense in so far as respondents possessing a comprehension of the subject of biodiversity might be expected to try to encourage wildlife into their gardens, and/or those who garden in this way might be more likely to come to know more about some parameters of biodiversity and be better able to identify species, particularly flowers. At a more aggregated level the relatively strong association between the Environment-related Activity Index [EAX] and the BUX,[3] was also to be expected - respondents exhibiting a better understanding of the subject tending to be more active in relation to pro-environmental behaviour, in addition to wildlife-related activities.

Almost no associations involving Activity variables involved data related to pet-keeping [A4-5], despite research suggesting childhood pet ownership may encourage positive attitudes towards protective care and concern for all animal life, wildlife, and environments (Serpell 1981). Although data about childhood pet-keeping were not available here, if such pet-keeping tends to

[3] EAXxBUX $r^P = 0.372$, *sig.* ≤ 0.001.

be replicated in adult life, there is no evidence for a relationship between pet-keeping and conservation knowledge or concern in the main survey data.

The general pattern of association between the Wildlife-Activity Index [WAX] and respondents' performance on Cognitive variables, together with those between the Biodiversity Understanding Index [BUX] and individual activities, points to an association between higher levels of biodiversity understanding and greater participation in those activities most closely related to wildlife. This finding agrees with studies that reached similar conclusions for environmental knowledge and behaviour (Arbuthnot & Lingg 1975; Arbuthnot 1977; Sia, Hungerford & Tomera 1985; Smyth & Brooke 1983; Hines, Hungerford & Tomera 1986/7 - a meta-analysis of 17 studies; Vining & Ebero 1990; Syme, Beven & Sumner 1993; Finger 1994). It disagrees with studies that found no such relationship (Maloney & Ward 1973; Amelang *et. al.* 1977; Borden & Schettino 1979; Buttel 1987). Socio-demographic variables may have influenced these correlations, but this seems less likely for the group of wildlife-related activities than for the environment-related ones. Whilst a few small coefficients were recorded in the former instance, relatively strong associations were suggested between the Environment-Activity Index [EAX] and broadsheet newspaper readership, higher social class and higher educational level (Table XIII, appendix I).

An exploration of bivariate correlations across the Affective and Cognitive data sets revealed few variable associations (Table XVII, appendix I). One unforeseen pattern was the consistently negative value of different associations of the B4 category "love" with Cognitive variables and the BUX. Although this is difficult to explain immediately, it might have had something to do with those respondents who expressed a feeling of love being persons who relate to the natural world in a more emotional than rational way. This interpretation is supported by the fact that the category "love" was also associated with less highly educated respondents. Similarly, the pattern of positive associations for certain answer categories to the question "how do you think we can best preserve nature", pointed to a weak link between respondents belonging to particular Attributes categories and specific perspectives. Although no significant correlation coefficients were found with either "leave it to its own devices", "study it closely", "manage it strictly", or "educate people about it", of those exhibiting significant values, those "protect it with laws", "put a fence around it and keep people out" and "collect and store it", were all negative. This means that neither the answer categories which could be deemed 'protectionist' [B5A, C, D, E, H], nor those implying a need for a learning process [B5B, G], were positively associated with respondents' performance on individual Cognitive variables or on the Biodiversity Understanding Index [BUX].

One single answer category to the question dealing with the best way to preserve nature [B5] stood out in showing positive associations with many Cognitive variables. This was "use it sustainably" [B5F]. Of the 13 Cognitive variables included in the BUX, just three [C13, C15, C21] showed no association with B5F, and of those that did, 6 had Spearman correlation coefficients greater than 0.3, with 2 above 0.5. Clearly, respondents selecting "use it sustainably" performed rather better on many Cognitive questions, and this was reflected in the relatively high coefficient with the Biodiversity Understanding Index (0.525). Whether respondents had chosen "use it sustainably" on the basis of their knowledge of biodiversity, is not apparent. However, that this category might be seen as relating to the modern 'use it, or lose it' approach to natural resource management is of particular interest. It points to the possibility that respondents adopting the idea and/or language of sustainability have a substantially different understanding of biodiversity. It also engenders the idea of paradigm shifts in environmental consciousness; an idea more compelling given the relative dearth of associations involving the 'leave it alone' or 'manage it strictly' approaches. Interestingly, the few other notable Affective x Cognitive correlations encountered across the ADS tended to involve negative associations between high scores on Cognitive variables and 'anti' nature feelings (i.e. "fear", "mild dislike") or more traditional paradigms for nature conservation (i.e. "collect and store it", "put a fence around it and keep people out"). Data for Activity x Attributes variables (Table XIII, appendix I) throw some light on this pattern by suggesting that the distribution of these data is related to the social class-educational level-newspaper readership cluster of variables. It may be that those occupying lower social classes, reading tabloid newspapers and having lower levels of formal education, are relatively less exposed to developments in thinking and practice *vis-à-vis* conservation, and therefore tend to retain perspectives which pertain to the older conservation paradigms.

With few associations found between Activity and Affective variables, and all these being weak (r^s values =±0.30), the conclusion must be that no strong patterns exist between them (Tables XVIII, XIX, appendix I). Most notable among those encountered were negative ones between both wildlife documentary viewing and visiting zoos/natural history museums, and "use it sustainably". They suggest respondents typified by frequent documentary watching and zoo/museum visits might have a different appreciation of the concept of sustainability. In contrast, positive associations were found between "use it sustainably" and gardening for wildlife, choosing not to use one's car, watching wildlife, going on a guided tour, doing practical conservation work, and the Environment-related Activity Index [EAX]. As shown in Chapter 4, social class, level of formal education and newspaper readership, influence this pattern, but it also suggests an association between the modern conservation paradigm and behaviours that imply active biodiversity conservation. Similarly engaging is the positive link between walking in the countryside or on the coast and respondents having declared themselves to have had a close relationship with nature during their childhood. This points to a formative influence of childhood experiences upon subsequent behaviour, but this is not reflected in associations with activities most closely related to wildlife, namely "do practical conservation work", "go on natural history holidays", "watch animals in the wild", and "go on wildlife tour". Such conclusions must therefore remain tentative.

That the declaration of feelings of fascination, protectiveness or responsibility were not disproportionately associated with any single wildlife-related activity or the Wildlife-related Activity Index, was surprising. It suggests these feelings towards nature and wildlife are not translated into actions in any consistent way, at least in respect to those activities included in the main survey. However, as Infield (1988) argues for conservation, it might equally be the case that some respondents were unable to support or participate in wildlife-related activities even if they would have liked to, simply because of a lack of resources (temporal or financial). The data therefore do not exclude the possibility that positive feelings fail to be materialised through wildlife-related behaviours because of circumstantial constraints.

In keeping with earlier findings, pet-keeping data were associated with almost no other variables. Only dog ownership was positively linked to selecting "leave it to its own devices" as the best way of preserving nature,[4] and negatively so to both "protectiveness" and reporting a closeness to nature during childhood.[5] Perhaps together these findings indicate a tendency amongst dog owners to view nature favourably but to see it as being able to withstand the effects of human activities and thus not in need of much protection. Since the data are so meagre in this area, the primary conclusion must be that the patterns of pet ownership recorded for the ADS demonstrated almost no relationships with responses to Cognitive, Affective and other Activity variables.

The final observations in this section concern broad patterns across the primary Activity, Affective and Cognitive variable indices (Table XX, appendix I). Immediately noticeable is the lack of association of the Pet-ownership and Genetics understanding indices [POX and GUX] with any other index (except GUX x BUX). This reiterates earlier observations that neither patterns of pet ownership nor respondents' understanding of genetics were related to patterns of understanding, behaviour or feelings *vis-à-vis* biodiversity. The positive GUX x POX correlation makes sense in that respondents reporting higher levels of pet ownership may understand genetics better than most people if this ownership involves pets reproducing or the simultaneous

[4] A5AxB5A, $r^s = 0.216$, *sig.* ≤ 0.05.

[5] A5AxB4L, $r^s = -0.244$ *sig.* ≤ 0.05, A5AxB6 = 0.237, *sig.* ≤ 0.001.

possession of different generations of a particular species. Either could encourage development of an understanding of inheritance. Indeed, of the subjects covered by Genetic Understanding Index component variables, the Pet Ownership Index shows a significant correlation only with C7, the question dealing with inherited characteristics. This pattern of correlation also suggests that pet-ownership and genetics understanding data are largely irrelevant to the research questions and should therefore not play a significant role in subsequent analyses. The remaining six primary indices were however quite closely associated with each other and will be considered together in due course.

5:2 Associations by different groups

5:2:1 Assessing and consolidating the main survey groups

Table 5.1 shows categories and sub-categories of the groups selected for the main survey, together with the predicted characteristic of primary interest in each category, and the number of interviews conducted.

Table 5.1 Main survey groups. Predicted characteristics of groups selected for main survey instrument. (Eleven coincidental Wildlife Trusts members transferred to KT category)

Groups		**Number surveyed**	**Possible relationship with biodiversity**
Conservation Biologists (CB)		8	biodiversity 'experts'
Wildlife Trusts members (KT)		37 (11)[a]	biodiversity 'supporters'
Government Officers (OG)	District (OD)	9	professional local biodiversity 'decision-makers'
	County (OC)	9	professional regional biodiversity 'decision makers'
Elected Members (ME)	District (MD)	11	elected regional biodiversity 'decision makers'
	County (MC)	10	elected local biodiversity 'decision makers'
Workers (WK)	Estates (WE)	10	wildlife 'managers'
	Skilled (WS)	8	relatively affluent non-biodiversity - related workers
	Unskilled (WU)	24	less affluent non-biodiversity - related workers

[a] (number of 'coincidental Wildlife Trusts Members' moved to this group)

An immediate problem arose concerning group allocation of cases because thirteen respondents declaring themselves Wildlife Trusts members were encountered in addition to those interviewed from the list supplied by the Kent Trust. This meant their inclusion in their selected survey group or transfer to the Kent Trust group had to be considered. Because a major parameter in the group selection had been the individual's relationship to nature, and since Trust membership had been seen to represent a specific degree of commitment, it was decided these 'coincidental Wildlife

Trust members' would best be included in the formal Kent Trust group – renamed 'Wildlife Trusts'. Two Conservation Biologists who were coincidental Wildlife Trusts members were allowed to remain in the CB category because this group status was seen to override Wildlife Trusts membership. The original allocation of respondents to group categories was therefore replaced by one in which eleven of the coincidental Wildlife Trusts members were transferred to the Wildlife Trusts category (so renamed because specific Trust membership was not known).

Another important issue was whether data for the District and County sub-groups of Government Officers and Elected Members should be considered separately. Data comparisons using One-way ANOVA and CROSSTABS operations suggested they need not be. Differences between District Members and County Members and between District Officers and County Officers were remarkable by their absence, with virtually no significant ones across all sets of variables. Furthermore, excluding the data for the 11 coincidental Trust Members had no effect on this result, either for Officers or Members (which made the transfer of these cases to the Wildlife Trusts group more acceptable). For Officers, just one significant mean frequency difference of a wildlife-related activity was encountered (effectively a twice/year contribution of money by County Officers over a once/year contribution by District Officers).[6] Otherwise, only answers to single, minor parts of two cognitive questions [C7 and C11] and two Identification Accuracy Indices (IAR and IAF) and the IAX, were significantly different.[7] Similarly, hardly any differences between the data for the Elected Member sub-groups were found. Of the wildlife-related activity questions, only answers to A1E (nature oriented holidays) and A1G (go on guided tour) were significantly different, with mean frequencies for County Members lying in the next most frequent category in each case, and mirrored in a significantly higher Wildlife Activity Index.[8] The mean score on the Environmental activity Index was also significantly higher for County Members,[9] largely due to a higher reporting of environmentally oriented activities in the mid-range (such as purchasing behaviour and writing to MP/Councillor) rather than glass/paper recycling or actual campaigning. Because of so few and relatively small differences between the subgroups it was decided to consider Members and Officers as single groups.

Comparison of the resulting aggregated groups of Government Officers and Elected Members also found very few significant differences in responses. Often being retired persons, Members tended

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[6] A1HR *F-ratio=4.83, Fprob=.0388*

[7] IAR *F-ratio=5.79, Fprob=.0249*; IAF *F-ratio=5.12, Fprob=.0335.*

[8] Mean - MD=65.1, MC=85.9. Duncan's test (Duncan 1955) *sig.* ≤ 0.05.

[9] Mean - MD=12.25, MC=16.25. Duncan's test *sig.* ≤ 0.05.

to be somewhat older[10] and almost none of them reported themselves to have written to their MP/councillor about an environmental/wildlife issue (compared to nearly half of the Government officers). This was probably because they were usually in practice their own councillors. No significant Affective data differences were found between Officers and Members, and just two instances for Cognitive data. Interestingly, these concerned changes to the countryside that have caused reductions in wildlife [C11] and the relative importance of different threats to the world's wildlife [C13], with the Government Officers performing rather better on both.[11] This was possibly the result of the greater experience of development issues that senior Officers are likely to have had. The similarity of the two groups is of interest for it suggests professional or elected status had little bearing in relation to understandings, feelings and behaviour, as measured by the main survey. Perhaps it also implies that there might exist a common 'culture' in local government in respect to wildlife, the environment and conservation. Given the small number of differences between the groups it was decided to combine them in subsequent analyses (as the Officers/Members group).

A similar comparison was made of the data for the Estate, Skilled and Unskilled worker groups. Significantly higher mean ages were encountered for Unskilled compared to Skilled workers.[12] All the Estate workers were male, and differences in social class were necessarily met with because social class allocation was derived from respondent's occupation. Yet hardly any significant differences for Activity, Affective or Cognitive variables were recorded. For just one Activity variable, "do practical conservation work" was there such a difference between any of the three groups of workers,[13] but this was largely due to the response of a single Estate worker who had declared himself in the "each week" category. Just two Affective variables were differentially associated with the worker groups, "leave it to its own devices" as the best way to preserve nature, and the "responsibility" category of feelings about wildlife and nature. In the former instance, no Estate workers selected it (compared to about half the other workers).[14] This was understandable given that Estate workers are daily involved in managing public open spaces and therefore engrossed in a culture emphasising the need to actively manage. In the latter instance, Estate workers selected "responsibility" rather less than average,[15] perhaps reflecting a tendency to see responsibility as resting with their managers rather than themselves. The overwhelming lack of

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[10] Oneway-Anova AGExAGGROUP Duncan test *sig.* ≤ 0.05, mean 3=3.33, 4=4.96.

[11] Oneway-Anova C11XxAGGROUP Duncan test *sig.* ≤ 0.05, mean 3=2.56, 4=1.86. Oneway-Anova C13xAGGROUP Duncan test *sig.* ≤ 0.05, mean 3= 4.00, 4 = 3.14.

[12] Oneway-Anova AGExAGGROUP(3,6,7) Duncan test *sig.* ≤ 0.05, mean 6= 3.17, 7 = 3.79.

[13] Oneway-Anova AGExAGGROUP(3,6,7) Duncan test *sig.* ≤ 0.05, mean 6= 1.25, 7 = 1.90.

[14] GR3xB5A Chi-square=10.39, df=1, *sig.* ≤ 0.01.

[15] GR3xB4G Chi-square=4.19, df=1, *sig.* ≤ 0.05.

differences between the three groups points to the conclusion that any specific effects of the greater proximity to living things Estate workers experience as part of their jobs, were not reflected in their responses to main survey questions. It also implies that data for the groups could be combined (as group WK), further reducing the nine initial survey groups to just four.

5:2:2 Main survey group data patterns

Table XXI (appendix I) shows the significant associations found between the aggregated main survey groups and Activity, Affective and Cognitive variables.[16] It shows a general overall pattern of highest mean ranks for the Conservation Biologists, second highest for Wildlife Trusts Members, third for Government Officers and Members, and lowest for Workers. Conservation Biologists and Wildlife Trusts members performed similarly on the Identification Accuracy Indices [IA*], but as was expected, Conservation Biologists appeared to know rather more about biodiversity, feel a greater sense of responsibility toward it, and to be both potentially and actually more active in regard to its conservation (particularly by campaigning and doing conservation work). They also tended to go on nature oriented holidays, go and watch animals in the wild, discuss wildlife issues and watch wildlife documentaries more frequently than those in other groups, although in the latter case only slightly more so than the Worker group respondents. Most notably they reported themselves infrequent countryside walkers and giving relatively rarely to wildlife/environmental organisations. The former seems likely to be due to their participating more directly in studying wildlife, the latter may relate to their understanding of the role of organisations in conservation (although this group was comprised of graduating students who probably had relatively small amounts of money to contribute).

Wildlife Trusts members ranked highest for the number of organisational memberships, giving money to organisations, the Environmental Activity Index, and its prominent component variable, "garden for wildlife", as well as going on guided wildlife tours. This seems to reflect a general interest in wildlife, a tendency for those who join one wildlife organisation to join others, and a desire to support wildlife financially and encourage it on their doorsteps. However Wildlife Trusts members performed slightly worse than the Officer/Member group when it came to some of the Cognitive questions, suggesting that biodiversity *per se* was not their focus of interest and perhaps too that they generally learn little about the subject as a result of their membership.

In just two instances ("recycle paper/glass", and "use it sustainably") were highest mean ranks achieved by Government Officers/Members, these possibly reflecting the respondents' official

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[16] As found using the Kruskal-Wallis H test for K independent samples.

involvement with the subjects at local and regional governmental levels. On five Cognitive variables (plus the BUX) Government Officers/Members also performed better than the Wildlife Trusts group, thereby supporting the view that Government Officers/Members may derive specific knowledge from workplace activities. The fact that these Cognitive variables included elements are dealt with in the county and district BAP processes (KCC 1996; CCC 1997) and Local Government Management Board biodiversity guidance notes (LGMB 1996), gives further weight to this argument. Otherwise, the Officers/Members were quite consistently third ranked for wildlife-related activities, and on par with Trust Members for most environment-related activities.

In only seven instances was the mean rank of Skilled/Unskilled Workers outside the lowest position. They declared the highest level of dog ownership and selected "leave it to its own devices" as the best means of preserving wildlife more often than others - the latter pointing to a continuance of a rather traditional paradigm for conservation (Pickett, Parker and Fiedler 1992). It might also mark a greater sense of powerlessness. This group also ranked second when it came to giving money to wildlife/environmental organisations and watching wildlife TV documentaries, and was above Officers/Members for reading about and discussing wildlife issues. The indication is that Skilled/Unskilled workers were somehow relatively interested in wildlife, but as the Cognitive and Identification accuracy data suggest, not very knowledgeable about it. Given this apparent interest, the low levels of participation in most wildlife and environment-related activities might seen to derive from poorer opportunities to do so, in terms of financial resources or otherwise, rather than a lack of interest or willingness. However, low rankings on the variable taken as a potential commitment index [B3] and the highest for "mild dislike" for nature/wildlife, point to a more complex explanation. Perhaps this group lacks a 'culture' of accessing real-life nature/wildlife experiences.

Despite the lack of differences between main survey groups that led to many being amalgamated for analytical purposes, those groups remaining showed quite distinct profiles. Besides the characteristics of the Conservation Biologists (which were well related to their subject area), the most important factors for the other groups seemed to be organisational membership, social class and, through its intimate connection with social class, respondent's level of education. Each of these will be considered in turn.

5:2:3 Membership of wildlife and environmental organisations

Correlating individual organisational memberships with other variables[17] enabled constellations of variables with significant associations to be formed for each organisation. Results for some may have been disproportionately influenced by the small numbers of respondents involved, and perhaps subject to the effects of intervening variables and/or multiple organisational memberships. Nevertheless, they show patterns worthy of consideration. Table XXII (appendix I) summarises these findings for organisations represented by five or more Full Data Set (FDS) respondents. It suggests certain activities, feelings and understandings may be associated with membership of particular organisations. However it is worth noting that comparison of those respondents who stated that they were not members of *any* such organisation (and had not been during the past three years) with those who said they were (or had been), found a lack of significant differences for a large number of variables. These are listed in Table 5.2, which shows this absence of difference was most marked for Affective variables, none of which were significantly correlated with organisational memberships.

Table 5.2 Main survey variables for which no statistically significant differences[a] were found in patterns of responses between respondents reporting themselves to have been members of an environmental/wildlife organisation during the past 3 years, and those who did not.

Variables	
A1A - watch wildlife TV documentaries	B4H - mild dislike
A1B - walk in the countryside/on coast	B4I - love
A1D - visit zoos/museums	B4J - indifference
A1I - read about wildlife	B4K - usefulness
A3B – recycle plastic	B4L - protectiveness
A3C – recycle batteries	B5A - leave it to its own devices
A3E – bought env. friendlier products	B5B - study it closely
A3G - put food out for birds	B5C - protect it with laws
A3I - signed petition env./wildlife issue	B5D - manage it strictly
A3J - written MP/ councillor env./wildlife issue	B5E - put a fence around it
A5B - cat ownership	B5F - use it sustainably
A5X - pet ownership index (POX)	B5G - educate people about it
B2J – balance of nature NEP subscale	B5H - collect and store
B2M - man over nature NEP subscale	C9 - characteristics of a species (O)
B4A – wonder	C21 - endemism, countries (C)
B4B – fascination	C27 - law relating to species (C)
B4C - mild interest	AGE - age of respondent
B4D – curiosity	BIOL - level of biology education
B4E – fear	SCI - level of science education
B4F – disgust	GEN - gender
B4G – responsibility	

[a] Using Mann-Whitney U- Wilcoxon Sum W Test or Chi square Test

[17] Using the Wilcoxon Rank Sum W Test for ordinal and interval variables and the Chi Square test for those involving dichotomous variables.

Of the wildlife-related activities neither visiting zoos/natural history museums nor discussing wildlife issues were correlated with overall organisational membership. Those reported as most frequently indulged in, i.e. watching wildlife TV programmes and walking in the countryside/on the coast also failed to correlate with organisational membership *per se*. They showed associations only with a few specific memberships. Similarly, with the exception of three categories; gardening for wildlife; choosing not to use one's car: and campaigning about an environmental or wildlife issue, respondents seemed to carry out the environment-related activities irrespective of belonging to an environmental or wildlife organisation.

Only in a few instances were particular organisations associated with particular Cognitive variables, but there were just three instances where scores attained by respondents not belonging to any organisation did not differ significantly from those who belonged to a least one. This suggests that organisational membership might have some bearing on individual's knowledge (or *vice versa*). Higher occupationally based social class, quality press readership and general level of education, were all associated with being a member of an organisation, whilst other socio-economic variables (including the levels of science and biology education) were not. The former might reflect the larger disposable income likely to be available to these groups, greater recognition of the need to support environmental and wildlife organisations, or both. The latter seems incongruous. If higher-level studies of science and biology are reflected in a greater interest in these subjects, they may be expected to be paralleled by relevant organisational memberships. There is however, no reason to assume the more highly science educated will join wildlife/environmental organisations in abnormally large numbers. The science subjects in question might be largely irrelevant to such memberships e.g. engineering, physics or biochemistry, and the better science educated might even hold a negative attitude to certain groups through perceiving their policies as based on a poor understanding of science. Scientists might also prefer to be involved in organisations not listed here. Similarly, the lack of association with higher levels of biology education might mirror the relatively low profile biological studies enjoy in most of the organisations in question. They might also mark an accommodation of the better biologically educated in other, more expert, organisations such a Field Clubs, Natural History Societies and specialist groups.

The clearest organisation variable cluster is that for Greenpeace, whose members the data describe as being of higher, social class, general educational level, as broadsheet press readers, and as indulging in environmental rather than wildlife-related activities. Just one correlation with a wildlife-related activity was recorded, a less than average amount of viewing of wildlife documentaries, and despite their endeavouring to support wildlife in their gardens, there was no indication Greenpeace members were particularly knowledgeable about biodiversity. They were however the only group especially involved in campaigning about environmental or wildlife issues and avoiding products tested on animals. Because they were all women, this may have been the result of taking care in purchasing cosmetics. They were also the only group scoring significantly higher on two of the New Environmental Paradigm subscales ("balance of nature" and "limits to growth" - see 3:4:2ii) - a finding which agrees with Edgell and Nowell's (1989) study of U.S. Greenpeace members. These data thus point to a stronger than average environmental consciousness amongst the individuals in this group, but little in the way of above normal knowledge, understanding and support *vis-à-vis* biodiversity.

For the nineteen World Wide Fund for Nature members encountered by the main survey, significant variable correlations were restricted to a single instance - disproportionately higher levels of reading about wildlife. This is surprising. Even if the lack of association with other Activity variables might be explicable on the grounds that WWF members are principally interested in supporting international wildlife conservation and therefore not unusually active, a better than average performance on some Cognitive variables and the Biodiversity Understanding Index might have been expected, particularly so, given the higher than average levels of reading about wildlife they declared. This raises questions about the materials they are reading, and the sort of educational activities that WWF conducts with members. Perhaps many members do not even read the materials the organisation sends to them.

Less difficult to explain are the findings for the Ramblers Association members. That membership was associated with walking in the countryside, practical conservation work (possibly path maintenance), and dog ownership makes sense, as perhaps does that with higher social class (given the middle-class origins of the organisation). The absence of other associations was unanticipated, and points to those Rambler's Association members encountered in the main survey being quite strongly and narrowly focused on accessing the countryside, rather than studying its wildlife. A similar observation can be made of RSPCA members. They demonstrated no special associations with any activities (save that of giving money), with virtually any of the Cognitive measures, and the socio-economic variables. This seems to reflect this organisation's broad base of support, its preoccupation with the welfare of pets (confirmed by the correlation with the Pet Ownership Index), and its relatively low level of concern with the environment in general and with wildlife in the wild in particular. Serpell (1981) found members of conservation organisations to tend to have more pets than non-members, but with the exception of the RSPCA and Rambler's Association members, this was not the case for main survey respondents.

The findings concerning membership of those organisations most directly dealing with wildlife are relatively easy to understand. RSPB and Wildlife Trusts members tended to be those who more often go to watch animals, go on wildlife tours and nature oriented holidays and read about wildlife, a pattern reflecting the focus of these organisations. Both are centred on living, unconfined wildlife, and either on watching and protecting birds specifically (RSPB) or wildlife in general (Wildlife Trusts). Members of both also tended to garden for wildlife, select the "use is sustainably" category as the best way to preserve nature, and were the only respondents to perform abnormally well on the Identification Accuracy indices. They also tended to belong to older age categories and report themselves as readers of the broadsheet press in significantly larger numbers - although a major reason for these similarities was the fact many were members of both organisations.

A similar pattern was found for the National Trust members, who declared themselves as watching animals in the wild and going on guided wildlife tours more frequently than the norm. They also appeared more active in relation to the environment generally. The higher frequency of wildlife tour participation could have taken place within the context of a National Trust property visit. National Trust members, like those of the RSPB and the Wildlife Trusts, were also disproportionately represented by older age groups, but this was largely due to multiple memberships (Table IX, appendix I). However, notable differences were found between the three groups. The absence of a Biodiversity Understanding Index [BUX] correlation with RSPB membership was rather unexpected, and, with the exception of gardening for wildlife, RSPB members were not associated with environment-related activities, the EAX, or any occupationally based social class. National Trust members, by contrast, were no better than other respondents at accurately identifying species in the four categories of organism [IA*], but did do significantly better on the BUX. Noteworthy too is the association of *not* selecting "leave it to its own devices" with Wildlife Trusts membership - possibly indicative of recognition on the part of the organisation of a need to be proactive in respect to wildlife preservation. These data provide support for what might be regarded as an obvious distinction between members of these organisations, namely that RSPB members tend to be interested in birds and little else. Wildlife Trusts members, by contrast, appeared to be more broadly concerned with wildlife.

Organisational membership *per se* was not consistently correlated with higher social class and level of education, in contrast to findings from other studies (see Tranter 1997). Only particular organisations were associated in this way (i.e. The National Trust, Greenpeace, the Rambler's Association, and the Wildlife Trusts), and just two (The National Trust and Greenpeace) were also linked with higher levels of formal education. Moreover, with the exception of the National Trust, these associations were neither very substantial nor significant. This might be seen as evidence that support for such organisations is not, as Buttel (1987) argued, elitist. Perhaps the large increases in the UK memberships of environmental organisations over the past fifteen years has, at least for organisations such as the RSPB and WWF, 'spread' to the lower social classes and the less well educated - thereby reflecting the 'trickle-down' effect of environmental concern described by Cotgrove (1982) and Morrison and Iatridis (1986). Unfortunately, detailed historical records of the structure of organisational memberships are not readily available. Nevertheless, the well-documented increase in public concern for the environment appears to have followed a popularisation of issues to the extent that they have become a permanent aspect of the political agenda, and organisational memberships thereby 'legitimised' (Rawcliffe 1998).

A major difficulty in interpreting correlation coefficients involving wildlife and environmental organisation membership is the fact that multiple memberships may have confounded the data. As well as the Wildlife Trusts, other organisations such as the RSPB and WWF were also over-represented. This could have been due solely to multiple memberships involving the selected group of Wildlife Trusts members, but in fact, the pattern changed little if these were removed. As Table 4.7 showed, with the exception of Wildlife Trusts, RSPB and WWF members, the approximate ratios of organisational memberships was broadly comparable with those existing nationally. This gives greater credence to view that data profiles for each organisation described by Table XXI (appendix I) might be representative. In attempting to compensate for the effects of multiple memberships, 34 respondents who belonged at least two organisations amongst the RSPB, National Trust or Wildlife Trusts, were removed and the analysis repeated. Few of the correlations remained, thereby suggesting that a sub-group of respondents who are comparatively frequent participants in wildlife-related activities was present. Looked at alongside the evidence for few differences existing overall between members and non-members (Table 5.2), it also implies that individual organisational memberships should be seen as one variable amongst others. It is not as a strongly definitive as expected, and is important only for some individual members of organisations. Perhaps for many members of wildlife/environmental organisations, their membership alone represents the greater extent of their support for the issues these organisations are involved with.

5:2:4 Groups defined by social class and education

Given the generally poor understanding of biodiversity and biodiversity loss exhibited by the ADS, it is not surprising so few factors loaded on the Biodiversity Understanding Index [BUX], even for correlations involving wildlife and environment organisations. Only National Trust and Wildlife Trusts memberships showed an association of this type, and only the latter was linked to a wide range of activities in support of wildlife as well. Analysis of aggregated survey groups threw some light on such seeming inconsistencies, but in the mix of variables which might describe support and understanding *vis-à-vis* biodiversity the predictive strength of organisational or main survey group membership was confounded by other key variables, notably social class and education. The general effect of these Attributes variables was considered in Chapter 4 (section 4:4), but it is worth reiterating some of these and looking at them in greater detail from the point of view of the group analysis.

Findings for social class (Table XXIII, appendix I) suggest data patterns for certain variables were strongly influenced by occupationally based social class. In practice this is likely to derive from associated parameters such as recreational behaviour or amount of disposable income, as well as the views and values of respondents belonging to each category. Overall the significant Cognitive/social class correlations were with those variables most closely associated with the BUX (Table 4.4) with an increasingly poor performance recorded with lower social class. Biodiversity Understanding Index scores were markedly higher for 'intermediate' and 'professional' classes, but did not vary much between the two, perhaps pointing to education as playing a key role here. For the Identification Accuracy indices however, there were almost no significant differences by class. Notable differences were found for some wildlife and environment-related activities - including higher Environment Activity Index [EAX] scores, and increased participation in practical conservation work amongst higher social classes. With the exception of TV wildlife documentary viewing, the semi/unskilled class category exhibited lower levels of participation in all WAX and EAX component activities, with only dog ownership being specially characteristic of this group. Confirming the findings reported in the previous section, most organisational memberships showed no patterns along class lines. The National Trust was associated with the 'professional' class, and the Wildlife Trusts and Rambler's Association were more the domain of the 'intermediate' category. So perhaps membership of these particular organisations does reflect values and attitudes associated with class membership. If this is indeed representative of these organisations, it suggests that any biodiversity education they undertake, might be most effectively targeted according to these categories.

In terms of the Affective variables, few patterns were found. Of feelings about nature/wildlife, only "love" showed a significant association, with a higher frequency being associated with skilled, unskilled and semiskilled categories. The association of higher social class with choosing "use it sustainably" has already been referred in relation to the Elected Members and Government Officers. The other association, that with "protect it with laws" suggests a greater belief in the power of legislation amongst respondents from lower social classes, with least belief amongst the 'intermediate' group. Perhaps the link of this 'intermediate' class category with Wildlife Trusts membership and the associated experience and knowledge of nature conservation, leads members to be more critical of the effectiveness of laws. Overall it seems reasonable to conclude that occupationally based social class does play an important role in relation to some main survey variables. However, its effect is not easy to distinguish from that of educational level, the next grouping variable considered.

Table XXIV (appendix I) shows significant main survey associations involving respondents' level of formal education. It reiterates the close link between occupationally based social class and education in that it records a similar pattern to that presented in Table XXII. For Cognitive questions however the pattern is less consistent, with those educated at or below GCSE level doing notably worse than others and those schooled only as far as primary level performing even less well. In most instances there are large 'steps' in performances between GCSE and A levels, A levels and college, and between college and University. This suggests education has played an important role in relation to the Cognitive responses. The fact of this education-understanding link being quite consistent and predominantly derived from responses to questions demanding a knowledge base, provides support for the contention that the respondents understanding of biodiversity was moderately related to their educational level. By contrast, wildlife and environment-related activities did not exhibit a consistent relationship with levels of education. The frequency of watching wildlife documentaries tended to increase with decreasing levels of education (although ADS data do not include the Conservation Biologist postgraduates), but giving money to environmental or wildlife organisations was primarily associated with those educated as far as A levels or GCSEs. Perhaps these groups, though not often participating much in activities directly oriented to nature and the environment, tend to prefer to make monetary contributions. Postgraduates alone were associated with battery recycling, possibly because of a better understanding of the toxic nature of the chemicals involved, but the forsaking of car use on environmental grounds was rather more the choice of those who had at least been college educated. With gardening for wildlife the 'peak' was in the 'college' and 'undergraduate' levels, but high levels of participation extended also to the 'A level' group. Notably, there was no particular association with the Wildlife Activity Index, suggesting other parameters such as organisational membership play a more important role here.

Membership of the National Trust was associated with higher educational level (possibly in connection with social class), but whether or not a respondent was a member of an environmental or wildlife organisation was not related to educational level. Of the other Affective variables, the feeling of "wonder" was associated with education at or above the 'college' level, that of "love" with the GCSE and 'primary' levels. Perhaps this illustrates these respondents' willingness to use the word. Perhaps because, on average, older respondents were represented in the 'primary education ' group, this reflects a generational difference in word usage. Finally, there was the strong correlation of "use it sustainably" as the best way to preserve nature with higher educational level, and the association of "collect and store it" with 'primary' education, both of which might relate to the adoption of different paradigmatic views for conservation amongst the different social classes. It seems then that groups defined by higher educational level tend to have a better understanding of biodiversity, participate more often in conservation activities, and be more in tune with contemporary approaches to (or paradigms for) conservation. Of course, given its relatively close association with educational level, it is difficult to separate the influence of social class, or of newspaper readership on this pattern.

5:3 Attitudinal dimensions in the main survey data

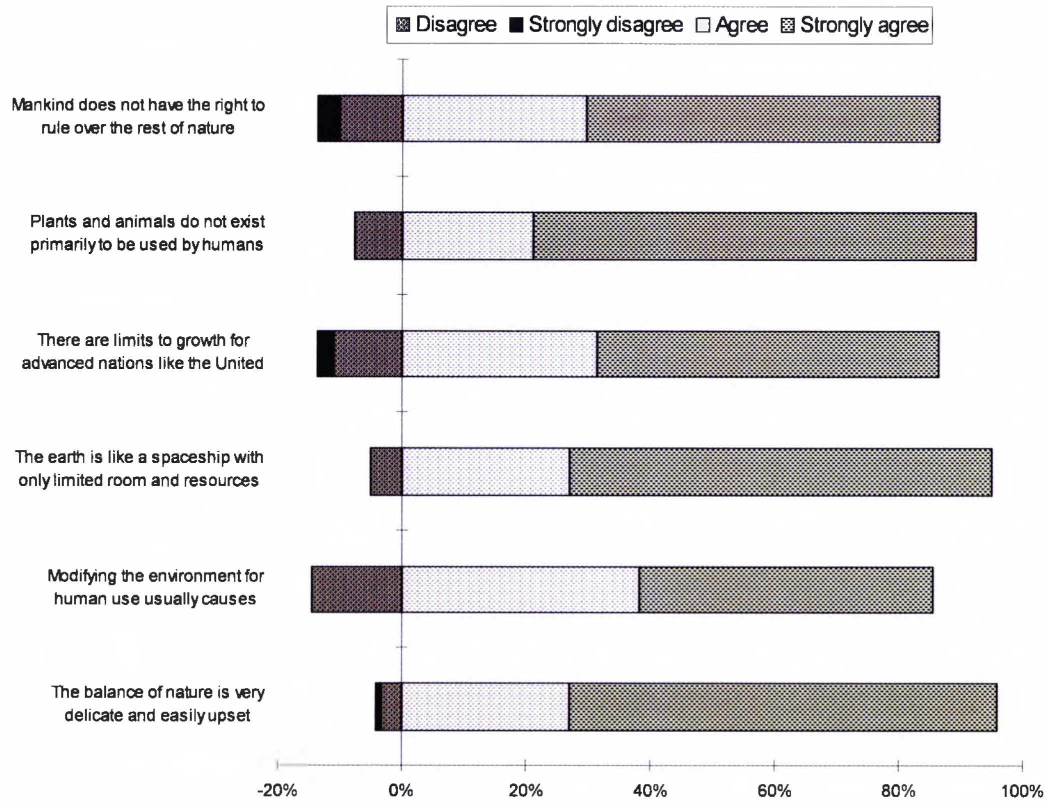
Although many associations have been described between pairs of variables across Affective, Activity, Cognitive and Attributes subsets, what are yet unclarified are the attitudinal aspects of the data, namely parameters which combine cognitive, affective and behavioural elements to suggest particular attitudes.

5:3:1 New Environmental Paradigm data and associations

Studies collectively referred to as "New Environmental Paradigm (NEP)" surveys (Dunlap & Van Liere 1978) are based on a theory and methodology formulated by Catton and Dunlap (Catton & Dunlap 1978, 1980; Dunlap 1980). They have probably been the most influential small-scale studies relating to environmental attitudes, and constitute some of the earliest contributions to the field of environmental sociology. Although NEP findings are not directly relevant to the subject of biodiversity, in their seeking to track 'paradigmatic' changes in attitudes and often involving knowledge scales, a form of the standard NEP question was thought to be of potential value for comparative purposes. This was the six-item scale distilled by Arcury, Johnson and Scollay (1985) from the twelve-item scale utilised in most NEP studies. It included two questions from each set of four comprising the three distinct attitudinal domains identified by Albrecht *et. al.* (1982) in the 12-item scale. These domains are called, "Balance of nature", "Limits to growth", and "Man over nature", with high scores on any scale indicating a pro-NEP perspective.

In general, New Environmental Paradigm scale data from the main survey broadly reflected those obtained in other studies. As Figure 5.1 demonstrates, on all scale items the great majority of respondents declared a pro-environmental position. Indeed, for all except the sub-question about the problems caused by humans modifying the environment [B2D] the majority of respondents selected the answer category representing strong agreement with a pro-environmental position. Levels of agreement with the statements were also higher for all items compared to those in studies that reported them (i.e. Scott & Willits 1994; Dunlap & Van Liere 1978).

Figure 5.1 ADS responses to B2 (NEP questions) x percentage of respondents.[a]



(a. The ± format of some questions has been changed for presentation purposes)

If these data are representative of the wider community, they support the contention of NEP proponents, that the New Environmental Paradigm has become the "dominant world view" (Capra & Spretnak 1984). Table XXV (appendix I) serves to sustain this position in the context of previous research. It shows data mean scores to be consistently high and indicates a distinct and substantial leaning towards the NEP which is consistent with the earlier studies, although mean scores lack the tendency to increase from 'Man over nature' through 'Limits to growth' to 'Balance of nature' which the other data exhibit. In addition, although none of the sub-scales were found to be statistically reliable, the overall reliability score was 0.528. This is lower than that found by Arcury, Johnson and Scollay 1985) and below the figures of 0.63-0.84 recorded in six studies which used the 12 item scale. However, it is above the figure of 0.5 normally considered acceptable (Nunnally 1967). This encourages use of the NEP score as an attitudinal index, albeit a slightly less reliable one than others have found.

Patterns within the NEP data also resembled those found in the other studies. Factor analysis using the same method employed in other research[18] confirmed the absence of a discrete multi-dimensionality, but a comparison with published factor loadings, revealed neither the sub-scales encountered by Albrecht *et. al.* (1982), Edgell and Nowell (1989) or Arcury (1990), Arcury and Christianson (1990), nor any new ones. The results pointed instead to a unidimensionality, although a weaker one than that identified by Dunlap and Van Liere (1978).

Bivariate correlations between the NEP score and individual variables belonging to the Cognitive, Affective and Activity sets, revealed few associations, just 12, the largest coefficient for which was a modest 0.360 (Table XXVI, appendix I), and only 3 of which involved Cognitive variables. There was also a notable lack of correlation with specifically wildlife-related activities. This might be expected on the grounds that the NEP scale is clearly environmentally oriented rather than wildlife-oriented. Also, it is designed to assess attitudinal dimensions, parameters that do not necessarily correlate with actual behaviour. Moreover, no NEP questions, even those mentioning nature or living things [B2A, B2B and B2F], relate directly to wildlife in such a way that a particular response might be associated either with high or low levels of participation in any wildlife-related activities or with a better knowledge or understanding. Whether for instance, a respondent agrees or disagrees with the statement that plants and animals do not exist primarily to be used by humans, is unlikely to bear any particular relation to how often s/he participates in practical conservation. Those who strongly support or oppose this statement might undertake frequent participation in practical conservation.

Younger respondents had been thought likely to exhibit more positive attitudes towards the environment, but no significant NEP x Attribute correlation coefficients were found between age and higher scores on any NEP subscale (Table XXVII, appendix I). This lack of association might indicate that the spread of the NEP paradigm has not been disproportionate amongst any age group and therefore not reliant upon sources of learning associated with specific age groups, such as formal education for young people. Similarly, whether respondents were in urban or rural residence had little bearing upon their NEP scores, thereby suggesting no major differences in rural/urban perceptions of the way nature operates, the environmental boundaries to human activities, or the basic relationship between humans and nature. This agrees with the view that urban/rural differences in environmental attitudes have diminished to the point of insignificance (Young 1992, Bogner & Wiseman 1997). In relation to the overall NEP index the only other associations were positive ones with quality newspaper readership, and higher levels of biology education. The former might be explicable on the grounds that it derived partly from broadsheet

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[18] A principle components analysis with a varimax rotation

press readership. The latter, might be expected if a better than average understanding of nature is reflected in more positive environmental attitudes. The important conclusion to draw from the main survey NEP data is that they approximate to those from other NEP studies and in so doing, support the view that the main survey data are broadly representative of the wider population. However, they provide little evidence about respondent's attitudes to biodiversity or even their attitudes to wildlife/nature.

5:3:2 Identifying attitudinal dimensions

The issue which must be considered first when looking in the data for attitudinal dimensions is the relationship between the affective data and attitudes. Most studies that consider how people relate to environmental issues look at attitudinal measures, but few openly consider the relationship between knowledge and affect (Zimmerman 1996). Because a mediated affective component has been central to attitudinal studies (Rosenberg *et. al.* 1960), measures of affect included in surveys of this type have with some legitimacy often been thought of as affectively based attitudes. Taking the Affective variables to represent such attitudes, points to a consistency of main survey findings with those suggesting slight associations between environmental attitudes and behaviour (Sia, Hungerford & Tomera 1985; Berger & Corbin 1992; Grob 1995) rather than those which encountered moderate ones (e.g. Maloney & Ward 1973; Weigel & Weigel 1978; Langerheine & Lehmann 1986; Hines, Hungerford & Tomera 1986/87; Boldero 1995) or none at all (Arbuthnot 1977; Oskamp *et. al.* 1991; Lansana 1992).. Those elements in the Affective set of main survey questions which dealt most directly with feelings (questions B4, B6 and B7) produced mediated data, so some would argue that they too comprise affectively-based attitudes. Accordingly, it is difficult to oppose the view that Affective variables relating to specific behaviours or outcomes [B3, B5, B8], should also be regarded as attitudinal measures, particularly since their interpretation consistently seeks explanation within a social context. Taking this position means attitudinal comparisons can be made between the Cognitive/Affective correlations in Table XVII (appendix I). In drawing these it seems that ADS findings also generally agree with the presence of a weak relationship between environmental knowledge and attitudes (Langerheine & Lehmann 1986; Grob 1995), rather than stronger ones resembling those reported elsewhere (Maloney & Ward 1973; Arcury, Johnson & Scollay 1986; Syme, Beven & Sumner 1993) or a lack of association altogether (Stutzman & Green 1982). At a more detailed level certain individual Affective variables (notably “use it sustainably”, “love”, “wonder”, “collect and store it”) seem to have meaningful and significant associations with the Cognitive variables. However, since these Affective variables relate to nature and wildlife generally, and since the significant correlations with Cognitive variables are few in number, the argument that such correlations provide evidence for the existence of attitudes to biodiversity *per se*, is not compelling. They may reflect attitudes to nature/wildlife, but even then, the pattern suggests that only those respondents choosing "use it sustainably" might be deemed to hold consistent and relatively strong attitudes of this type.

5:4 Latent grouping variables

In adopting another approach to identifying attitudes amongst the respondent group an attempt was made to distil attitudinal dimensions across the six primary indices identified [WAX, EAX, MEX, B3, NEPX, BUX]. Multiple step-wise regressions posing each index in turn as the dependent variable were undertaken, but because confounding of correlated variables was likely to have occurred (West 1991), this technique was rejected in favour of factor analysis (Cattell 1978). Analysis of the Full Data Set resulted in a single factor solution suggesting an overall tendency to score consistently moderately across all these indices (Table XXVIII). In itself this can be thought of as representing a generally positive attitude being expressed, although the affective elements it includes (variable B3 and the implicit affective components to other indices) are not very clear. How closely this attitudinal dimension relates specifically to biodiversity is also open to question. So this result is therefore not particularly useful in distinguishing details of attitudinal domains within the respondent group and suggests a more detailed approach may prove useful.

The factor analysis was repeated using individual Affective and Activity variables, whilst keeping the Cognitive component as unified as possible in the form of the Biodiversity Understanding Index. This produced a fifteen-factor solution with many variables having small loadings across all of them. Variables loading less than ±0.3 on all factors were then removed in batches until all remaining ones loaded at least ±0.3 on at least one factor.[19] This resulted in the 9-factor solution accounting for 68% of the variance[20] (Table 5.3).

Few groupings represented by the latent variables involved Affective variables. This was probably because responses to Affective questions were so widely spread, had few bivariate correlations within them, and expressed a consistently strong, positive view of nature and wildlife. Together these characteristics meant factors would tend not to load differentially between Affective variables, and only marked differences would become apparent. Looking at this finding from the point of view of attitudes, one might assume a general positive affective component to be present

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[19] Norusis (1993) advocates the inclusion only of variables with correlation coefficients ≥ ± 0.3 and the removal of those showing a high degree of multicollinearity and singularity. It was decided to adhere to these criteria in this instance except use 0.25 as the level and to remove all index variables for whom component variables remained.

[20] Determinant of correlation matrix = .0000528; Kaiser-Meyer-Olkin measure of sampling accuracy = .73225; Bartlett Test of Sphericity = 1134.235 *sig..0000.*

in all Factors (except perhaps Factor 5), but given the important role of such variables in attitudinal measures, this lack of specific Affective loadings remains problematic.

Table 5.3 Full data set (FDS) Factor solution[a] for all variables (*negative loadings in italics*).

	Factors								
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
ED level of education	.827								
CLSF social class	.825								
BUX biodiversity und/ing index	.685		.252			*-.258*			
NEWS newspaper	.685							.250	*-.302*
B5F use sustainably	.672								*-.279*
BIOL level biology education	.523		.291	.283		*-.430*			
B3 potential commitment index	.459						.303		
A6A RSPB membership		.857							
A1F watch animals in the wild		.648						.312	
A6G Wildlife Trusts membership		.603							
A3H garden for wildlife			.646			.255			
B2K limits to growth subscale	.448		.624						
A1J discuss wildlife issues			.611		*-.305*				
A1I read wildlife books/mags.		.445	.482	.279			.355		.253
A1E go on nature oriented hols.		.297		.753					
A1C do practical conservation				.734					
A1G go on guided wildlife tour		.499		.506			*-.309*		
B4J indifference					.817				
B5E put a fence around it					.763				
A1A watch wildlife TV	*-.309*				*-.553*				
AGE respondent's age						.876			
B6R positive childhood							.789		
A6E National Trust membership	.323	.374					*-.514*		
A3K campaign env./w/life issue				.276				.763	
A6D Greenpeace membership			.271				*-.269*	.699	
A6C RSPCA membership									.811
A3A recycle paper/glass	.439								.478
% variance	20.2	9.7	5.8	6.8	5.2	4.8	4.7	4.1	3.9

[a] factors have been rounded to 3 d.p. Only factors = ±0.25 are included

Results concerning the cognitive and behavioural components showed quite distinct groupings. These might be interpreted as based on attitudinal domains, but only Factors 1 and 3 loaded positively on one or more activities together with the Biodiversity Understanding Index. Two related observations shed light on these findings. First, it should be noted that aspects found elsewhere to be correlated with environmental attitudes and behaviour, including human 'values' (Dunlap, Grieneeks & Rokeach 1983) and a variety of personality variables (Arbuthnot 1977; Borden 1978; Newhouse 1990) had not been considered in this survey. This means other loadings that could have delineated attitudinal domains were not available. A more convincing argument however is that factor-based groupings should not strictly be considered as representing attitudinal dimensions *vis-à-vis* biodiversity, but as attitudes concerning wildlife and/or nature more generally. Survey evidence and other research have already suggested a poor understanding of biodiversity to be widespread. Looked at together with the fact that most main survey data concerning behaviour necessarily dealt with the subjects of nature and wildlife rather than biodiversity *per se* (see section 3:3:2) the implication is that attitudes relating to biodiversity cannot reliably be derived from these data. It seems possible, and indeed likely, that responses to Activity and Affective variables had little to do with biodiversity because participants had not had the opportunity to form *any* specific attitudes to it.

If for most respondents the subject of biodiversity has not yet comprised an attitudinal object, then at least one key entity that makes up an attitude (cognitive, affective, conative) will be missing (Ajzen & Fishbein 1977). Moreover, even if biodiversity does constitute an attitudinal object within the respondent group, then as Liska (1974) points out, when this object is relatively unfamiliar, attitudes towards it will be poorly formed and difficult to detect. This conclusion also makes sense because specific 'biodiversity-conservation behaviours' consciously engaged in as such are unlikely to be widespread in a context in which there is a virtual absence of accurate understandings of the subject and where use of the term (and thus probably the concept too) has hardly moved beyond science journals. It is nevertheless worth considering the latent variables produced by the factor analysis because they provide portraits of sections of the public which are both interesting in themselves, and which could be targeted for biodiversity education purposes.

Factor 1 can be described as a domain occupied by "inactive conservationists", respondents showing an understanding and appreciation of the subject and something of what needs to be done, but not directly involved. They seldom watch wildlife television programmes, but score highly on the "Limits to growth" NEP subscale, adhere to the idea of sustainable use of nature as the best way to preserve it, score well on the Biodiversity Understanding Index [BUX], and highly on the "potential commitment index" [B3]. They are not, however, very active in relation to wildlife and the environment, despite being additionally typified by higher occupationally based social class, broadsheet press readership, higher levels of education (including biology education), and membership of the National Trust. In contrast, Factor 5 describes a domain occupied by a handful of "nature disinterested" respondents, respondents who tend to watch few wildlife television programmes, seldom discuss wildlife issues, and express an indifference to nature and wildlife, believing the best way to preserve it being to put a fence around it and keep people out.

What might be called the "wildlife gardeners" are represented by Factors 3 and 6. A "biologist wildlife gardeners" domain (Factor 3) tends to encompass individuals who are reasonably well formally educated in biology, who are Greenpeace members, and active in reading and discussing wildlife issues. They are distinguishable from the "non-biologist wildlife gardeners" (Factor 6), which describes distinctly older respondents who tend to be poorly educated in biology and appear to know little about biodiversity. Despite declaring themselves to garden for wildlife, otherwise these people do not participate in wildlife-related activities (possibly because of their age).

"Wildlife activists" are represented by two domain groupings. The first (Factor 2) marks the group of individuals with multiple organisational memberships highlighted in section 5:4. It embodies members of the RSPB, the The Wildlife Trusts and the National Trust, individuals who might be described as "wildlife watchers" or "armchair activists". They seem to read about wildlife, watch animals in the wild, go on nature-oriented holidays and guided wildlife tours, but do not perform particularly well on the BUX and do little in the way of active conservation. They appear more generally interested in wildlife than biodiversity and stand in some contrast to those activists incorporated by Factor 4. Respondents in this domain also read about wildlife, but tend to know about biodiversity (often having studied biology formally), have no specific organisational associations and are rather more likely to participate in practical conservation and to have campaigned about an environmental or wildlife issue. This domain could be termed "practical conservationists".

A small domain occupied by "environmental activists" is also described in this analysis. Denoted by Factor 8, this group is linked to watching animals in the wild, broadsheet press readership, membership of Greenpeace and participation in campaigning (probably in connection with Greenpeace membership). Finally, there are two other minor factors, 7 and 9, which relate to no particular wildlife or environmental-related activity save reading books/magazines about wildlife. Whilst the former is linked to higher educational levels, greater potential commitment and a positive childhood experience of nature, the latter is most strongly associated with tabloid press readership and RSPCA membership, and therefore more concerned with the "welfare" aspects of wildlife - a suggestion also supported by the negative loading on the B5 sub-question which relates to extractive use, namely "use it sustainably" as the best means to preserve wildlife.

Overall, these factor-based portraits bear a good resemblance to the types of relationship combinations identified by Ramsey and Rickson (1976) in their study of environmental attitudes. Their findings describe a group who neither know much about the environment, nor have any attitudes towards it (which corresponds with Factor 5 in this study), another which is inactive, but which holds environmental attitudes and allows others to act on its behalf (Factors 1, 7 and 9 in this study), and finally, a group of more knowledgeable persons who are activists committing personal resources and exhibiting a passionate interest (Factors 2, 3, 4 and 8). In paralleling the groupings encountered by Ramsey and Rickson (1976), these latent variables appear to have additional credence and warrant further exploration.

Due to the high degree of association between the main survey groups and certain socio-demographic variables, a factor analysis involving variables representing these groups could not proceed satisfactorily. The relationship between survey group membership and the factors identified in this analysis was therefore explored using the independent samples t-test (Table 5.4).

Table 5.4. The relationship between survey group membership and the factors identified in Table 5.3. – as indicated by an independent samples t-test (*a negative sign indicates a positive relationship between survey group category and the particular Factor in question*).

Group

Factor	**Conservation Biologists** t-value significance	**Wildlife Trusts members** t-value significance	**Gov. Officers /Elected Members** t-value significance	**Unskilled/ skilled workers** t-value significance
1 "inactive conservationists"	-6.24 .000	n/s	-6.66 .000	14.40 .000
2 "wildlife watchers"	2.97 .009	-5.48 .000	3.35 .001	3.91 .000
3 "biologist wildlife gardeners"	n/s	-2.12 .036	n/s	n/s
4 "practical conservationists"	-2.91 .022	n/s	n/s	3.41 .001
5 "disinterested in wildlife"	n/s	n/s	n/s	n/s
6 "non-biologist w/life gardeners"	5.45 .000	-3.75 .000	-2.19 .030	2.84 .006
7 "interested readers"	-5.79 .000	n/s	1.99 .049	n/s
8 "environmental activists"	n/s	n/s	n/s	n/s
9 "welfare-minded"	n/s	n/s	n/s	n/s

Where n/s=not significant at or below 5% level.

The "practical conservationists" domain might have been expected to correlate significantly with the Wildlife Trusts group, but this group was active in viewing wildlife, rather than doing conservation work. Along with Wildlife Trusts membership, such viewing, particularly in the context of holidays and tours, can itself contribute to conservation through revenue generation and *via* its demand for non-extractive utilisation. This group's links to wildlife gardening, whether informed by a biology education or not (Factors 3 or 6), is of additional interest for it points to a grouping of committed and interested supporters (as indicated by membership and wildlife-related activities) who tend to actively promote biodiversity through gardening and raises an important issue about the potential role for wildlife gardening in relation to biodiversity education. Indeed, the BUX loading on Factor 3 "biologist wildlife gardeners", might be interpreted as further supporting this possibility.

The aggregated group of workers were highly negatively associated with "inactive conservationists", largely due to the heavy loadings on higher social class and educational level this factor exhibited. In fact, there were no positive WK associations with *any* factors, only negative ones with "practical conservationist", "wildlife watchers" and "non-biologist gardeners". This might make depressing reading for those involved with biodiversity conservation, although some consolation can be sought in the fact that the "disinterested in wildlife" factor was also not associated with this group, suggesting that the general overall picture of a positive view of nature and wildlife seems likely to be present amongst substantial numbers of this group. Given the make up of the WK group (Table XXIX. appendix I), these associations point to a lack of understanding and participation *vis-à-vis* biodiversity and wildlife along the lines of social class, education and newspaper readership; it also suggests that workers belonging to this group should perhaps be given special consideration when considering biodiversity education.

The government officers and elected members were marked by an association with the "inactive conservationists" and "non-biologist wildlife gardeners". This again flags up the possible importance of gardening, but also suggests Officers and Members may have a level of potential commitment, which under the right conditions could be translated into action. The National Trust membership invoked in Factor 1 is worth mentioning in this context because this is by far the largest NGO in the UK involved with nature conservation (2.5 million members) The suggestion is that if these data are representative, then the National Trust might provide a useful avenue for biodiversity education which targets this grouping.

5:5 Discussion

Considered together, the evidence presented in this chapter points to membership of some groups being of importance in relation to respondents' understanding and support *vis-à-vis* biodiversity. The suggestion is that social class and educational level may be key predictors of both, with organisational membership of significance only for some individuals. However, analysis of attitudinal dimensions indicates that the real picture is rather more complicated because much of the data cannot be unequivocally associated with biodiversity. Moreover, even if they can be, the findings suggest that although the "New Environmental Paradigm" seems to be established within the respondent group largely in line with other research findings, attitudes towards biodiversity *per se* are, if they do exist, only very weakly developed amongst the UK population. Of course, this is not surprising with the subject being virtually absent from all but a very specialised literature, and with biodiversity loss probably seldom being discussed or campaigned about as an issue. This lack of well-formed attitudes to biodiversity has important ramifications in relation to attempts to implement the *Convention on Biological Diversity* via the *UK Biodiversity Action Plan* and local Biodiversity Action Plans, because it suggests that public responses are unlikely to be either predictable or consistent.

The formation of new attitudes is influenced by the constellation of existing closely related ones within which the new are anchored (Petty & Cacioppo 1981). In attempting to develop positive attitudes towards biodiversity, an impetus therefore may be provided by existing attitudes towards wildlife. Despite the paucity of convincing evidence concerning attitudes to biodiversity amongst the main survey respondent group, the data do agree with others studies (see Kellert 1987) in that a generally positive view of wildlife/nature appears to be widespread. Feelings of wonder, fascination, protectiveness and responsibility were widely declared amongst the main survey sample, and largely irrespective of socio-demographic categories.

Associations suggested by bivariate, multivariate and factor-based analyses also provide considerable cause for thought about the way in which people engage with wildlife and nature. Several correlations together suggested different perspectives (perhaps affectively-based attitudes) to conservation such that better educated and socially positioned respondents were more likely to hold more up-to-date views. Thus, respondents with lower levels of formal education and belonging to the unskilled/skilled workers groupings tended to be associated with the traditional paradigms of "leave it to its own devices" or "manage it strictly", and the better educated/of higher occupationally-based social class, were more likely to select "use it sustainably". It was argued that these differences might derive from differential exposure to the more modern conservation paradigms, and that they might also be influenced by the perceptions of individuals as to what can actually be done to conserve nature and wildlife.

Notable amongst activity-related patterns were the possible lack of influence of wildlife documentary programmes and zoo and museum visits, and the positive role of direct and intimate experiences of nature/wildlife on knowledge and understandings about biodiversity. Besides 'hands on' experiences of wildlife in the wild, such as doing practical conservation work and watching animals in the wild, another activity which emerged as perhaps having special significance and potential in relation to biodiversity conservation was wildlife gardening. This was related to several Cognitive variables, the Identification indices, and choosing "use it sustainably" as the best way to preserve nature, as well as figuring prominently in the latent variables. These patterns were found linked to membership of particular wildlife/environmental organisations, notably the RSPB, the Wildlife Trusts, and, to a lesser extent, the National Trust. They may provide impetus to the development of experiential approaches to biodiversity education. However, they appear to have been somewhat confounded by individuals having multiple memberships, and strongly influenced by a sub-group of particularly active and knowledgeable individuals.

The other grouping variables appearing to have a particularly significant bearing on performance and categories of Cognitive, Activity and (a few) Affective variables were the interrelated ones of social class, education, and perhaps newspaper readership. All three were associated with the Biodiversity Understanding Index [BUX] and its primary constituent variables, and with specific Affective variables. Together class and education were associated with certain wildlife and environment-related activities. Social class was of greatest influence in relation to the latent variables, correlating, as it did, with Factors 1, 6, and 7, (the "inactive conservationists"; "non-biologist gardeners"; and "interested readers"), and respondents' formal educational level correlated only with Factor 1. Clearly, there must be many reasons for people's involvement in wildlife and environment-related activities, and hence for their active participation in conservation (Yearley 1996). This involvement also takes a variety of forms, and it may well depend upon the resources, financial, temporal and intellectual, which an individual has to hand. The main survey data tend to confirm this assertion, yet they do also point to variable groupings that may prove useful in developing strategies to increase public understanding and support *vis-à-vis* biodiversity.

By considering Tables 5.3 and 5.4 together with Table XXI (appendix I), the categories of respondent that present themselves, when considered in the context of their associated variables, pose potentially valuable questions in respect to the development of such strategies. For example, the 'biodiversity decision makers' (i.e. government officers and elected members) appear relatively inactive when it comes to physically doing things that relate to biodiversity. However, except for those associated with the "non-biologist wildlife gardener" domain, they do tend to have a comparatively good knowledge and understanding of the subject, and express a desire to be active conservationists. Assuming this represents the true picture, perhaps the key questions that need addressing, are how this group might be effectively moved to action, and which actions are most appropriate. Similarly, many respondents belonging to The Wildlife

Trusts member group, though active "wildlife watchers", tend to attain surprisingly average scores on questions dealing with the biodiversity component concepts. Yet they tend to be active wildlife gardeners (whether or not they are formally educated in the biological sciences). Could this membership and interest in gardening be exploited to provide this group with effective biodiversity education? Indeed, perhaps the objective for both these groups could be pursued through a focus on wildlife gardening. The same could not be said of the skilled-unskilled workers. They exhibited low levels of participation in wildlife/environment-related activities, particularly poor understandings of biodiversity, and were found to have consistently negative relationships with any Factor domains they were associated with. Of the groups considered in the survey, this one clearly provides the greatest challenge for biodiversity educators. One key question that presents itself for this group is the role that TV wildlife documentaries might be able to play in this respect; another is how this group's members might come to participate more frequently in real-life experiences of nature and practical conservation. In trying to address such questions attention will now turn to the means by which positive attitudes towards biodiversity might best be developed and maintained.

5:6 Chapter summary

This chapter has explored the patterns of understanding and support *vis-à-vis* biodiversity, and considered how these patterns might be related to membership of different types of group. Of the nine groups initially selected for study, the four including the district and county government officers and members differed so little in their data that they could be aggregated, whilst the data for the skilled, unskilled/semi-skilled, and estate worker groups were also combined for the same reason. The four resulting groups (i.e. conservation biologists, Wildlife Trusts members, officers/members, and skilled-unskilled workers) exhibited notable differences across many main survey cognitive, affective and activity variables. In most instances these differences were least between Wildlife Trusts and government officer/member groups (Table XXI, appendix I). With the exception of data for a handful of variables (notably: wildlife documentary viewing; giving money to environmental/wildlife organisations; dog ownership; reading about nature/wildlife; and "leave it to its own devices" as the best way to preserve nature) the skilled-unskilled worker group was consistently the least active, least knowledgeable and showed the least positive or distinct affective responses.

Comparison of respondents according to membership of wildlife organisations and socio-demographic variables suggested that, with the exception of the conservation biologists, many of these differences were most strongly related to one or more of the inter-related variables of: occupationally-based social class and level of formal education. With the exception of most cognitive variables, some variables concerning activity levels, and species identification accuracy, data for those respondents who declared themselves members of one or more wildlife/environmental organisation, did not differ much from that for non-members. Membership data patterns seemed explicable in terms of the objectives of the individual organisations concerned, but only those for The Wildlife Trusts and the RSPB were notably associated with wildlife/nature. Moreover, most organisationally related differences encountered were found to be due to data for a sub-group of particularly active respondents with multiple organisational memberships. These findings call into question the level of support that organisational membership represents for many people, and draws attention to the educational role of these organisations, topics that will be discussed in the next chapter.

In terms of their attitudinal dimensions, the main survey data, though suggesting public acceptance of the New Environmental Paradigm, presented little evidence for the existence of attitudes to biodiversity. They did however point to some 'constellations' of variables which characterise domains occupied by respondents, and which might prove valuable in addressing the 'need' to improve public understanding and support *vis-à-vis* biodiversity. They also bring the focus of attention to bear upon the last research question, namely, how more positive attitudes towards biodiversity might best be developed and maintained. Main survey data evidence have suggested a poor understanding of biodiversity, coupled with a widespread recognition of the need for more public education in relation to biodiversity and nature conservation. Different sources present themselves as being less or more effective in this regard. The next chapter will explore these sources in the light of this and other research evidence.

Chapter 6. The nature and sources of biodiversity education

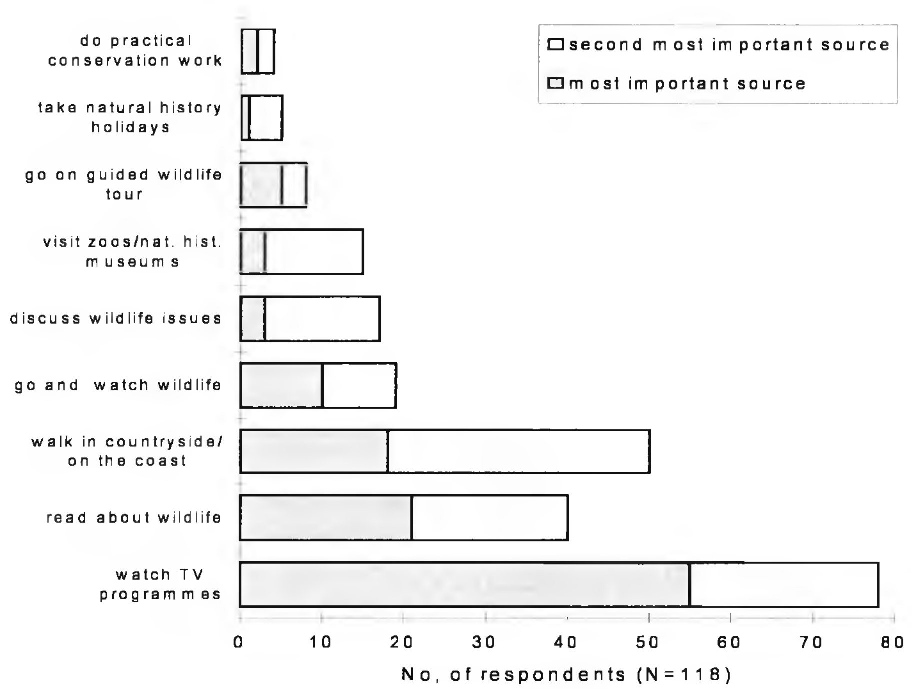
The preceding chapters have shown that the relationship between people's understanding of biodiversity and their participation in associated activities is neither particularly clear nor consistent, at least for the main survey sample. Evidence gathered in this research suggests that for the great majority of the main survey respondents, their knowledge and understanding *vis-à-vis* biodiversity was poor, and, although they expressed a considerable amount of interest in and positive feeling about nature and wildlife, they did little to directly help conserve it. There is no reason to believe that the same picture does not pertain to the UK population as a whole. Indeed, the Biodiversity Understanding and Wildlife-related Activity indices were associated with higher levels of formal education, and the main survey sample was skewed towards the better educated. Amongst the general public, overall levels of knowledge and understanding, participation and support, seem likely to be rather lower than those recorded in the main survey. Hence activities designed to promote public understanding of biodiversity appear to have had very little success in the UK.

These conclusions need to be considered in the context of the enormity and urgency of the problem of biodiversity loss as proclaimed by the *Convention on Biological Diversity* and its advocates. They should also be set against the commitments to increase public understanding and support that form a core component of the UK Biodiversity Action Plan (DoE 1994a) and much of its derivative literature. If the data provided by the surveys conducted for this thesis, plus the circumstantial evidence gleaned from other studies, are reasonably accurate, then the problem itself has yet to be translated into the public domain, and the increase in public understanding and support will have to be very substantial. Consequently, government organisations and NGOs will need to allocate substantial resources in trying to precipitate both. It is worth reiterating the main survey finding that 89% of respondents selected "educate people about it" as being amongst the three best ways to preserve nature, and 46% chose it as the most important; Moreover, that they did so irrespective of social class or level of formal education. This points to a widespread awareness of the importance of increasing public understanding for conservation purposes, and suggests that a significant amount of biodiversity education is likely to be publicly welcomed. In accepting this, the questions that must then be asked, concern the delivery of this biodiversity education, the subject of this chapter.

6:1 Survey respondents' sources of learning about wildlife

Despite few detailed studies to substantiate it, the educational value of experiencing nature and wildlife is widely accepted and consistently reported. Main survey data support this view in that better performances on Cognitive variables were associated with activities involving actual experiences of wildlife in the wild. As indicated by so-called ‘significant life experience’ (SLE) research (see section 2:1:3), the educational value of wildlife extends beyond a mere appreciation of the subject. In addition to teaching facts about animals and plants, wildlife is seen as helping people consider mankind's treatment of the environment generally and as encouraging them to take responsibility for their actions (Hair & Pomerantz 1987). Many authors (including Shaw 1987a, 1987b, Rolston 1989, Harrison 1991, Bostock 1993, Katcher and Wilkins 1993, and Kellert 1993) acknowledge the spiritual, emotional, intellectual, physical and social learning that can accrue from contact with nature. Those links between biodiversity understanding, wildlife-related activities, and environment-related activities (as indicated by a tendency to score consistently moderately across all these indices, Table XXVI, appendix I), coupled with the generally positive affective stance shown towards nature and wildlife, might reflect this sort of outcome. In regards to learning about wildlife, both main survey and Keoladeo survey data referring to self-declared sources of learning, suggest however that many people may not see actual experiences of nature as the most significant factor. Data for respondents' views, in being self-declared, must be treated with some caution because individuals do not necessarily have an accurate understanding of how they learn about things. Summarised in Figure 6.1, they are nevertheless worthy of consideration.

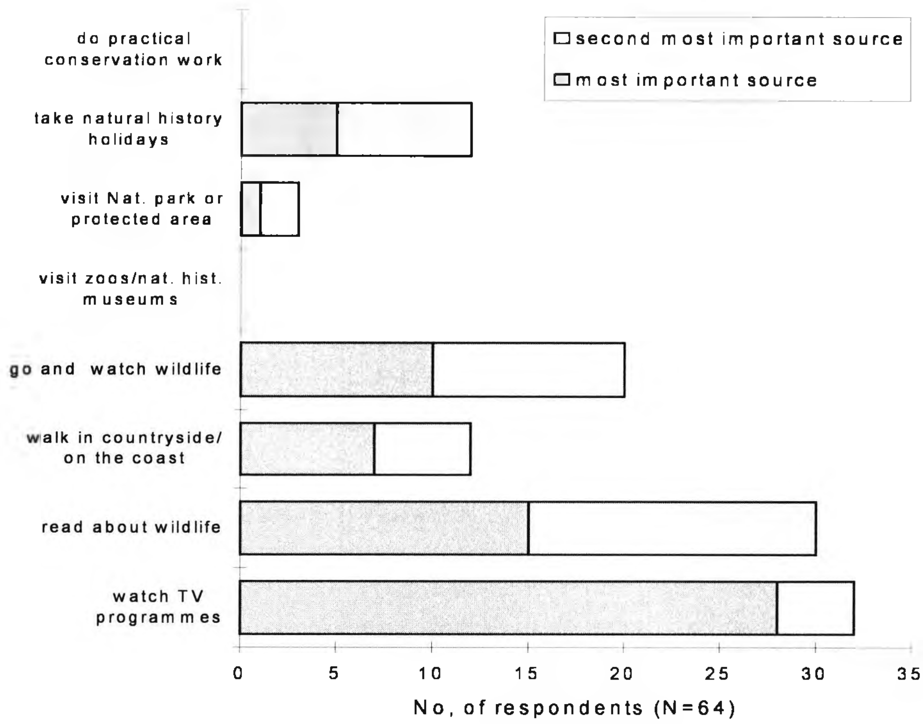
Figure 6.1. Self-declared sources of learning about wildlife. ADS responses to A2.



Watching TV wildlife documentaries and visiting the countryside are seen as the most important (Figure 6.1). Because wildlife documentary viewing and walking in the countryside were the activities respondents said they indulged in most frequently, it could be argued that this relative significance was accredited simply on this basis. This idea is further supported by the fact that the overall pattern 6.1 broadly reflects that of declared frequencies of participation (Figure 4.12 vs Figure 6.1). The consistency of these data with findings concerning sources of learning about the environment reported by Worcester (1994), suggest they are not merely the result of repeating responses to the preceding question. However, although frequencies of participation were not recorded in this study, the data might provide an indirect measure of this. TV was reported as by far the most important source of learning, with newspapers and magazines, the next most, and "family members" (roughly equivalent to main survey category of "discuss wildlife issues with family and friends") to be relatively unimportant.

Equivalent data for UK respondents in the Keoladeo survey (Figure 6.2) replicate this basic pattern, but give greater importance to direct experiences of wildlife. They also suggest TV and reading to be most important, and practical conservation work and visits to zoos/natural history museums/safari parks, to be of relatively little value. In contrast to the main survey, Keoladeo respondents accredited a rather more significant role to natural history holidays and watching wildlife in the wild, but this is not surprising, given the high proportion of keen birdwatchers in the sample (67% of the UK nationals were RSPB members) and given that the data related to a visit to an internationally recognised wildlife tourism destination.

Figure 6.2. Keoladeo responses to Q15. Self-declared sources of learning about wildlife.



Evidence provided by 'significant life experience' (SLE) research may be relevant here, in that it suggests the most powerful experiences in our lives are often not those designed to educate us (Newhouse 1990). The vivid images of memorable experiences of wildlife described by interviewees, and the clustering of these experiences in the 7-13 age group, imply that for many in the main survey sample, significant, formative experiences of nature might have played an important role in engendering positive attitudes toward wildlife. This interpretation is supported by the fact that "a positive wildlife experience" and "a close childhood relationship with nature" were of the few Affective variables significantly associated with wildlife-related activities involving direct experiences.

A degree of caution is however required in accepting this evidence as applicable to biodiversity. So-called 'significant life experience' data relating to the environment do not necessarily apply to wildlife or nature, and such data relating to wildlife or nature are not necessarily applicable to biodiversity. Indeed, the 'feather and fur', experientially-based, view of wildlife encountered in the main survey, might present major obstacles to the development of some positive biodiversity attitudes, for instance, in regards to insects, parasites or swamps. Similarly, experiences in urban parks that encourage positive attitudes towards the grey squirrel (*Sciurus carolinensis*) will be counter-productive for maintaining biodiversity because of the considerable damage this introduced species does to native fauna and flora. Studies do suggest that specially designed conservation education programmes involving direct experience can lead to increased appreciation, understanding, positive affect, and increased community involvement in conservation activities (e.g. Armstrong & Impara 1991; Butler 1991; Padua 1994; Traynor 1995; Múgica & De Lucio 1996). However, when looking across an individual's lifetime it may be impossible to separate the influence of 'significant life experiences' from that of designed learning experiences.

There are also issues to be addressed concerning the methodological reliability of SLE research. As Payne (1999) observes, there may be a tendency amongst respondents to construct or reconstruct the past in order to make sense of the present. So in seeking an explanation for why they behave as they do, regular participants in pro-environmental behaviours, might embellish, exaggerate, even invent, experiences. The issue therefore arises as to how experiences are individually or socially (even culturally or politically) constructed as 'significant' (Payne 1999). Notwithstanding these possibilities, 'significant life experience' research does appear to connect with an important aspect of human behaviour. Perhaps the most compelling argument in its favour is that the findings appear to speak to the experience of many scientists, educators, wildlife NGO members, and to interested members of the public alike.

Although it can only be reported as hearsay, virtually all the conservation biologists, wildlife enthusiasts, and other members of the public this researcher spoke to during the course of this research, were able to relate at least one experience of nature that they felt had been significant in precipitating their present interest.

Self-declared sources of learning are not, however, the same as significant life experiences. A person may have had a memorable experience which influenced the development of positive attitudes towards wildlife, yet may still learn most of what s/he actually knows from, for instance, reading books. Indeed, significant experiences are usually designated as such because they *are* infrequent and unusual, whilst patterns of learning often involve repeated activities. The importance accredited different sources can therefore be expected to be partly a function of levels of participation, so some correspondence between Figures 6.1, 6.2 and 4.12, is likely. Main survey data suggest that this is not the case in respect to learning about biodiversity from TV wildlife documentaries. However, they do point towards real life experiences of nature perhaps being a more effective means of learning about biodiversity. Scores on the individual component variables and the Biodiversity Understanding Index were noticeably higher and more numerous where the correlating variable involved real life contact with wildlife in the wild (Table XV, appendix I). The question remains however, as to whether the experiences themselves engender this, whether this process operates in the other direction, or whether they occur simultaneously. There is also the question of how applicable this conclusion might be to the specialist subject of biodiversity. Learning about wildlife is not the same as learning about biodiversity. Some parameters are shared, but many are not, and main survey results may have tended to record this area of overlap. Given the relatively recent appearance of the subject in the public domain, the number of learning opportunities targeted at the development of knowledge and understandings of biodiversity *per se*, will have been low. Consequently, as was found by the surveys, people's knowledge and understandings, are likely to be partial and necessarily largely constructed. Nevertheless, having explored a knowledge base and participation in a wide range of activities, main survey findings do suggest various sources that might be capable of providing effective learning about biodiversity. They also suggest others, which, though presently thought to be important, are perhaps not as effective as many people believe. Each of these will be considered in turn.

6:2 Potential sources of learning about biodiversity

6:2:1 The formal sector

In addition to many non-vocational courses on offer nation-wide, there is a small amount of subject matter relating to biodiversity in the school National Curriculum and rather more in a growing number of specialist programmes running in the tertiary sector. The group of conservation biologists surveyed with the main survey were graduates of one such programme. Unfortunately, few people participate in tertiary courses, and for reasons already explained (section 2:1:1), most of the non-vocational courses tend to deal only with identification (Thomas 1993). This leaves primary and secondary schooling bearing the weight of mass biodiversity education within the formal education sector.

Despite formal education being found to have a significant influence on environmental attitudes (Palmer & Neal 1994; Palmer 1998; Palmer *et. al.* 1999), its relationship to understanding, behaviour, and attitudes *vis-à-vis* biodiversity is much less clear. Evidence from the main survey ADS data pointed to a surprising absence of strong associations between levels of biology education and any wildlife-related activities. Biology education appeared to have some bearing on views about the best way to preserve wildlife and in relation to some of the variables making up the Biodiversity Understanding Index, but with the exception of perspectives on nature preservation and performances on Identification Accuracy Indices, respondents' level of general education (followed by science education) was a stronger predictor of Activity and Cognitive responses. As suggested earlier, this may be explained by the fact that much of the content of biology courses has little to do with biodiversity. The problem is, there may exist considerable barriers to increasing the proportion that does. Many schools suffer from an absence of readily accessible habitats to study, a lack of designated time-tabling for locally based fieldwork, large class sizes, and a lack of sufficient resources, including equipment and materials (Hale & Hardie 1993; Tilling 1993).

Hale and Hardie (1993) point out that ecological knowledge has been taught across the science and geography curricula for many years (which might explain the higher correlation coefficients between "general" educational levels and variables with an ecological aspect [C11 and C12] Table XII, appendix I), but it is questionable by how far this content can be increased. Biodiversity components are included in the National Curriculum. Key Stage 3 considers the causes of variation, classification according to the major taxonomic groups, the process of inheritance, and the relationship between organisms and their habitats, together with ways of protecting the environment. In Key Stage 4, students are taught in more detail about the origin of variation and how variation and selection may lead to evolution or extinction, as well as how the distribution and abundance of species in habitats comes about. This knowledge is also related to the human impact on the environment and to the importance of sustainable development (DfEE/QCA 1999, pp.107, 116). However, the type of knowledge taught in this formal, exam-oriented context, is essentially fact based. Moreover, despite the evidence from SLE research, plus many years of anecdotal reports suggesting that learning associated with 'in the field' settings is especially persistent (Tilling 1993), such activities are not a frequent feature of environmental and biological science learning in schools. Indeed, they often become one of the first casualties of efforts to reduce spending.

It does seem that considerably more could be done to educate about biodiversity within the formal educational context, including more experiential learning and consideration of local and national history from the point of view of patterns of biodiversity. Yet with multiple pressures on the National Curriculum and those who deliver it, it looks as though it will be difficult to incorporate biodiversity into the school curriculum as a specific topic of focus. It seems likely to remain a small element of other courses and as a specialist subject only in the tertiary and non-vocational sectors. What is learnt and remembered in the formal sector will hopefully have an influence in later life, but this in itself will not have much influence in respect to the major increases in understanding and support being sought. This will mean that the lack of correlation between levels of formal biology education and individuals' understanding of the subject of biodiversity found in the main survey is likely to persist. Furthermore, since the *Convention on Biological Diversity* and its derivative literature call for urgent measures, educating the public about biodiversity cannot rely solely on a 'trickle down' effect *via* the formal sector. It must be sought through more informal and immediate means.

6:2:2 Wildlife and environmental organisations

During the late 19th and early 20th centuries environmentalism was practically synonymous with wildlife conservation. Many conservation organisations were founded during this period, including the Society for the Protection of Birds (1889), the National Trust for Places of Historic Interest and Natural Beauty (1894), the Society for the Preservation of Wild Fauna of the Empire (1903), the British Empire Naturalists Association (1905), and the Society for the Promotion of Nature Reserves (1912). Following the period of 'scientific conservation' (Lowe 1983), during the 1970s and 1980s there was a rapid increase in the membership numbers of wildlife and environmental organisations and the appearance of new ones, including Friends of the Earth (1971), Greenpeace (1977), Plantlife (1989), and Earth First! (1991). Overall numbers have gone up dramatically from the 1.8 million, 1981 total. In 1999 there were roughly 4.6 million members of such organisations in the UK - although the pattern of multiple organisational memberships is not clear, so the actual proportion of the UK population who are members may be rather less than the 8% suggested by this figure. Since some of these organisations control considerable budgets, they can be seen as major potential providers of biodiversity education.

The situation is not, however, as straightforward as it might seem. It might well be the case, as Rose (1993) maintains, that those who belong to and give money to environmental NGOs do so because they see these organisations as fighting for causes which matter to them and want to support this work. However, the organisations themselves are constrained by factors that often come to operate in opposition to each other in the context of educating their membership and/or the public in general. To begin with, their remits are often very wide reaching. For example, most wildlife trusts were set up in order to promote "the enjoyment of nature" (Smith 1987, p.195) and to do so by providing information, interpretation activities, literature, and practical conservation in the form of saving sites and species. As Micklewright (1993) observes, this has resulted in NGO education usually meaning education in a very broad sense. Consequently, although many organisations conduct wildlife 'awareness' campaigns, for example, to encourage people to do simple things that benefit wildlife, they do not have much experience of dealing with complex scientific subjects such as biodiversity. More importantly however, because effective education involves increasing knowledge and understanding about the complexities of a subject, it often leads to an increase in a person's level of uncertainty as to what should be done. Organisational campaigns are however often oriented at eliminating uncertainty and at providing information as to the 'correct' course of action in order to encourage people to participate. As Rose (1993) points out, there is often a conflict between education which helps people understand that the reality is more complex than it seems, and campaigns which need to eliminate doubt and uncertainty in order to try and encourage people to take action they believe will be effective. Such actions include giving money, and since these organisations depend substantially upon the generosity of their members and the public (and often compete with each other for the same 'purses'), they are largely obliged to present a face of certitude. Few people give hard-earned money to an organisation that tells them that ecosystem processes are very complicated, incompletely understood, and that they therefore do not know whether the actions they propose will be successful. Indeed, the professional fund-raisers who now work for all the larger organisations (Rawcliffe 1998) would discourage indications that their organisation did not know the solutions to the problems it was concerned with.

Another important aspect of the role of NGOs in biodiversity education is suggested by Harrison's (1993) observation that although the scientific basis of the nature conservation is important, it is insufficient when it comes to convincing the public. This is understandable given the strong affective and moral aspects to many people's involvement with these organisations. Yet it also suggests that both the general public and NGO members tend to have a rather conventional view of the science involved. And with the 're-positioning' undertaken by many groups during the early 1990s, whereby they acknowledged a need to recognise their members wants (Rawcliffe 1998), the educational opportunities for developing understandings that challenge this view, may have diminished. Circumstantial evidence provided by Canon *et. al.* (1996), suggests that because in some conservation organisations the scientific knowledge of employees has been considered less important than their skills, actual knowledge levels across these organisations is low. Not only is this sometimes reflected in their literature,[1] but as Yearley (1996) observes, many of those involved in such organisations are rather ambivalent about the 'scientific enterprise' itself. Furthermore, those who are scientifically trained tend to be involved in the scientifically oriented activities of the organisation (such as habitat surveys). This leaves the campaigning and communicating to non-scientists, with the result that science tends to be harnessed in a pragmatic, sometimes ambivalent, and occasionally quite inaccurate, way (Yearley 1996).

According to this picture of wildlife/environmental organisations, the main survey finding that members of many organisations did not exhibit significantly better than average understandings of the subject of biodiversity, is more easily explicable (Table XXII, appendix I). The complexity of the subject, coupled with the nature of these organisations and their memberships, and the position of science within them, combine in such a way to make the learning experience associated with them, rather simplistic. Even many Wildlife Trusts members, although quite good at naming species in response to questions C23-27, poorly understood quite basic parameters relating to biodiversity, such as the species concept. In addressing the demands of Biodiversity Action Plan implementation, the challenge for such organisations, will therefore not only be to educate their audiences, but to educate themselves.

Of course, the sorts of difficulties in educating about biodiversity within and outside environmental organisations are likely to differ for each organisation. One significant factor might be the political ideological leanings of members. Researchers have found higher levels of environmental concern to be associated with leftist political ideology (Scott & Willits 1994) or liberalism (Buttel & Flinn 1974; Springer & Constantini 1974). The suggestion is that this is reflected in patterns of organisational members. Hence, because the 'left wing' press has a greater coverage of the subject of biodiversity (Lacey & Longman 1997), this will be reflected in the understandings of members of certain groups. Main survey respondents had not been asked about their politics, but they had been asked to name the newspaper they read most often.

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[1] For example, the recent publication *Guidelines for Biodiversity Education* produced by the Council for Environmental Education (CEE 1997, p.4) contains an instance of a complete misuse of the term 'species'. Also, a survey commissioned by the Royal Society for Nature Conservation (GALLUP 1987) included a question which lists "animals", "fish", "birds" and "insects" as separate categories (p.15), mistakenly indicating that 'mammals' is equivalent to 'animals'.

So a comparison was possible between respondents who had declared 'right-wing' or 'left-wing' broadsheet readership.[2] Table 6.1 presents the findings, and points to some differences across the political left-right spectrum of broadsheet readers.

Table 6.1 FDS. Significant differences of responses by left/right-wing broadsheet readers.[1]

Broadsheet - political association

Variable	Mean rank		U value	Significance
	Right wing	**Left wing**		
A3F chosen non-animal-tested products	34.71	**43.18**	555.0	.0413
A5A dog ownership	**42.48**	33.59	546.0	.0243
A6D Greenpeace membership	34.40	**43.56**	542.0	.0021
B2J balance of nature	34.19	**43.82**	533.0	.0443
NEPX new environmental paradigm index	32.45	**45.42**	426.5	.0072
B4K usefulness	**40.93**	35.50	612.0	.0465
BUX biodiversity understanding index	33.42	**44.78**	500.5	.0256
Number of respondents	42	34		

[1] as indicated by the Mann-Whitney Rank Sum W Test. FDS=Full Data Set

Membership of the relatively radical organisation Greenpeace was disproportionately associated with 'left wing' readership, which might be expected. Other significant correlations indicated higher levels of declared acceptance of the New Environmental Paradigm (mainly due to the "balance of nature" subscale) amongst 'left wing' readers, and more utilitarian view of nature amongst 'right wing' readers. The 'left wingers' also appeared to be more concerned with the testing of products on animals. However, overall, in terms of Affective, Activity and Cognitive variables, survey findings tend to agree with the observation made by Pepper (1996) when discussing modern environmentalism, namely that it is a practice drawn from both the left and right parts of the political spectrum.

In relation to biodiversity, the specific correlation of higher Biodiversity Understanding Index scores with 'left wing' broadsheet readership is interesting for it might reflect a relationship between newspaper content and understanding of biodiversity. This is discussed in the section that looks at the mass media (6:3:4). What is to be stressed at this point is that the left-right political makeup (as measured by broadsheet press readership) was remarkably undifferentiated between the main NGO organisations represented in the main survey sample. Furthermore, because levels of understanding of biodiversity appear to vary little across the different organisations (with the exception of the Wildlife Trusts and the National Trust), the question as to what education specifically concerned with biodiversity any of these organisations is

[2] Where 'right-wing' included The Times and The Telegraph, 'left-wing', The Guardian and The Independent.

conducting, must be raised. A review of membership literature and organisational websites suggests the answer is that it is very little.

Within environmental and wildlife organisations there may be good opportunities to communicate the relevant science more effectively, and understand the uncertainties which surround actions to conserve biodiversity. One means could be *via* the many study days, courses and other interpretative activities these organisations are already involved in, particularly with the great upsurge in interpretation predicted for the future (Barrow 1993). However, a review of the Kent Wildlife Trust study days for 2000 and 2001 reveals little that concerns biodiversity as such. Just one of 22 days on offer in 2000, and 2 of 25 in 2001, do not involve a traditional natural history, species identification, approach. Even those that take a different approach, consider a specific habitat from a similar 'inventory' perspective. In other words, they are all firmly set in the naturalist tradition and restricted to an appreciation of one aspect of biodiversity, that of species diversity. Perhaps this reflects the demands made by members, perhaps also, the attitude towards wildlife that permeates the organisation.

Through their involvement in environmental and wildlife organisations, people may be able to become active in campaigning or practical conservation work in connection with biodiversity at local, national, even international wildlife sites. At the national or international levels, the opportunities are generally fewer, so that giving money, visiting sites, and participating in nature-oriented holidays, are probably the only realistic options open to most people. However, some of these activities do not necessarily benefit biodiversity in an unambiguous way. Visits to wildlife sites may increase revenue to be used for the purpose of conservation, but the negative impacts of visitors might lead to an overall net loss of biodiversity. Similarly, the benefits of practical conservation work are often complicated, because different forms of management favour one type of diversity over another. For instance, bird species may be encouraged over butterfly species, phyla over genera, or habitat diversity over community diversity. In considering these and the other issues faced by wildlife and environmental organisations, it seems that realising their potential to educate about biodiversity will require that significant attention be paid to their present and future approaches.

6:2:3 Zoos and natural history museums

Both the zoo and the museum have had a long and varied relationship with the public. The first UK zoo for instance, the Tower menagerie was opened to the public in the early 18th century on the payment of three-half pence or a cat or dog to be fed to the lions (Blunt 1976). It functioned, along with that of travelling menageries that organised fights between animals, as a show-ground for what was considered public entertainment at the time. In contrast, the Zoological Society of London, which formed London Zoo and the Natural History Collection in 1826, was established primarily by scientists for the purpose of studying living and preserved animals. The scientific basis of the enterprise was reflected in the fact that both zoos and museums were built to systematically illustrate the divisions of natural history according to the then-established typology (Hooper-Greenhill 1992). Indeed, for many years the zoo did not admit the poorer classes in order to "prevent contamination" of its studious ambience (Blunt 1976, p.32). Down the years, zoos and natural history museums have had a confusing relationship with education. In the UK this confusion is evidenced in law, so that collections of stuffed animals are designated as educational - and thus VAT exempt - but collections of living animals are seen as entertainment - and therefore subject to VAT (Ironmonger 1992). Nevertheless, for the past 30 years modern UK zoos have seen themselves as fulfilling three principle functions: conservation, research and education.

For a long time the educational role of the zoo and museum was largely assumed, it being accepted that simply seeing animals on display imparted some useful understanding of the natural world. With the changing perceptions of the environment and nature that took place during the 1970s and 1980s, there was a growing realisation of the need to communicate more effectively with the public. So the institutions underwent a great deal of scrutiny and change. To date, a considerable research literature has been produced which considers many aspects of the learning experience associated with zoo and museum visits. They include for instance, detailed studies of the design of exhibit labels to ensure their attractiveness, ease of reading and best level and density of content (Serrell 1988). Similarly, visitor behaviour has been widely studied. It has been looked at in relation to the objects of interest themselves (Surinova 1971), the way in which they are presented to the public (Peart 1984), the wider zoo/museum environment, and the relationship between visitors and the zoo/museum professionals. The 'cased specimen', 'tiled toilet', and 'rocking bear' images are becoming a thing of the past, and articles now talk of a 'third generation' exhibits, which in zoos are designed to foster natural behaviour in captive animals, and involve visitors in a more interactive experience (Schettel-Neuber 1988).

Undeniably, as Chadwick's (1980) comprehensive review demonstrates, a great change has taken place in the way in which zoos and museums view and undertake their educational role. It can be illustrated by the difference between the behaviour of visitors in the National Zoo's Reptile House (USA), where Marcellini and Jenssen (1988) found visitors spending on average just 8 minutes looking at all 74 exhibits, and the 'behind the scenes' visitor experience provided at Dallas Zoo Reptile House, whose success in attracting and holding visitors' attention is described as "spectacular" (Murphy & Mitchell 1989). This 'holding power' over visitors is now considered in terms of many aspects of exhibit design (see Bitgood, Patterson & Benefield 1986; Bitgood & Patterson 1987). These include the size and novelty of the animal/exhibit, its movement, closeness, and visibility, the associated signs and graphics, the architecture of the surrounds, and the presence of visually competing stimuli. As a result, modern museums and zoos now market themselves as products, try to acknowledge their 'target audiences', address the needs of their 'consumers' and offer a 'holistic', often high-tech, experience (Hooper-Greenhill 1992).

In regard to their educational success, the evidence is not solidly in favour of zoos and museums. For instance, despite data suggesting that zoo visits by young children have a formative influence in teaching protective care and concern for animals (Kidd, Kidd & Zasloff 1995), Kellert (1989) found zoo visitors scored markedly lower than other groups on scales measuring their biological and ecological understanding of animals (see also Kellert & Dunlap 1989). Similarly, Birkenshaw (1994) found no knowledge increase associated with a visit to the £5 million, high-tech, *Ecology* exhibit at the Natural History Museum. Main survey data seem to confirm these findings, with the frequency of visits to zoos/museums correlating with a better than average performance on none of the Cognitive variables. On the other hand, research has found formal educational visits where teachers have systematically prepared beforehand to be associated with significant knowledge gains (e.g. Marshdoyle, Bowman & Mullins 1982; Gutierrez de White & Jacobsen 1994). Live animal demonstrations have been recorded as having the same effect (Heinrich & Birney 1992). In these instances it is not possible to separate the effects of the teacher's activities from those of the visit itself, but pre/post-visit data from zoos with active educational departments have found significant increases in knowledge levels to be associated with non-formal zoo visits (Everitt 1995; Broad 1996).

The picture is therefore complicated. Evidence suggests knowledge and understandings gains may develop in the zoo/museum context, but this seems to depend upon the provision of structured activities that visitors, whether formal or informal, will willingly participate in. Many zoo/museum educators however, agree with Sommer's (1972) argument (reaffirmed by Hooper-Greenhill 1994a), that much of the learning associated with zoos/museums is intuitive and rarely factual. It seems that the fundamental 'problem' with these institutions, is that many people, perhaps most, go along simply to be entertained and/or use the exhibits and animals as a background for the social event in which they are participating (Wolf & Tymnitz 1981). Consequently, the learning experience is usually of an informal "leisure-learning" type (Hooper-Greenhill 1994b, p.21). Critics of the educational aspirations of zoos and museums, such as Shortland (1987, p.213), argue that whenever "education and entertainment are brought together under the same roof, education will be the loser". This is a view supported by Castillo-Alvarez's

(1988) study of science centres, which concluded that they contribute little in promoting a better understanding of science and technology. Other authors are even more disparaging, for instance, arguing that zoos destroy the "dualism" of gaze which is said to be part of the essence of the relationship between man and animal (Berger 1980, p.256), that they reinforce an image of Man's dominion over nature (Singer 1983), or that they cruelly frustrate the animals' natural activities (Ryder 1989).

There are very considerable numbers of visitors to zoos and natural history museums each year. Of an estimated 620 million zoo visitors world-wide *per annum* (IUDZG/IUCN 1993), 13 million visits take place in the UK (Zoo Federation 1999 *pers. comm*). London Zoo sees over a million people through its turnstiles each year (ZSL 2000 *pers. comm.*), whilst the Natural History Museum, with 1.7 million visitors, boasts itself to be the single most popular tourist attraction in the UK (NHM 2000 *pers comm.*). Zoos and museums seem to provide potentially valuable environments for teaching about biodiversity, despite the highly informal context in which this often takes place. As evidence provided by MacDonald's (1996) study of visitors to the *Food for Thought* exhibit at the Science Museum seems to show, it may not be difficult to teach people about science in such contexts because they are usually interested and want to learn. MacDonald argues that it is only difficult to teach people about subjects they *perceive* as complicated and difficult. This suggests that providing effective biodiversity education is a question of addressing *how* the science/public 'divide' is bridged.

Perhaps zoos and natural history museums should each be considered as different learning environments, given they are so fundamentally distinguished by the presence of living animals (although they do not necessarily have to be so). They might therefore be each better at encouraging different aspects of biodiversity education. Both have moved away from the taxonomically based presentations that encouraged zoos to be seen as little more than living museum exhibits. Many zoos and museums are developing an image of themselves as biodiversity institutions *per se*, and are asking questions as to what they want to achieve with their visitors (Whitehead 1995). However, outside the context of formal educational visits, zoos and natural history museums face a very considerable challenge in educating their audiences about biodiversity and biodiversity loss (Wheater 1995). It may be possible to overcome these, but a lot of research needs to be conducted. Perhaps VAT exemption for zoos that develop themselves into predominantly educational institutions could provide an impetus, but they might first have to prove they have done so, and this would require significant research and resource inputs.

6:2:4 The role of the media

In terms of levels of access to people, the mass media clearly provide the best tools for mass environmental education (Sandman 1974). Chan (1998), for instance, found the mass media to be one of the major means of exerting social pressure to conform to a pro-recycling norm. It is also said to have been highly influential in encouraging 'green' consumerism (Hansen 1993), whilst notable growth in concern has been found to follow certain major events. For example, the marked increase in levels of concern between Young's 1985 and 1986 studies (Young 1986, 1987), followed the accident at the Chernobyl nuclear power station.[3] The media are also said to have been highly influential in awakening Europeans to the trans-national nature of pollution and the potentially catastrophic environmental effects of sophisticated technologies (Neale 1993). Similarly, media coverage of the international debate surrounding the specific disaster of the wreck of the *Exxon Valdez* in March 1989, is thought to have influenced the "culture shift" which helped precipitate the unexpected success of the Green Party in the 1989 European elections, and the political rhetoric on environmental issues which followed (Grove-White 1991).

Findings of Lacey and Longman's (1997) investigation of newspaper coverage of environmental issues also suggest that UK mass media plays an important role in setting and maintaining the public environmental agenda, as does evidence from MORI (Worcester 1993), which found people to recognise TV, newspapers and magazines as their principal sources of information about environmental issues. Main survey and Keoladeo survey data positing TV and reading as the respondents' most important source of learning about wildlife appear to support this view, although their role in relation to learning about such issues, is not straightforward.

Much of the research on media coverage of environmental issues has concerned news reports or specific events, such as accidents with major environmental consequences or natural disasters (Hansen 1993). This is because those conducting it have been primarily interested in the way in which news is assembled by the media and the mechanisms by which things become newsworthy. The research suggests that environmental issues, like many others, are constrained by short-term pressures on time and space, and by the need to emphasise the latest events and those deemed most newsworthy. Almost by definition, news of a long-term degenerative process is not new, and therefore not 'news'. Unfortunately, this means slow processes such as global warming or biodiversity loss need to be 'hung' on particular events, such as major storm damage or the loss of a particularly remarkable species. 'Symptoms' are newsworthy, not the 'disease'. Evidence concerning the television coverage of the 1984/5 Ethiopian famine (Philo & Lamb 1990), does

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[3] The chemical disaster at Sandox, Basel, Switzerland, also occurred in 1986, in November (Tolba & El-Kholy 1992), but the SCPR survey data would already have been collected.

suggest that although news editors have considerable influence in deciding 'what is news', issues can force themselves past these 'gatekeepers' onto newspaper pages and television screens. Yet, once again, such occurrences relate to out-of-the-ordinary events, rather than continuing ones. Furthermore, because the media tends to pick up, simplify, and drop issues very quickly, even those sections that report environmental issues, may only serve to raise people's awareness about them, and little more (Ramsey & Rickson 1976, Lacey & Longman 1997; Hannigan 1995).

As well as particular aspects of the story itself, the perceived risk and the level and type of public concern have a bearing on the process of issues entering the media. Research suggests that "practical life lived locally determines the sense that people make of media texts" (Burgess & Harrison 1993, p.218). In other words, people evaluate media claims according to their own cultural values, experiences and knowledge. Here again, the social constructionist position seems significant. However, in considering the media coverage of biodiversity, the question of people's evaluation of the ideas and debates presented to them is largely irrelevant because media coverage of the issue has been minimal (Lacey & Longman 1997). Readers and audiences therefore have not had information to make sense of. This does not mean that they are unable to learn about biodiversity from this source. Indeed, it can be argued that there has never been a systematic attempt by the media to educate the public about any particular environmental issue.[4] It seems rather, that environmental coverage by the media generally reflects the way the sector is organised and operated. It approaches knowledge in a particular way, and tends to reproduce the dominant social paradigm (Pirages & Erlich 1974) whereby the values embodied in most programming and newsprint are those of environmental exploiters rather than conservationists (Newhouse 1990).

There is said to be one notable exception to the generally poor coverage of environmental subjects in the media. This is the television programming that deals with nature and wildlife. In relation to the public understanding of science, Gregory and Miller (1998, p.121) describe such programmes as "the triumph of television science". Across all channels and in prime-time viewing slots, audiences are presented with increasingly sophisticated pictures of the intimate details of the lives of a great range of species. Viewing figures confirm their popularity, with wildlife documentaries regularly achieving between 2-3 million viewers (BARB 2000). Despite their audience figures, what educational effect these wildlife programmes have however, is unclear. It seems likely to differ with each viewer, and the research evidence is inconsistent. Langenau *et. al.* (1984) argue that attitudes to wildlife are shaped most strongly by the mass media, whilst Secord (1996, p.457) states that there is "considerable evidence" that people's attitudes towards such animals as wolves,

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[4] The position taken during the last two years by the Independent newspaper against genetically-modified organisms, is a notable exception. Unfortunately its effects do not appear to have been studied.

bears, sharks and other large carnivores have been transformed through the cumulative effect of filmed documentaries (although neither indicate what this evidence is). It seems plausible that endearing images of fox or bear cubs playing will help counter perceptions of them as dangerous vermin, and both main survey and Keoladeo data found wildlife documentaries to be by far the most frequently declared "most important source" of learning about wildlife. However, main survey data and other evidence suggest this learning might not concern knowledge and understanding of biodiversity.

Burgess (1993) reports a heated debate between conservationists and makers of natural history programmes as to how entertaining their documentaries should be and how far they should raise awareness of threats to species and habitats. Amongst others, Sir David Attenborough himself is accused of "representing a false and unreal picture of a world 'brimming with animals'" (Burgess 1993, p.53). Her argument is that the wealth of images people are presented with, lead them to see their own local wildlife as boring, and, as she has found, cause them to be bitterly disappointed when they visit it and fail to see what has been revealed to them on their television screens. Perhaps the massive overestimates of species richness recorded in the main survey, reflect this false perception. Main survey data related to levels of wildlife documentary viewing, certainly point no better understanding of key parameters of biodiversity being associated with this medium (Table XV, appendix I). This might simply be due to the content of these programmes being inappropriate, but the lack of associations between higher frequencies of viewing and performances on any of the Identification Accuracy Indices, tends to indicate otherwise. With so much of wildlife programming being about particular species, people who watch a lot of these programmes would be expected to be able to identify at the species level with some accomplishment. The data suggest very little of this sort of learning is associated with these programmes. Indeed, even research that associated positive attitudinal changes with the watching documentaries (Fortner & Teates 1980), found these changes to have disappeared after two weeks. Perhaps there is something in the nature of the wildlife documentary, perhaps something in the act of television viewing itself, which makes it little more than entertainment and disables the capacity of many people to learn from it. In many instances wildlife documentaries seem to be more about the cleverness of the people who make them, and about providing audiences with essentially 'human' stories about sex, violence, eating and death., than they are about teaching about their actual subjects. It is tempting to accept, as Rolston (1987) does, that TV and other images are a poor substitute for the immediacy of the aesthetic experience of wildlife in the wild, and therefore bound to provide less effective means of learning. However, it is also true that commercial programming specifically designed to educate about the subject of biodiversity and biodiversity loss, has not been made. So along with other types of mass media, as a vehicle for educating about biodiversity, the wildlife documentary may hold some potential. However, it clearly needs developing in particular ways if its contribution is to be a really valuable.

6:2:5 Gardening

As a possible source of learning about biodiversity, gardening was a topic that emerged from the main survey data set, rather than having been identified at the outset. It was consistently correlated with key variables and was an important component of two Factor domains (Table 5.3). Although gardening has long been a popular pastime in the UK, in recent years it has undergone something of a renaissance. There are many more gardening programmes shown on television than there were twenty years ago, and a some of these occupy 'prime time' slots, appearing to be more popular than wildlife documentaries. For example, in the week ending 2/7/2000, *Gardener's World* (Fri. 20:32) was the most watched BBC2 programme (3.2 million viewers), and *Charlie's Garden Army* (BBC1, Fri. 20:00) was watched by 4.6 million (BARB 2000). When considered in the light of the main survey findings, the growth in interest this reflects, suggests that gardening may provide a valuable means of educating about biodiversity. It was positively associated with many important Cognitive variables, as well as the overall Biodiversity Understanding Index (Table XVI, appendix I).

The half a million small gardens in the UK, which are estimated to cover an area of over a million acres, constitute the largest "nature reserve" in the country (Baines 1985). They might also be regarded as forming an enormous classroom in which many people already spend a considerable amount of time. In addition to its proven recreational benefits, gardening has been found to involve a positive orientation towards nature, notably in Kaplan and Kaplan's study of the psychological aspects of gardening (Kaplan 1973). Although the research was conducted amongst readers of *Organic Gardening and Farming* and members of the American Horticultural Society (and therefore skewed), respondents ranked "nature fascination" second highest behind "peacefulness and quiet" and above "sensory aspects" (beauty, colours, smell) and "tangible benefits" (the 'joys of harvest') (Kaplan & Kaplan 1989, p.170). The results of the factor analysis of the main survey data (Table 5.3) also suggest that gardening may have special place as a biodiversity related activity, with the category "garden for wildlife" being the dominant activity in Factors 3 and 6.

Compelling evidence of the potential conservation value and interest of gardens also comes from Owen's 15-year study of an organic, urban garden in Leicester (Owen 1991, p.367). Owen recorded a phenomenal number of species: 166 native plant species, 1602 species of insect, 121 species of other invertebrates, and 59 species of vertebrate. Amongst these were 263 large moth species (about 30% of the species known nationally), 51 species of bee (20% of national species) and the 91 species of hoverfly (36% of national species). She even found 15 species of Ichneumonidae and 5 species of Serphidae, never previously recorded in the UK and another 4 species of ichneumonid new to science. Clearly, there are many more species in a well-designed garden than most people would want to identify, and the particularly poor performance of main survey respondents on the Insect Identification Accuracy Index may signal a large gap between what is actually present and what is known in almost any garden.

A further notable advantage gardens have for learning about biodiversity is their community diversity. Since no two gardens are alike in their structure or the species that live in them, each a unique biological community. This could provide a means of encouraging people to make efforts to conserve biodiversity on their doorstep, particularly if the indication that a high proportion (75% of the ADS) would like to own and manage their own wildlife site can be reliably extrapolated to the general population. Many people already have such a site. Perhaps they just need to realise that they do, develop an understanding of something of the processes that operate in it, and learn what to do in order to increase its biodiversity value. Gardens can involve the active management of habitats for biodiversity, alongside sustainable production and use, and thereby offer a good opportunity for people to do something tangible to conserve biodiversity and to learn about it at the same time. Gardens also have a great cultural focus, and seem ideal candidates for recognising the role of natural images in human culture, and exploring key biodiversity issues; For instance, whether to use exotic species (which may encourage many indigenous animal species but then escape the garden to occupy ecological niches of native plants and thereby exclude them), or the need to obtain wildflower seed locally (seed of distant provenance can potentially wreak havoc with the gene pools of local populations).

Probably the greatest attraction that gardens have to offer, is that it enables people to do things that directly benefit biological diversity. This can be creating a wildlife garden, or simply not keeping a cat as a pet, not using slug pellets, or building a pond and not stocking it with fish (they tend to exclude native amphibian species). In 1990 Gigliotti (1996), repeating a 1971/1981 survey by Thompson and Gasteiger (1985), found that over the 20 years there had been no significant changes in people's willingness to make real personal sacrifices to help alleviate environmental problems. It was the lack of connection between lifestyles and environmental problems that was identified as the major barrier, coupled with a lack of understanding as to what new behaviours needed to be adopted. Perhaps a systematic campaign to promote biodiversity in gardens would enable this connection to be made and simultaneously address Van Weelie and Wals' (1999) view that biodiversity is best learnt about experientially in one's immediate 'backyard'.

6:2:6 Experiences of nature and wildlife

Direct experiences of nature and wildlife can occur in a wide range of contexts both formal and informal. These range from residential school trips to Field Studies Centres, through visits to site-based interpretation centres and organised nature tourism trips, to maintaining a domestic back garden. Evidence from the main survey suggests that such experiences are associated with better than average knowledge and understandings of biodiversity, that they can be highly memorable, and that they can take place throughout a person's lifetime. A close childhood with nature and positive experiences of nature were not however unequivocally associated with wildlife-related activities, so the picture is not simple.

The term "biophilia" has been coined to describe "the innate tendency to focus on life and lifelike processes" (Wilson 1984, p.1). In *The Biophilia Hypothesis* (Kellert & Wilson 1993), Kellert (1993) discusses the concept of biophillia within the context of his typology of nine value dimensions that he has developed and tested over many years (Kellert 1980, 1986, 1987, 1989). He argues that some aspect of each dimension can be related to biophillia. These aspects include: the motivation to experience or to study the natural world (Naturalistic; Ecologistic-scientific dimensions); a love, respect or fear of living things (Humanistic; Moralistic; Negativistic dimensions); an important and powerful frame of reference for the development of language and communication (Aesthetic; Symbolic dimensions); or an evolutionary advantage *via* the exploitation and management of nature (Utilitarian; Dominionistic dimensions). His observations are reinforced by other studies. These provide evidence in support of the existence of biophillia in the form of biophobia[5] (Ulrich 1993), of the positive effect of natural environments on human health (Parsons 1991), and of the influence of landscapes (Kaplan & Kaplan 1989; Ulrich 1993) and animals (Katcher & Wilkins 1993) on psychological well-being. The question remains as to whether the tendencies referred to as 'biophillic' are actually innate or result from learning and experience, but the human response to features of the natural environment is widely accepted as having special characteristics (Heerwagen & Orians 1993).

How such experiences might relate specifically to the subject of biodiversity is difficult to fathom in the absence of research dedicated to addressing this question. In more structured contexts biodiversity education might be effectively developed through 'hands on' experiences aided by targeted interpretation materials, and using specialised educators or guides. The factor analysis in the main survey suggested no strong link between positive memorable experiences of wildlife and higher levels of knowledge and understanding of, and support for, biodiversity, but the experiences themselves were not oriented at learning about biodiversity. It seems probable that knowledge and understanding of biodiversity could be promulgated through the provision of properly supported 'significant life experiences' of wildlife and nature. And as with some of the other potential sources discussed in this section, it might simply be a question of developing the right approach and syllabus.

6:3 Discussion

> "I don't mean that appeals to emotions and intuition should always replace rational and materialistic arguments, [but] we should use every (ethical) tool at our disposal to minimise the damage to this planet"
>
> Soulé (1986, p.9).

Amongst the most striking features of conservation biology are its profoundly multidisciplinary nature and the considerable levels of uncertainty associated with its efforts to conserve biological diversity. Given this complexity and uncertainty, the need to employ a commonly understood language is particularly important. Of the most notable conclusions drawn from the Cognitive data set in the main survey was the poor understanding of concepts and facts fundamental to an understanding of biodiversity, concepts including that of species and basic ecological ones such as carrying capacity. The common language was not to be found. Many environmental educators, including Stapp *et al* (1970) and Newhouse (1990) argue that: "The job of educators is to ensure that everyone has all the tools necessary to make responsible environmental decisions" (Newhouse 1990, p.31). With as complex a concept as biodiversity, amongst these 'tools', a level of basic 'biodiversity literacy' must hold a position of special importance. Yet, as Bishop and Scott (1998) observe, although 'action competence' is seen as a crucial outcome of environmental education, many educators dismiss the place of science in relation to knowledge and understandings of environmental issues. The developments in environmental education, natural history and the public understanding of science debate described in Chapter 2, help explain why this happens. The discussion of the subject of biodiversity, with its characteristic history and development, shows why, for this subject, the place of scientists has been, and remains, paramount.

Biodiversity conservation is not simply the traditional species and habitat protection which many wildlife NGOs have been engaged in. It involves understanding many lesser appreciated concepts such as genetic and community diversity, the causes and consequences of extinction, as well as the

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[5] The etymology suggests that these two terms are opposites, indeed Orr (1993, p.416) understands them in this way but argues that whether or not there is a genetic basis, the affinity can be over-ridden. Ulrich (1993) however, in accepting the innate quality of biophillia understands biophobia as a negative form of biophillia.

way in which human societies and individuals can change their behaviour in the interests of biodiversity conservation. Biodiversity literacy is therefore fundamental, both to an understanding of the subject itself, and an ability to place it within a relationship with wider environmental issues. A broad public literacy must be at the heart of defining, reclaiming, and maintaining biological diversity, and, as Van Weelie and Wals (1999) argue, this literacy should be a key objective of biodiversity education. This is a view loudly echoed in respect to the environment in general by John Smyth, president of the Scottish Environmental Education Council, when he states:

> "I hope we are leaving behind the emphasis on environmental awareness.....and aiming for the later stages of environmental literacy, responsibility, competence and citizenship."
>
> Smyth, (1995, p.3).

As the nature of the science/public 'gap' in regards to public knowledge and understanding of biodiversity revealed by the main survey data suggests, an important aspect of any approach to developing literacy, is that it presents the subject to the public at the level of complexity that its theoretical foundation requires (Hargrove 1994). The theoretical foundations of biodiversity have been (and are being) firmly set by scientists, and so the scientifically defined concept of biodiversity is fundamental to the literacy that Smyth is referring to in the above quotation. Whether attempted through by environmental organisations, zoos, natural history museums, or the mass media, this literacy must sit on the bedrock defined by science. At the same time however, to paraphrase Orr (1992, p.108), it must also be a literacy which provides the tools and enables people to "make themselves relevant to the *biodiversity* crisis of our age" ......"and to live accordingly" (my italics). This means that as well as comprising a basic knowledge and understanding, it must embody aspects of biodiversity which science had traditionally eschewed, in particular the aesthetic, the ethical, the social and the cultural - those elements which input into individuals' formation of their own understandings and which influence their behaviours.

A useful tool in defining this wider form of literacy encompassing many non-scientific elements, is Stables' (1998) distinction between "functional literacy", that which allows the 'story to be read' (or a person to be defined as literate); "cultural literacy", that which 'everyone needs to know' (as expressed in developments such a national curricula); and "critical literacy", that which implies an understanding of the "cultural, social and political forces that shape the 'text'" (Stables 1998, p.157). Main survey data suggest that not even a basic functional literacy (a pre-requisite for the cultural and critical forms) was present amongst the large majority of the respondent group (and most probably in the wider regional and UK populations as well). The significance of the distinction between different levels of literacy could not therefore be easily explored within the survey data. Evidence from studies of environmental knowledge, attitudes and behaviour, do however, shed light on the matter.

Schahn and Holzer's (1990) comparative study of non-member and members of German conservation groups, suggests that this three-tier framework for defining literacy is useful, at least in relation to environment-related research. Their study developed several new scales but also used items from Maloney and Ward (1973), Weigel and Weigel (1978), and Van Liere and Dunlap (1981). When knowledge data were recoded into two categories distinguishing between "concrete" and "abstract" knowledge (with "abstract" knowledge defined as simply fact-based knowledge and "concrete" knowledge as knowledge that can be applied or can be related to action strategies), a compelling picture emerged (Schahn & Holzer 1990, p.773). Whilst abstract knowledge (broadly corresponding to functional literacy) was found to have little or no effect upon the relationship between attitudes and self-reported behaviour, concrete knowledge (broadly corresponding to cultural literacy) had a moderate effect. This finding points to a relationship between attitudes and behaviour that is not subject to factual knowledge alone. Similarly, Oskamp *et. al.* (1991) found general environmental information to be rather less associated with particular behaviour than was specific information which considered processes rather than facts, whilst Kaiser, Wölfing and Fuhrer (1999) encountered a strong correlation between understanding of the workings of environmental processes and general 'ecological' behaviour.

Unfortunately few of the other studies cited in this thesis differentiate what kinds of knowledge they discuss (Gray 1985). Neither do they provide sufficient information to enable this idea to be explored by correlating the abstract or concrete nature of their knowledge scales with a knowledge-behaviour relationship. Perhaps, as was the case in this study, scale items could not be differentiated in this way or levels of knowledge/understanding were generally so low as to lead to inconclusive findings regarding the relationship between knowledge, attitudes and behaviour. Yet the broad distinction between abstract knowledge/functional literacy and concrete knowledge/cultural literacy may simply demarcate that between knowledge and understanding. Dembkowski (1998) neatly (though apparently inadvertently) emphasises this distinction, when she cites Cope and Winward's (1991) conclusion that consumers lack an understanding of the connection between specific environmental problems and the behaviours which would ameliorate them, and then cites Kuhlke's (1993) conclusion of his meta-analysis, that environmental strategies which rely on information alone "are bound to fail" (Dembkowsi 1998 p.68). Perhaps they are, but this might be because knowledge and understanding are not the same thing. They are accompanied by, or correspond to, different forms of literacy. In addition, to be effective in precipitating changes in people's behaviour, this understanding has arguably to embrace the wider social, cultural and political aspects of the subject. It needs to be a "critical literacy".

Besides its use as an analytical tool, Stables' three-tier designation of literacy is useful in that it integrates Robottom and Hart's (1993) three paradigms for environmental education (Table I, appendix I) across another dimension (i.e. literacy). In so doing it may perhaps provide an effective means of bridging the science/public divide that is reflected in this schema. A functional biodiversity literacy can thus be described as one which includes knowledge of, for instance, what a species is, but also an appreciation of the wonder of nature or the beauty of a hoverfly in flight. Similarly, we can talk of a curriculum for biodiversity cultural literacy that places UK biodiversity within the natural history of the British landscape, Wordsworthian Romanticism (Stables 1998), practical urban gardening, or even the European Common Agricultural Policy. Finally, because it enables solutions that address the complexity of the subject, critical biodiversity literacy should form the ultimate objective of biodiversity education and the BAP implementation process. This literacy must posit the functional and cultural understandings of biodiversity within their wider cultural, social and political context, and enable people to take strategic decisions about their own actions support *vis-à-vis* biodiversity and biodiversity loss. Furthermore, looked at in relation to available research evidence (see above, Schahn & Holzer 1990, Oskamp *et. al.* 1991, Kaiser, Wölfing and Fuhrer 1999), a critical biodiversity literacy indicates that an approach to biodiversity education that is based purely on a scientific knowledge deficit model, would be severely inadequate. It also suggests that this education would requires widespread learning about conservation problem solving (Touval & Dietz 1994).

Considering potential sources of biodiversity education within this three-tier framework, suggests that different sources are better suited to different forms of literacy. Thus the constraints described for school-based formal education, presently allow little more than a partial functional biodiversity literacy to be developed, because as a subject in its own right, it is unlikely to get much attention. School, and other visits to zoos and natural history museums, might enable higher levels of biodiversity literacy to be achieved, particularly perhaps if they focus on the 7-13 year old age range. The problem with these institutions is that their approach to education seems to have reflected changes in the 'paradigm' of science communication; At one time, packaging and transmitting a particular image of science (Allison-Bunnell 1998), it now embraces a model that accepts that visitors 'construct' their own learning experience. The ramifications this has for biodiversity education are unclear, but it may result in a reduction of provision aimed at functional or cultural literacy, in favour of critical literacy. Unfortunately, since a critical literacy presupposes the other two forms are in place, and since main survey data suggest that even a good functional literacy is not associated with zoo or museum visits, for many visitors, such educational 'advances' might have been premature. This remains to be seen, but it is certainly an area that could benefit from large-scale evaluative research.

The potential of the mass media for teaching about biodiversity appears to be similarly limited. Although an association between newspaper readership and good performances on many Cognitive variables was encountered in the main survey data, with such poor press coverage of the subject (see 2:1:5), this was probably largely due to the intervening effect of level of education. The restrictions that the process of news production imposes on the coverage of biodiversity issues seem to exclude the likelihood of newspaper media engendering more than functional literacy in regard to certain aspects of biodiversity (e.g. the demise of a charismatic species). Yet, even in this role, newspapers could act as 'critical' educators, placing events within their wider social, political and cultural context. The recent campaign against genetically modified organisms conducted by the *Independent* may be an example of this. A similar point can be made about TV wildlife documentaries. These could quite easily offer functional or cultural biodiversity literacy by simply explaining basic parameters of biodiversity and by endeavouring to cover the subject in a detailed, and comprehensive manner, one relevant to the UK experience. Arguably, this could be done within the framework provided by the present genre of wildlife documentary and without diminishing the commercial value of the product. As to the potential of wildlife documentaries for offering a critical literacy, perhaps the combined natures of the industry and the viewing process, constitute too big a hurdle to overcome. Would programmes likely to make viewers feel uncomfortable or which seek to get them to change their behaviour, ever be produced?

Perhaps the best opportunities for developing biodiversity literacy are those grounded in direct experiences of nature. Whether these take place at a wildlife site or in a domestic garden they have the advantage of building upon the special attraction that a close contact with living things tends to hold for many people. With the rich social and cultural roots that the English landscape and garden both have, these contexts might also provide good opportunities for the development of critical biodiversity literacy. In the case of domestic gardens, there is the added advantage that people can actually do something to encourage biodiversity on their doorstep. A major problem with learning environments of this type, is providing an adequate educational structure in terms of materials and/or personnel. At a Field Centre, this might be possible, but in a domestic garden setting, most learners rely on what they experience. A few explore printed reference materials, and although many such materials are available for wildlife gardeners, there are presently none that engage with the subject of biodiversity, a least from a cultural or critical literacy perspective.

Perhaps the production of targeted materials and the spread of access to them via the Internet will go some way to address this, but if the process of biodiversity loss is to be addressed with some urgency, public education cannot rely only upon individuals directing their own learning; It will have to involve a component widely recognised as a mainstay of the biodiversity education process, the biodiversity educator.

Swan (1974) blames science educators for the lack of public scientific literacy, and may be right to do so. However, 'biodiversity literacy' is yet to be consistently defined, let alone developed in the public domain. So biodiversity educators can as yet be seen as largely innocent in respect to the lack of public understanding of the subject. As well as producing learning materials, it is the environmental/wildlife organisations who are already involved in teaching within the context of experiential learning. However, as the earlier discussion indicated, on one hand these organisations are constrained by their wide remits and the need to raise funds, whilst on the other, many of their 'educators' are either untrained as scientists, or are natural historians taking a 'species list' approach in the context of a study day (see 2:1:1 and 6:2:2). Many organisations recognise the need for their personnel to be good communicators. For instance, a recent study of 136 conservation organisations in the U.S.A. (Canon *et. al.* 1996), found a quarter to regard their employees' communication skills to be more important than scientific knowledge. As Aronson and Gonzales (1990) have shown, communication skills can sometimes be easily improved to dramatic effect. Such skills, are however, largely irrelevant in the absence of knowledge and understanding about the subject in question, and arguably, the organisations need to first educate themselves about the scientific concept of biodiversity. Biodiversity educators need to be in possession of a functional and cultural biodiversity literacy, and ideally, a critical literacy that reaches all the non-scientific aspects of the subject as well. Many individuals working in field study centres or educational departments of zoos, museums, and environmental/wildlife organisations, may fulfil these requirements, but often those who occupy these posts have been trained as educators rather than scientists. Moreover, if the delivery of biodiversity education is to take place on a scale large enough to address the importance of the issue as laid out in the UK Biodiversity Action Plan and its derivative literature, many more such educators will be required. They will need to be trained, not just as communicators, but to address much of the complexity of the subject, place it in its wider social, cultural and political context, and integrate the moral, aesthetic, and scientific arguments.

Although the idea might prove unpopular with those environmental educators who regard the subject of biodiversity education as their rightful domain, one group of people is already in possession of a good level of biodiversity literacy embracing science, aesthetics and the interaction between biology and society. These are the conservation biologists. They are not the stereotyped 'laboratory' scientists so many critics of science posit as an object of criticism, but are part of the multi-skilled 'community of workers' described by Soulé (1986). Conservation biologists are trained as scientists and work at the interface of biodiversity and human activities. Most importantly, they are people who delight in knowledge of the natural world and are driven by the very same sense of wonder and fascination that the main survey found to so thoroughly permeate the respondent group. They tend to have the functional, cultural and (sometimes) the critical literacy required for the job. Even if they are not trained in education and communication skills, they can be.

Advocating the promotion of conservation biologists as biodiversity educators does however bring with it its own set of problems. As the quotation from Soulé at the head of this section illustrates so well, amongst conservation biologists there is a tension between the recognition of the need to address the emotional and aesthetic aspects of people's relationship with nature, and the requirement of maintaining scientific objectivity. However, that which Green (1981) observes of conservationists in general, is equally true of the conservation biologists, namely that most seem to be driven by moral and aesthetic arguments. Soulé (1986) himself recognises this when he states that: "Everyone knows ardour and enthusiasm are inspiring, and that love of subject matter is infectious" (p.8). What he is arguing for is that conservation biologists use their advantage. They have the advantage of at least a cultural literacy in respect to the subject of biodiversity. Moreover, the promotion of the more even-handed species preservation which biodiversity conservation requires calls not only "for people to love tapeworms, termites, and toads" but also for biodiversity to enjoy "the same cachet as pandas and penguins" (Colwell 1994, p.221). Some conservation biologists have the advantage of already 'loving' tapeworms, termites, and toads, and of well appreciating the cachet of biodiversity. It is up to the conservation biologists and those who train them to ensure they are critically literate and able to communicate their passion without fear of losing sight of their science. Arguably, this can be done because much of science itself is about passion, beauty, the aesthetic; It is about wonder, fascination and delight in knowledge.

This discussion has highlighted the barriers and opportunities different sources provide to the development of widespread knowledge, understanding and support *vis-à-vis* biodiversity. The *Convention on Biological Diversity* argues that the problem of biodiversity loss is of such magnitude that there is a great urgency and need to act. If this is indeed the case, then it seems likely that as many sources as possible will have too be employed, and that the limitations associated with each, will have to be addressed. Given that different individuals learn more effectively in different ways, this might also provide the most effective means of reaching all the variety of audiences that have been identified in this study. Yet in employing a 'holistic' approach, the fact remains that the basic 'functional biodiversity literacy' (found to be so lacking amongst survey respondents), in being a pre-requisite for the development of the higher forms of literacy, cannot be ignored. What repercussions this has for attempts to implement the *Convention*, will be discussed in the next, and concluding, chapter.

6:4 Chapter summary

This chapter has considered the nature of and some of the principle vehicles for biodiversity education, referring to relevant data gathered in this and other studies. It has suggested that whilst some sources, such as TV wildlife documentaries, schools, and perhaps, zoos/natural history museums are of questionable value, others, such as, gardening and perhaps the activities of wildlife and environmental NGOs, may hold considerable potential, at least for developing a functional and cultural biodiversity literacy. The picture presented also points to a need for a considerable amount of research to be conducted in these different sources.

In the process of conducting this research and interpreting the data it has become clear to the researcher that a simple deficit model of public understanding of biodiversity is not sufficient in respect to conservation strategies that educate and involve the public. The problem is not simply one of a lack of information provision. Only a more 'holistic' approach addressing the different audiences, their characteristics, and the key characteristics of the learning sources employed, will succeed. It seems it will need to draw heavily on the wonder and interest concerning nature and wildlife, that most people seem to share. However, in line with the position taken by the *Convention on Biological Diversity*, the survey evidence also suggests that the need remains for a good and widespread level of understanding of biodiversity. There is a primary need for a basic functional biodiversity literacy, whilst both a functional and cultural biodiversity literacy have been accepted as a prerequisite for the sort of critical literacy necessary for effectively addressing the problem of biodiversity loss. The details of the content of this literacy will need to be worked out. This review of the potential vehicles that might be able to deliver it, suggests that a great deal of further work is needed in this area. The final chapter will conclude the overall argument, its repercussions, and suggest ways in which this work might be taken forward.

Chapter 7. Conclusions and recommendations

7:1 Conclusions

Engaging with the problem of anthropogenic biodiversity loss and efforts to halt it, and accepting the calls for an increase in public understanding and support as a necessary condition for doing so, this thesis set out to assess the nature of people's knowledge, understanding and support *vis-à-vis* biodiversity and biodiversity loss. It explored patterns in the relationship between the cognitive, affective and behavioural components, attempted to discover how these patterns might be affected by membership of different groups, and considered the potential of the sources of learning involved.

In line with the criteria for judging an exploratory study of this type (Strauss & Corbin 1990), though the research data were not derived from a stratified sample of wider or national populations, their validity, reliability and credibility, did seem acceptable. Data patterns were explicable and exhibited a great deal of internal consistency. Furthermore, these patterns appeared to be largely in line with circumstantial evidence provided by other studies, and hence likely to broadly illustrate the situation in the wider population. Expectations, which led to the original selection of the main survey groups, were only partially fulfilled, with data for some initial survey groups being so similar as to be more usefully considered in aggregated form. Nevertheless, some parameters, notably social class, level of formal education, expert understanding, membership of specific wildlife organisations, and participation in certain wildlife-related activities, did appear to be significant in relation to data patterns in the remaining groups. In addition, the concepts utilised in the study (notably attitudes, groups, paradigms, and subsequently, literacy) proved to be valuable tools of exploration and analysis. Perhaps most significantly in relation to research of this type, the theoretical position of the researcher changed during the research process, moving away from a simple deficit model, to one which integrated other perspectives. Overall, the findings appear to be important, and they have generated a substantial number of questions and hypotheses that can be addressed by future research. As such, the study admirably fulfils the principle criteria laid out by Strauss and Corbin (1990).

Addressing the first two research questions, those concerned with the nature and patterns of respondents' knowledge, understanding and support *vis-à-vis* biodiversity, this study produced many notable findings. Data pointed to a widespread lack of understanding of key concepts and processes, including the extent and consequences of extinction; basic ecological processes; the different forms of diversity; what defines a species as such; and the magnitude of species diversity locally, nationally and globally. They represent a situation in which the great majority of respondents' views of nature and wildlife appear to necessarily rely on their personal experiences and observations. As a result, these are often misconceived and appear to inhibit respondents from engaging with the issue of biodiversity loss, or identifying appropriate actions to help conserve biological diversity. In relation to their behaviour, although many main survey respondents declared themselves members of wildlife/environmental organisations, and despite the sample group including some keen wildlife watchers, besides a sizeable proportion claiming to have gardened for wildlife during the previous three years, few practical conservationists were encountered. Respondents did however consistently express a sense of wonder and fascination about nature, and a willingness to own a wildlife site. The great majority could also describe a memorable experience of wildlife, and these experiences took place across all age groups, with a notable peak in the 7-13 year age range. Attempts to distil 'biodiversity attitudes' from the data were however, not successful. This was probably due to such attitudes having yet to be clearly formed in the public domain, and this in turn being a result of the low profile the subject has had.

The overall picture is thus one of a poor knowledge and understanding of biodiversity, low levels of participation in activities designed to conserve it, and an absence of attitudes towards it, coupled with a great deal of interest in nature and wildlife generally. This pattern was found to vary, notably in relation to level of social class/formal education, such that skilled/unskilled workers and those with lower levels of formal education tended to be the least active, least knowledgeable, show more negative affective responses, and hold more traditional views about nature conservation. Membership of wildlife organisations was also associated with patterns of knowledge and behaviour. These tended to reflect each organisation's orientation, but understandings of biodiversity did not figure as highly as had been expected in this context. Indeed, organisational membership *per se* was found to have little influence in relation to many activity, affective and cognitive variables. Some of the domains usefully describing different sorts of 'conservationist', which the factor analysis revealed, did however suggest links with certain organisations.

Against the backdrop of these conclusions, the widespread calls to increase public awareness, knowledge, understanding and support, seem justified, but grossly inadequate. The basic text for implementing the *Convention on Biological Diversity* in the UK, the *UK Biodiversity Action Plan* (DoE 1994a), includes a fifteen-page chapter entitled "Partnership and Education", which emphasises the need to develop appropriates values and attitudes as a basis for building support for biodiversity. The importance of local communities in monitoring and managing biological resources is stressed, along with the specific roles that can be, and are being, played by nature conservation agencies, zoos and museums, wildlife sites, voluntary organisations, and both formal and informal education. Many individual actions and numerous collaborative efforts across different sectors are identified, as well as the government's responsibility in supporting efforts to promote an awareness and better understanding of biodiversity by: "developing a sense of wider public ownership for biodiversity; improving access to accurate and understandable information; and assessing and evaluating progress." (DoE 1994a, p.124). In addition to a call for widespread vocational training in relevant skills, there is also the proposal to:

> "Consider the publicity strategy to explain the meaning and importance of biodiversity and to explain what needs to be done to conserve and enhance it"
>
> DoE (1994a, p.125)

Some seven years later, neither the training nor the strategy have materialised. Moreover, the approach taken in this document appears to adopt a deficit model for addressing public understanding and support *vis-à-vis* biodiversity, yet says nothing about the nature of this deficit or the research required to clarify and monitor it. In essence, this biodiversity action plan identifies the problem of a lack of understanding, but encourages others to address it, and does so without engaging with the complexity of the issue or the need to study it. Perhaps not much more can be expected of this type of document, but since its approach has been incorporated into regional and local biodiversity action plans (e.g. KCC 1997 and CCC 1995), its legacy may actually hamper the BAP implementation process.

The findings of the main survey suggest that a very careful design and targeting of educational efforts will be required if local, regional and national Biodiversity Action Plans (BAPs) are going to succeed. They point to a need for a basic syllabus for functional/cultural biodiversity literacy to be established, for a biodiversity education 'campaign' to be conducted using several different sources, and for a monitoring process to be set in place to enable long-term evaluation of these efforts. They also suggest direct as opposed to second-hand experiences of wildlife will have a greater positive influence on the development of biodiversity knowledge. With some indication that children in the 7-13 age range might be a key group in which to develop positive attitudes to biodiversity, perhaps biodiversity education which involves experiences of wildlife/nature targeted at this group might prove particularly effective. Main survey qualitative data appear to suggest that these experiences need not be particularly unusual or exotic. Such activities could also provide a useful focus for furthering research that considers the role 'significant life experiences' play in the formation of positive attitudes towards nature and wildlife. These ideas require a lot more exploration, but look promising - more so especially given the overwhelming agreement amongst the respondent group that educating people was the best means of preserving nature. Many people might welcome widespread biodiversity education in a variety of guises.

Those involved in implementing the *UK Biodiversity Action Plan* and its progeny, also need to consider more seriously how appropriate attitudes to biodiversity in its entirety might be promulgated. Evidence from this and other studies, has suggested a widespread lack of any discernible attitudes to biodiversity, but points to the positive attitudes generally being held toward wildlife and nature providing impetus for developing such attitudes to biodiversity. Certainly a lack of negative attitudes that could prove difficult to sway might provide a good opportunity to develop positive attitudes (Kahle 1979), and in the absence of any attitudes related ones will have a more important influence on their formation (Rosenberg *et. al.* 1960).

The survey data sign-posted a strongly hierarchical valuation of livings things dominated by mammals and birds, one which favours species over assemblages, a vague notion of countryside/nature, and, amongst habitats, woodland. They suggest that a mass movement against biodiversity loss would be dominated by a preoccupation with certain individual species and particular habitats (Kellert 1987), a view supported by Kuitman and Törmälä's (1994) finding that students favour conservation of species well known and taxonomically close to man. Yet, as Nabhan (1995) warns, there are serious dangers in simplifying biodiversity conservation in this way. Biodiversity and endangered species are not synonymous, and biodiversity does not consist of a number of interchangeable parts. The vast bulk of the world's recorded species diversity belonging to the Class Insecta, and with even higher proportions of genetic diversity located outside bird and mammal taxa than mere species numbers would suggest (WCMC 1992), the 'feather and fur'/species focus may prove a major impediment to the development of positive attitudes towards biodiversity in its entirety. Similarly, attitudes associated with the animal liberation and animal welfare movements could provide another barrier because they tend not to discriminate between wild/domestic, overabundant/rare, or native/exotic species (Callicot 1987) - a point reinforced by the virtual absence of significant main survey data associations involving membership of the RSPCA. Clearly, unless there exist appropriate attitudes to highly destructive introduced species such as the grey squirrel (*Sciurus carolinensis*) and the mink (*Mustela vison*), support for moves to systematically eradicate them will simply not be forthcoming. So there may still be major difficulties to be faced in developing positive attitudes to biodiversity, notwithstanding the generally favourable regard and interest most people may declare for nature and wildlife. The development of such attitudes might be possible, but it is unlikely to be easy or straightforward. Biodiversity conservation must address the complexity and extent of the subject, and herein lie important challenges for biodiversity education.

Being able to make the sort of intelligible decisions about biodiversity issues (which the *UK Biodiversity Action Plan* suggests communities should be able to do), requires an understanding of the subject that embraces a significant extent of its complexity. A principle obstacle to developing this may be the divide between science and the public, although the particular characteristics of the subject of biodiversity might enable it to form an effective bridge between the two. To this end, Stables' (1998) three-tier concept of literacy seems a useful measure to employ. It implies that the challenge for biodiversity educators should not be posed simply as providing everyone with what they need to know (Challinor 1985). Instead, biodiversity must be made relevant to people's lives through the development of their 'cultural biodiversity literacy', and by empowering them to make appropriate decisions about their behaviour through the development of their 'critical biodiversity literacy'. It should be remembered however, that both are predicated upon a 'functional biodiversity literacy'.

In addressing the third research question, the review of the potential vehicles for providing biodiversity education revealed that different means may favour encouragement of different forms of literacy. It also found that not only were none of these means without some problems or disadvantages, but that, unless accompanied by a considerable allocation of resources and research effort, few could presently provide really significant opportunities for biodiversity education. Moreover, even assuming suitable vehicles exist, and that effective biodiversity educators can be found, be they teachers, guides, books, TV documentaries, or magazines, these educators will have to impart biodiversity literacy in its 'functional', 'cultural' and 'critical' forms, and address the relevant issues in their complexity across the science/public divide. Perhaps many individual educators will eventually emerge from amongst the 'community' of conservation biologists to fulfil this need. However, if the efforts deemed necessary to conserve biodiversity are to succeed, then this community will have to be substantially expanded and/or substantial training given to individuals from other sectors.

The title of this thesis asked the reader to consider the state of the UK public's understanding and support *vis-à-vis* biodiversity and biodiversity loss. In so doing, it posited the question as to whether this understanding and support was 'As dead as a Dodo', the common expression used to describe something utterly extinct or obsolete (OED 1993). The research findings suggest that although this understanding and support appears to be generally poorly developed amongst the public, like people's awareness of the Dodo's infamous fate, the basic prerequisites for developing an understanding which can lead to real benefits for biodiversity, are very much alive. These prerequisites are, in essence, a sense of wonder and fascination about the natural world. What is required, it was argued, is the equivalent of a widespread understanding of the detailed story of the Dodo. In other words, the development of a biodiversity education which addresses an understanding of the processes which lead to biodiversity loss, and which enables opposition to this loss to be translated into meaningful action. Conservation biology is a comparatively recent field, and there still needs to be a very considerable amount of research conducted in order to increase the science knowledge base (see Soulé & Kohm 1989, Cotterill 1995). However, even if this were quickly accomplished, the *Convention on Biological Diversity* and its derivative literature and actions will still be found wanting, unless that is, they are supported by a considerable amount of research into public understanding and support, and then, on the basis of the findings, reformulated accordingly.

7:2 A final word

In the process of carrying out this research, I came to realise that the sort of "deep motivation" Naess (1986, p.514) identifies, is vital to the slowing of the loss of biological diversity and is not only the motivation which many scientists have always had, but is driven by the same sense of wonder and fascination about the natural world that most people seem to share. I came to recognise the need for biologists to combine philosophical with practical arguments, overcome their fear of being labelled 'unscientific' (Naess 1986) and integrate science and passion in conservation education (Fleischer 1990). As Jacobson (1990) perceptively observes, we biodiversity managers, conservation biologists and biodiversity educators have to admit we have failed. To date, we have failed to make biodiversity intelligible and wonderful to a wider audience. We have been preaching to the converted rather than engaging the unconverted (Jacobson 1990). Hopefully, this thesis and its progeny can contribute to the process of identifying and overcoming some of the disciplinary and communication barriers which exist in our 'metadiscipline' and help set an agenda for the considerable amount of work ahead. Biodiversity education appears to remain a side issue even within the discipline of conservation biology, but a few individuals have been successful in bringing it further into the mainstream (e.g. Butler 1991) and providing evaluation frameworks for its implementation (see Jacobson 1987, 1090, 1997, 1998; Nagagata 1994) It should reassure us greatly to realise that the seventeenth-century sense of wonder documented by Whitaker (1996) is still with us. We conservation biologists must learn to treat this as a help rather than a hindrance. In the middle of the 19th century Henry Thoreau saw a sense of wonder at nature's complexity as the trigger for understanding the role of animals (including ourselves) in larger systems and as the basis for teaching our species a new world-view and a new code of behaviour (Norton 1994). Since then, many species have gone the way of the Dodo. Nevertheless, Thoreau may still prove to be right.

7:3 Recommendations

As stated at the outset, the ultimate aim of this thesis was to find means by which those demands of the *Convention on Biological Diversity* and its derivative literature relating to the United Kingdom (particularly the UK Biodiversity Action Plan) can be effectively met. If the *Convention* continues to provide a basis for our biodiversity strategies, and the hypothesis-generating objective of this thesis is to be met, there are a number of hypotheses which can be posited and some specific recommendations for research and biodiversity education which can be made.

7:3:1 Some hypotheses generated by this study

i. Public understandings of important components of the concept of biodiversity are largely constructed by individuals on the basis of observation and experience, but appropriate education would enable scientifically based understandings to be widely developed.

ii. Significant life experiences play an important role in the formation of positive attitudes towards nature and wildlife.

iii. Experiences enjoyed by the 7-13 age group have particular significance for the development of positive attitudes towards nature and wildlife throughout later life.

iv. Television wildlife documentaries are not an effective means of learning about biodiversity and its component parameters.

v. Wildlife gardening is a good means for learning about biodiversity.

vi. Pet ownership bears no relationship to people's knowledge, understanding, and behaviour in relation to nature and wildlife.

7:3:2 Suggestions for further research

i. Dedicated and comprehensive research should be conducted into public understandings and support *vis-à-vis* biodiversity and biodiversity loss (it being not sufficient to rely on findings from general research into environmental knowledge, attitudes, behaviour, and education). This should involve a "major bench-mark survey" of a representative sample of the UK population and gather baseline data of a similar nature to that gathered by the main survey (this would form the basis for developing a UK biodiversity education strategy).

ii. Benchmarks for 'biodiversity literacy' should be researched and established, and the UK population monitored in relation to them. Since 1993, the American Association for Advancement of Science (AAAS) has published annual *Benchmarks for Scientific Literacy.* The UK government and NGO community should consider doing the same for 'biodiversity literacy' and combine this with the development of an instrument to measure it (the results can also be utilised by government and NGOs as an additional 'sustainability indicator').

iii. The role of 'significant life experiences' of wildlife and nature should be acknowledged as being of potential importance in relation to the development of understanding and support, and should therefore be thoroughly researched (particularly in relation to the age of participants and the frameworks in which such experiences take place).

iv. Considerable efforts should be made to address the problem of why, despite the public's declared fascination with the diversity of life, and the apparent amateur interest in identification, research into systematics and taxonomy remains so badly funded and has such a poor image (Secord 1996). Funding for pilot taxonomic diversity education projects should be made available.

v. Many smaller, more narrowly focused research projects should be conducted to provide detailed information in relation to the implementation of the UK Biodiversity Action Plan. Topics might include:

The role of the wildlife television documentary in developing people's understanding and support *vis-à-vis* biodiversity.

The potential of wildlife gardening as a vehicle for biodiversity education.

An in-depth study of the relationship between biodiversity knowledge, understanding and biodiversity-related activism.

Assessments of the biodiversity education activities of NGOs, and the development and evaluation of dedicated biodiversity education projects by them.

The relationship between pet ownership and understanding and support regarding biodiversity conservation.

A consideration of what actually counts as biodiversity education.

An exploration of key age groups for learning about biodiversity.

A study of the biodiversity literacy gains associated with nature tourism.

vi. A comparative study should be conducted in a range of less developed countries of public understanding and support vis-à-vis biodiversity.

7:3:3 Suggestions for biodiversity education

i. NGOs and Government should collaborate to set up a scheme whereby biodiversity experts are trained to be better educators, and are widely used to perform this function with the public.

ii. Television gardening and wildlife programmes should be made with a specific focus of increasing public understanding and support *vis-à-vis* biodiversity (+ its effects on viewers should be studied).

iii. Museums, zoos, NGO wildlife organisations and government organisations should address the issue of biodiversity literacy (functional, cultural and critical), both in their practice amongst the public and within their own organisations.

iv. NGO wildlife organisations, and government organisations should explore the possibilities of using gardening as a vehicle for biodiversity education.

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Appendix I - Tables

Table I. Three images of environmental education (Robottom and Hart, 1993, p.26).

	Positivist	Interpretivist	Critical
Purposes			
view of environmental education	knowledge about the environment	activities in the environment	action for the environment
educational purpose	vocational	liberal/progressive	socially critical
learning theory	sometimes behaviourist	constructivist	reconstructivist
Rules			
role of goals of environmental education	externally imposed taken for granted	externally derived but often negotiated	critiqued
teacher's role	authority-in-knowledge	organiser of experiences in the environment	collaborative participant/inquirer
student's role	passive recipients of disciplinary knowledge	active learners through environmental experiences	active generators of new knowledge
curriculum supporters	dissemination of prepared solutions to environmental problems	external interpreters of the learner's environment	participants in new problem-solving networks
role of texts	pre-existing source of authoritative knowledge about the environment	pre-existing source of guidance about environmental experiences	emergent reports of outcomes of critical environmental inquiries
Knowledge and power			
view of knowledge	preordinate commodity systematic personal objective derived from experts	intuitive semi-structured personal subjective derived from experience	generative/emergent opportunistic collaborative dialectical derived from inquiry
organising principles	disciplines	personal experience	environmental issues
power relationships (PR)	reinforces PR	ambivalent about PR	challenges PR
View of research			
research is	an applied science objectivist instrumental quantitative acontextual individualistic deterministic	interpretivist subjectivist constructivist qualitative contextual/ individualist illuminative	critical social science dialectical reconstructivist qualitative contextual/ collaborative emancipatory
research design	preordinate/fixed	preordinate/ responsive	negotiated/ emergent
researchers are	external experts	external experts	internal participants

Table II. Results of discussions and review: principle parameters of 'biodiversity' (X = mentioned by the group/in the text).

Parameters	Diploma students	MSc. curriculum	Conservation biologists	Charity staff	Academic texts	Lay texts
Definition of biodiversity	X	X	X	X	X	X
The 'levels' of biodiversity	X	X	X	X	X	X
Genetic		X	X		X	X
Species	X	X	X	X	X	X
Community		X	X		X	
Habitat	X	X	X	X	X	X
Species richness	X	X	X	X	X	X
Endemism		X	X		X	
Variation-habitat/geography		X	X	X	X	
Causes of extinction	X	X	X	X	X	X
Consequences of extinction	X	X	X	X	X	X
Rates of extinction		X	X	X	X	X
Keystone species		X	X		X	
Ecological processes		X	X	X	X	
Conservation/management	X	X	X	X	X	X

Table III. Spearman correlation coefficients for main survey Aggregated Data Set socio-economic data variables.
Arrows indicate direction of ordinal ranks ↑=increasing, ↓= decreasing

VARIABLES	GEN Male/female	AGE↑	CLSF ↓	ED↑	SCI↑	BIOL↑	NEWSR↑	NEW2↓	RES↑
AGE Age ↑	-.0214								
CLSF Social class ↓	-.0246	-.1099							
ED Level of education ↑	-.0770	-.1556	-.7336****						
SCI Level of science education ↑	-.0076	-.1621	-.3359****	.5916****					
BIOL Level of biology education ↑	.1264	-.1136	-.2287	.4192****	.7500****				
NEWSR Quality newspaper readership ↑	.0292	.2147*	-.6474****	.5136****	.2254*	.2401**			
NEW2 Local newspaper readership ↓	-.0747	-.2145*	-.0183	.0648	.0935	-.1358	.0231		
RES Degree of rural residence ↑	.0946	-.0215	-.0276	-.0220	-.0348	-.0242	.0769	.0207	
PRAC Degree of religious practice ↓	-.0979	-.2616***	.0116	.0001	.0204	.0524	-.1464	.0991	.0076

Significance . * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table IV. Spearman correlation coefficients for ADS respondents' cognitive data indices indicating level of knowledge/accuracy of answers.

VARIABLES	C1x Biodiversity	C2x Levels	C3x Importance	C9x Species characteristics	C10x Habitats	C11x Changes British countryside	C12x Felling a wood	C13x Causes extinction	C14x Countries	C15x Rates of extinction	C16/17x Naming extinct	C19x How many?	C20x % known to science
C2x Levels	.4437****												
C3x Importance	.3613***	.2741***											
C9x Characteristics species	.3424***	.2759***	.2290***										
C10x Species richness - habitats	.3483****	.2221*	.2636****	.1033									
C11x Changes - British countryside	.4074****	.3496****	.1818*	.4506****	.1285								
C12x Effects of felling a wood	.3089****	.2772***	.1555	.3940****	.1459	.3316****							
C13x Causes extinction	.2512**	.1870*	.2460**	.3031****	.0864	.2532***	.1886*						
C14x Species richness - countries	.4281****	.2588***	.0787	.2611***	.0674	.2650***	.1832*	.1339					
C15x Rates of extinction	.2195*	.2646****	.1071	.0837	.1484	.1787	.0334	.1084	.0796				
C16/17x Naming extinct species	.5000****	.3770****	.3153***	.3228****	.3293****	.3569****	.2258*	.2415*	.2560***	.2662****			
C19x How many species?	.1256	.1235	.1228	.0486	-.0250	.0321	.1017	.0909	.1719	-.1737	.1108		
C20x % species known to science	.1955*	.1763	.1248	.1372	.1416	.0433	.1452	-.0064	.0675	.1506	.2293*	-.0272	
C21x Endemic species richness - countries	.1369	.1818*	.0994	.0896	.1917*	.0265	.1050	-.0093	.0172	.1516	.1056	.1715	-.1756

Significance. *- Sig ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table V. Significant partial correlation coefficients between BUX component variables. Based on ADS Cognitive data.

BUX variable	Associated variable	Partial correlation coefficient[1]
C1X- heard of "biodiversity"	C3X - importance	.199*
	C10X - habitat species richness	.230*
	C11X - changes to British ctry/side	.206*
	C14X - endemism	.352**
	C16/17X - name extinct sp.	.203*
C3X - importance of biodiversity	C9X - characteristics of species	.206*
C9X - characteristics of a species	C11X- changes to British ctry/side	.267**
	C12X - effects of felling wood	.212*

Significance. * - Sig. ≤ .05 ** - Sig. ≤ .01
[1] controlling for all other BUX component variables.

Note: The lack of an even distribution across some of the C* indices, throws the validity of employing the partial correlation coefficient into question (Elifson, Runyon & Haber 1998). The resultant findings should therefore be considered with caution.

Table VI. Spearman correlation coefficients for ADS respondents' wildlife-related activities.

	A1A	A1B	A1C	A1D	A1E	A1F	A1G	AIH	A1I
A1B Walk in countryside	.0622								
A1C Do conservation work	-.0040	.1366							
A1D Visit zoos/museums	.2525**	-.0302	-.1793						
A1E Take nature oriented hols.	-.0892	.1333	.2768***	-.0428					
A1F Watch animals in the wild	.0623	.1486	.0815	.0880	.2963****				
A1G Go on guided wildlife tour	-.0581	.0908	.2806***	-.0005	.4841****	.3721****			
A1H Give £ to wildlife orgs.	.0516	.0989	.0527	-.0014	.1445	.1807	.1691		
A1I Read about wildlife	.2360**	.2765***	.2015*	.0384	.3641****	.4121****	.2145*	.2654***	
A1J Discuss wildlife issues	.2510**	.2442**	.1797	.2497**	.2310*	.3533****	.2052*	.0802	.3625****

A1A Watch wildlife TV; A1B Walk in countryside; A1C work; A1D Conservation; A1E Vist zoos/ museums; A1F Take natural history holidays; A1G Watch animals in the wild; AIH Go on guided wildlife tours; A1I Give £ to organisations; Discuss wildlife issues

Significance. *- Signif ≤ .05 ** - Signif. ≤ .01 ***- Signif. ≤ .005 **** - Signif. ≤ .001 (2-tailed)

Table VII. Spearman correlation coefficients for ADS respondents' environment-related activities.

A3B Recycle plastic	.3087****									
A3C Recycle batteries	.1696	.0419								
A3D Chosen not to use car	.2128*	.1274	.1418							
A3E Bought env. friendlier products	.1904	.0082	.1218	.2108*						
A3F Avoid products tested on animals	-.0910	.0003	-.0461	-.1970	.1860*					
A3G Put food out for birds	.0280	-.1040	.1419	-.0582	-.0599	-.1090				
A3H Gardened for wildlife.	.2213*	.1529	.0475	.1490	-.0249	-.0852	.0070			
A3I Signed petition env./wildlife issue	.1380	-.0057	.0752	.1033	.1849*	.2337*	.0428	.0195		
A3J Written to MP/councillor wildlife issue	.1203	-.0013	-.0507	.0863	-.0783	-.0249	.0786	.3486****	.1068	
A3K Campaigned env./wildlife issue	.1448	.0750	.0938	.0830	-.0974	.0842	.0285	.1356	.1588	.2031*
	A3A Recycle paper/glass	A3B Recycle plastic	A3C Recycle batteries	A3D Chosen not to use car	A3E Bought env. f/products	A3F Avoid ps. - animals	A3G Put food out for birds	A3H Gardened for wildlife	A3I Written to MP/councillor	A3J Campaigned env./wildlife issue

Significance. *- Signif ≤ .05 ** - Signif. ≤ .01 ***- Signif. ≤ .005 **** - Signif. ≤ .001 (2-tailed)

Table VIII. Variable correlations with EAXu (unweighted environment-related activity index) as indicated by Spearman correlation coefficients (r^s). Based on ADS responses to A3.

EAX variable and subject of question	**r_s - with EAXu** (EAX variables unweighted - less variable data)
A3A - recycled paper/glass	.3087****
A3I - signed a petition about an env./conservation issues	.2457**
A3D - chosen not to use car for env. reasons	.2426**
A3J - written to MP/councillor about env./wildlife issue	.1935*
A3K - campaigned about env/wildlife issue	.1736 - not significant
A3H - gardened to encourage wildlife	.1659 - not significant
A3C - recycled batteries	.1263 - not significant
A3E - bought env. friendlier products	.1071 - not significant
A3B - recycled plastic	.0701 - not significant
A3G - put food out in the garden for the birds	.0052 - not significant
A3F - avoided products tested on animals	-.0311 - not significant

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table IX. Multiple organisational memberships reported more than three times (figures in brackets indicate number of respondents for whom the particular combination is not part of larger multiple membership). Based on ADS responses to A6.

Wildlife Trust	**RSPB**	**National Trust**	**WWF**	**Green-peace**	**Rambler's Assn.**	**RSPCA**	**No. of respondents**
X	X						22 (5)
X		X					18 (1)
	X	X					15 (4)
X	X	X					12 (4)
		X	X				10 (2)
		X		X			7 (1)
X					X		7 (1)
X			X				7 (2)
		X			X		5 (0)
	X		X				5 (2)
		X				X	4 (1)
X	X				X		4 (2)
	X				X		3 (0)
X		X			X		3 (0)
	X	X	X				3 (1)
Total number of respondents reporting membership of each organisation							
37	32	39	18	9	11	8	
Number of respondents reporting just one organisational membership							
3	2	6	1	0	2	1	

Table X. “feelings” category combinations selected 3 or more times. Based on ADS responses to B4.

B4B Fascination	**B4A** Wonder	**B4G** Responsibility	**B4L** Protectiveness	**B4D** Curiosity	**B4I** Love	No. of respondents
X	X	X				20
X	X			X		13
X	X		X			11
	X	X	X			7
X			X		X	7
X		X		X		5
X			X	X		5
X	X				X	3
	X	X		X		3
	X		X		X	3
X		X			X	3
X				X	X	3
X		X	X			3
		X	X		X	3
Total number of respondents selecting each “feeling						
89	76	55	44	36	30	

Table XI. Category combinations selected 3 or more times. Based on ADS responses to B5.

B5G Educate people about it	B5C Protect it with laws	B5F Use it sustain-ably	B5B Study it closely	B5A Leave it to its own devices	B5D Manage it strictly	B5H Collect and store it	B5E Fence it and keep people out	No. of respondent s
X	X	X						23
X		X	X					20
X	X		X					16
X			X	X				10
X	X				X			9
X			X		X			7
X		X		X				5
X	X			X				5
X	X					X		3
X			X		X			3
X		X			X			3
Total number of respondents selecting each means of protecting nature								
105	67	59	57	30	21	10	5	

Table XII. ADS data set associations between Cognitive variables [C*] and Attributes variables. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

Attributes variable

Cognitive variables (ordered according to strength of relationship with BUX) Type O = open, C = closed	Gender	Age	Newspaper readership	Social class	Educational level (general)	Educational level (science)	Educational level (biology)	Place of residence
C16/17 - naming extinct species (O)			.218*	.312****	.316****			
C2 - levels of biodiversity (O)				.237**	.286****	.327*	.341****	
C9 - characteristics of a species (O)			.241**	.213*	.282***			
C11 - changes to British c/side (O)			.306****	.331****	.411****	.303***	.268***	
C1 - heard of "biodiversity" (C)			.465****	.603****	.566****	.309****		
C3 - importance of biodiversity (O)			.250**	.307***	.354****			
C14 - species richness, countries (C)			.380****	.403****	.328****	.202*	.208*	
C12 - effects of felling wood (O)			.182*	.263***	.367****	.331*	.249**	.186*
C10 - species richness, habitats (C)								
C13 - causes of extinction (O)	.196*		.217*					
C15 - rates of extinction (C)					.202*	.202**	.200*	
C21 - endemism, countries (C)								
C19 - number of species existing (C)				.202*				
C20 - % species identified (C)		-.284***			.299****	.323****		
C27 - law relating to species (C)								
BUX			.444****	.529****	.563****	.392****	.337****	
IAB - bird understanding index (O)								
IAR - reptile/amphibian u/index (O)				.241**	.255***	.306****	.257***	
IAF - flower understanding index (O)	.252**			.262****		.219**	.198*	
IAI - insect understanding index (O)					.214*	.360****	.324****	
IAX			.197*	.255***	.240**	.342****	.324****	

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Because these correlations were calculated using the C*X indices (which were effectively 'ignorance' indices), in order to avoid confusion, the sign of the coefficients has been reversed, and a positive coefficient therefore indicates a correlation between a good performance on the Cognitive question and a positive selection on the other variable in question.

Table XIII. ADS data set associations between Wildlife and Environment-related activities [A3*] and Attributes variables. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

Wildlife and environment-related activities	Gender	Age	Newspaper readership	Social class	Educational level	Educational level (science)	Educational level (biology)	Place of residence
A1A watch wildlife TV documentaries	-.207*		-.362****	-.315***	-.367****		-.197*	
A1B walk in the countryside/on coast								
A1C do practical conservation work				.307****	.332****	.340****		
A1D visit zoos/museums								
A1E go on natural history holidays			.244**	.272***				
A1F go and watch animals in the wild	-.233*				.200*			
A1G go on a guided wildlife tour				.387****	.243**			
A1H give money to wildlife organisations								
A1I read about wildlife								
A1J discuss wildlife issues								-.221*
WAX wildlife activity index				.218*	.241**	.220*		-.198*
A3A recycle paper/glass		.265***	.372****	.260**	.279***	.221*		
A3B recycle plastic					.201**	.200*		
A3C recycle batteries			.270***	.239**	.251***			
A3D chosen not to use car		.251**	.458****	.493****	.370****	.194*		
A3E bought env. friendlier products								
A3F avoid animal tested products	.232*	.250**					.242**	
A3G put food out for birds								
A3H garden for wildlife		.235*		.212*	.211*	.190*	.212*	
A3I signed petition env./wildlife issue								
A3J written MP/ councillor env./wildlife issue		.230*						
A3K campaigned env./wildlife issue			.292****		.194*			
EAX environment activity index		.266*	.428****	.371****	.413****	.260***	.289***	

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table XIV. ADS data set associations between Affective variables [B*] and Attributes variables. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

	Attributes variable							
Affective variable [B*]	Gender	Age	Newspaper readership	Social class	Educational level (general)	Educational level (science)	Educational level (biology)	Place of residence
B3 - commitment to conservation			.219*	.223*	.299****			
B4A - wonder			.190*		.227*			
B4B - fascination		-.275***						
B4C - mild interest		-.201*						
B4D - curiosity								
B4E - fear					-.186*			
B4F - disgust								
B4G - responsibility							.214*	
B4H - mild dislike					-.262***	-.227*		
B4I - love		.214*		-.265***	-.295****	-.342****	-.284***	
B4J - indifference								
B4K - usefulness								
B4L - protectiveness								
B5A - leave it to its own devices			-.268***	-.202*	-.205*	-.257***	-.253**	
B5B - study it closely								
B5C - protect it with laws				-.210*				
B5D - manage it strictly			-.197*		-.185*	-.182*	-.246**	
B5E - put a fence around it								
B5F - use it sustainably			.426****	.601****	.541****	.327****	.317****	
B5G - educate people about it								
B5H - collect and store		.219*						
B6 - close childhood rel. with nature								
B7 - +ve wildlife experience			.227*				.187*	
B7A - age at B7								

Significance: * - Sig. $\leq$ .05 ** - Sig. $\leq$ .01 ***- Sig. $\leq$ .005 **** - Sig. $\leq$ .001 (2-tailed)

Table XV. ADS data set associations between Wildlife-related activities [A1*] and Cognitive variables. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

Wildlife-related activities

Cognitive variables (ordered according to strength of relationship with BUX) Type O = open ,C = closed	A1A TV progs.	A1B walk c/side /coast	A1C do pract. con. work	A1D zoos/ museums	A1E nature oriented holidays	A1F watch wildlife	A1G guided tour	A1H give £ w/life orgs.	A1I read about wildlife	A1J discuss wildlife issues	WAX wildlife activity index
C16/17 - naming extinct species (O)			.221*			.248**			.203*	.200*	.291***
C2 - levels of biodiversity (O)			.284**		.268***	.216*	.334****		.201*		.373****
C9 - characteristics of a species (O)			.190*					-.189*			.220*
C11 - changes to British c/side (O)			.120*			.263***			.195*		.250**
C1 - heard of "biodiversity" (C)			.294***		.372****	.248**	.361****		.203*		.382***
C3 - importance of biodiversity (O)											
C14 - species richness, countries (C)	-.215*										
C12 - effects of felling wood (O)			.269**	-.204*	.246**		.220*		.307****		.310****
C10 - species richness, habitats (C)						.219*					
C13 - causes of extinction (O)			.244**			.210*					.256***
C15 - rates of extinction (C)							.237**				
C21 - endemism, countries (C)											
C19 - number of species existing (C)											
C20 - % species identified (C)			.120*								.194*
C27 - law relating to species (C)										.184*	
BUX			.309****		.257***	.240**	.316****		.218*	.212*	.359****
IAB - bird understanding index (O)					.214*				.325****	.281***	.291****
IAR - reptile/amphibian u/index (O)		.257**	.207*		.207*	.232*	.231*	.197*	.313****		.358****
IAF - flower understanding index (O)		.186*							.219*	.207*	.209*
IAI - insect understanding index (O)		.243**				.266***			.273***		.246**
IAX		.253**	.207*			.278***		.242**	.364****	.295****	.354***

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Because these correlations were calculated using the C*X indices (which were effectively 'ignorance' indices), in order to avoid confusion, the sign of the coefficients has been reversed, and a positive coefficient therefore indicates a correlation between a good performance on the Cognitive question and a positive selection on the other variable in question.

Table XVI. ADS data set associations between Environment-related activities [A3*] and Cognitive variables. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

	Environment-related activities											
Cognitive variables (ordered according to strength of relationship with BUX) Type O = open, C = closed	A3A recycle paper/ glass	A3B recycle plastic	A3C recycle baterries	A3D chosen not to use car	A3E bought env. friendlier products	A3F avoid animal tested products	A3G put food out for birds	A3H garden for wildlife	A3I signed petition	A3J writtem MP/ councillor	A3K camp-aigned	EAX env. activity index
C16/17 - naming extinct species (O)				.273***				.254**				.251**
C2 - levels of biodiversity (O)	.189*							.239**				.262**
C9 - characteristics of a species (O)												
C11 - changes to British c/side (O)	.182*				.226*			.225*		.191*		.290***
C1 - heard of "biodiversity" (C)	.228*			.373****				.259***			.262**	.393****
C3 - importance of biodiversity (O)			.219*									
C14 - species richness, countries (C)					.211*							.225*
C12 - effects of felling wood (O)										.215*		
C10 - species richness, habitats (C)			.202*									
C13 - causes of extinction (O)										.190*		.242**
C15 - rates of extinction (C)						.319****						.251**
C21 - endemism, countries (C)												
C19 - number of species existing (C)	.271**											
C20 - % species identified (C)												
C27 - law relating to species (C)												
BUX	.272***		.252**	.286***	.218*			.267***			.203*	.372****
IAB - bird understanding index (O)				.250**			.193*					
IAR - reptile/amphibian u/index (O)			.200*	.221*	.276***			.237*	.182*			.265**
IAF - flower understanding index (O)								.214*				
IAI - insect understanding index (O)					.253**							
IAX				.205*	.269***			.243**				.240**

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Because these correlations were calculated using the C*X indices (which were effectively 'ignorance' indices), in order to avoid confusion, the sign of the coefficients has been reversed, and a positive coefficient therefore indicates a correlation between a good performance on the Cognitive question and a positive selection on the other variable in question.

Table XVII. ADS Cognitive variable associations with Affective variable. Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength. Only those Affective variables with significant correlations are shown

	Feelings about nature and wildlife									Best way to preserve nature				
Cognitive variables (ordered according to strength of relationship with BUX)	B4A wonder	B4C mild interest	B4E fear	B4G respon-sibility	B4H mild dislike	B4I love	B4L protecti-veness	B5C protect with laws	B5E fence it	B5F use it s/tainably	B5H collect and store	B7 wildlife experi -ence	B7A age at B7	B8 effects of extinctn.
C16/17 - naming extinct species	.300****				-.199*	-.183*				.340****	-.292****			
C2 - levels of biodiversity	.220*									.541****				
C9 - characteristics of a species	.185*									.210*				
C11 - changes to British c/side										.303****				
C1 - heard of "biodiversity"	.301***							-.192*		.541****				
C3 - importance of biodiversity					-.214*		.292****			.365****				
C14 - species richness, countries						-.194*				.125**				
C12 - effects of felling wood			-.193*							.333****			.243**	
C10 - species richness, habitats					-.248**					.239***	-.302****			
C13 - causes of extinction		-.240*										.291*	.316****	
C15 - rates of extinction														
C21 - endemism, countries														
C19 - number of species existing		.225*		.224*						.204*				.187*
C20 - % species identified	.204*					-.306****				.229*				
C27 - law relating to species		-.248*		-.190*		-.185*			-.291*					
BUX	.274***		-.225*			-.211*				.525****	-.223*			
IAB - bird understanding index														
IAR - reptile/amphibian u/index	.198*	-.217*								.291****				
IAF - flower understanding index								-.191*		.249***				
IAI - insect understanding index										.257***				
IAX		-.240**			-.231*					.328****	-.231*			

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Because these correlations were calculated using the C*X indices (which were effectively 'ignorance' indices), to avoid confusion the sign of the coefficients has been reversed and a positive coefficient therefore indicates a correlation between a good performance on the Cognitive question and a positive selection on the other variable in question.

Table XVIII. ADS data set associations between Wildlife-related activities [A1*] and Affective variables (only those B* variables having associations are shown). Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

	Wildlife-related activities										
Affective variables	A1A TV progs.	A1B walk in c/side on coast	A1C do pract. con. work	A1D visit zoos/ museums	A1E nature oriented holidays	A1F watch wildlife	A1G go on guided tour	A1H give £ w/life orgs.	A1I read about wildlife	A1J discuss wildlife issues	WAX wildlife activity index
B3 - commitment to conservation		.257***				.183*					
B4A - wonder									.199*	.236**	.237**
B4C - mild interest		-.235**					-.185*		-.190*	-.258***	-.273***
B4E - fear					-.186*						
B4K - usefulness				-.213*							
B5C - protect it with laws					-.268***		-.214*				-.190*
B5D - manage it strictly	.198*										
B5F - use it sustainably	-.251**		.239**	-.216**		.253**	.274***				
B6 - close childhood rel. with nature		.365****							.301****		.201*
B7 - +ve wildlife experience						.199*	.184*		.212*		.268***
B7A - age at B7							.351****				

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table XIX. ADS data set associations between Environment-related activities [A3*] and Affective variables (only those B* variables having associations are shown). Sign indicates nature of association, Spearman correlation coefficients and level of significance indicates strength.

	Environment-related activities											
Affective variables	A3A recycle paper/ glass	A3B recycle plastic	A3C recycle baterries	A3D chosen not to use car	A3E bought env. friedlier products	A3F avoid animal tested products	A3G put food out for birds	A3H garden for wildlife	A3I signed petition	A3J writtem MP/ councillor	A3K camp-aigned	EAX env. activity index
B4C - mild interest								-.256**				
B4D - curiosity							-.192*					
B4G - responsibility												.201*
B4H - mild dislike	-.262***								-.218*			-.181*
B4I - love		.218*										
B4J - indifference	-.288*											
B4L- protectiveness					.213*				.236**			
B5A - leave it to own devices	-.214*										.211*	
B5B - study it closely							.195*					
B5E - put a fence around it	-.222*											
B5D - manage it strictly								-.212*				
B5F - use it sustainably	.204*			.409****				.243*			.181*	.279***
B7 - +ve wildlife experience				.239*				.337****				.218*
B7A - age at B7				-.224*								

Significance: * - Sig. ≤ .05 ** - Sig. ≤ .01 ***- Sig. ≤ .005 **** - Sig. ≤ .001 (2-tailed)

Table XX. Pearson correlation coefficients for ADS respondents' Cognitive, Affective and Activity indices.

	WAX Wildlife-related activity index	EAX Environment activity index	POX Pet ownership index	MEX Organisational membership index	B3 Potential commitment index	NEPX NEP index	BUX Biodiversity understanding index
EAX Environment-related activity index	.4155****						
POX Pet-ownership index	.1752	-.0159					
MEX Wildlife/env. org. membership index	.4294****	.3864****	-.1346				
B3 Potential committent index	.2104*	.3062***	.1362	.2082*			
NEPX New Environmental Paradigm index	.2753***	.3026****	.0893	.2282*	.2109*		
BUX Biodiversity understanding index	.3748****	.3723****	.0615	.3594****	.3463****	.2866***	
GUX Genetics understanding index	.0648	.1059	.2408**	.0486	.0303	.0437	.2389**

Significance. *- Signif ≤ .05 ** - Signif. ≤ .01 ***- Signif. ≤ .005 **** - Signif. ≤ .001 (2-tailed)

Table XXVIII Full Data Set. Main survey factor solution for primary indices (principal component analysis).

Index	Component 1
wildlife-related activity index	.732
Knowledge index	.724
environment-related activity index	.673
no. of env./wildlife organizational memberships	.644
potential commitment index	.599
New Environmental Paradigm index	.487

Table XXIX The description of the aggregated groups used in the main survey (with coincidental Trust Members reallocated).

AGROKTR groups (aggregated)	Gender		Social classes represented				Level of education					Relationship with nature/wildlife		
	♀	♂	I	II	III	IV/ V	Post-grad	Under-grad	College	A levels	primary/ GCSEs	Close	Policy maker	Not clear
Conservation biologists	3	5	2	6	-	-	8	-	-	-	-	8	-	-
Members - Kent Wildlife Trust	21	16	16	8	11	2	6	6	9	6	10	37	-	-
Senior officers/elected members	22	17	28	8	3	-	12	12	10	3	2	-	39	-
Skilled/unskilled workers	23	19		1	15	26	-	-	6	7	29	-	-	42
Totals	69	57	46	23	29	28	26	18	25	16	41	45	39	42

Appendix II - Questionnaires

(Q1-4 reduced in size to fit margins)

Thank you for agreeing to participate in this survey. The objective is to find out what you think about certain environmental issues. Please note: that for almost all the questions, there is no right or wrong answer (even the experts do not know!). What we want to find out is how you see things, what you think. So please give us your own opinions. All answers will be treated in the strictest confidence. Unless you are asked to do otherwise, please put a tick in your chosen box. √

How worried or concerned are you about:

	A great deal	A fair amount	Not very much	Not at all
Lack of access to open space and countryside	-	-	-	-
The condition of local wildlife areas	-	-	-	-
The pollution of rivers and lakes	-	-	-	-
The destruction of the ozone layer	-	-	-	-
The disposal of nuclear waste	-	-	-	-
Possible changes in the earth's climate due to carbon dioxide	-	-	-	-
The extinction of species of plant or animal	-	-	-	-
Damage caused to sea life and beaches by oil tankers	-	-	-	-
The depletion of the world's forest resources	-	-	-	-
Disposal of industrial chemical waste	-	-	-	-

Please number the following items from 1-7 according to which you think is the least important threat to the world's wildlife (1) and which you think is the most important threat (7).

Tourism	Breeding with other species and subspecies
Pollution	Destruction and disturbance of habitats
Global climatic change	Introduced species e.g. rats, cats and goats
Hunting and collecting	Modern agricultural practices

Which of the following activities do you do?

	frequently	occasionally	rarely	never
Watch wildlife documentaries on TV	-	-	-	-
Visit the countryside	-	-	-	-
Countryside conservation work	-	-	-	-
Visit zoos, museums or safari parks	-	-	-	-
Go on nature oriented holidays	-	-	-	-
Watch wild animals	-	-	-	-
Visit a National Park or protected area	-	-	-	-

Are you, or have you been in the past 5 years, a member/activist of any of the following environmental and wildlife organisations? If not, do you sympathise with any of them?

	member	activist	sympathiser		member	activist	sympathiser
RSPB				The Green Party			
RSPCA				Greenpeace			
EIA				The National Trust			
WWF				Kent Trust for Nature Conservation			
anti							

Others (which?).. ....

Q1 - original *Environmental News* survey questionnaire

Do you keep any animals at home? YES......NO..... **Which animals do you keep?**
....
....

How much do you think you have you learnt about wildlife and conservation?:

	a lot	a reasonable amount	a little	nothing
from books	-	-	-	-
from magazines	-	-	-	-
by being in a wildlife organisation	-	-	-	-
watching television	-	-	-	-
in formal education (school, college etc.)	-	-	-	-
going to the zoo	-	-	-	-
going to a museum of natural history	-	-	-	-
observing animals and plants in the wild	-	-	-	-
going on nature oriented holidays	-	-	-	-

Have you ever heard the term "Biodiversity"? Yes.......No......

Which one of the following do you think best describes the term "Biodiversity"?

Whatever biologists study -
All the plants and animals on the earth -
The variety of all living things from the genetic to ecosystem level -
Everything which is living and everything which has ever lived -

Roughly how many species of plant and animal do you imagine there to be? (including mosses, fungi, plankton, insects and other invertebrates) **(Please circle your choice).**:

In the world	100,000	1 million	10 million	100 million	1 billion	10 billion	100 billion
In the UK	1,000	10,000	100,000	1 million	10 million	100 million	1 billion

In the Blean
woodlands (Please write a number)...................................

Please number the following types of habitat from 1-6 according to which you think supports the least (1) to the most (6) species of plants and animals?

Deserts Tropical rain forests Marshes Chalk Grassland Coral reefs Seashores

Please number the following countries from 1-8 according to which you think supports the least (1) to the most (8) species of plants and animals?

Indonesia Kenya Mexico United States Spain New Zealand Japan Mongolia

Please indicate your response to the following statements by putting a tick in the appropriate box

	strongly agree	mildly agree	mildly disagree	strongly disagree
It is more important for nature to survive than it is for *Homo sapiens* to survive				
Nature should ultimately define what we can and cannot do with the planet				
Wildlife should sometimes be put before people				
Protecting nature is a way of protecting people				
The balance of nature is very delicate and easily upset	-	-	-	-
When humans interfere with nature it often produces disastrous consequences	-	-	-	-
Humans must live in harmony with nature in order to survive	-	-	-	-
Mankind is severely abusing the environment	-	-	-	-
We are approaching the limit of the number of people the earth can support	-	-	-	-
The earth is like a spaceship with only limited room and resources	-	-	-	-
There are limits to growth beyond which our industrialised society cannot expand	-	-	-	-
To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled	-	-	-	-
Mankind was created to rule over the rest of nature	-	-	-	-
Humans have the right to modify the natural environment to suit their needs	-	-	-	-
Plants and animals exist primarily to be used by humans	-	-	-	-
Humans need not adapt to the natural environment because they can remake it for their own needs	-	-	-	-

Which of the following is normally illegal in the UK?

Wearing alligator shoes   Importing carved ivory   Keeping a poisonous snake at home
Killing a frog

What is the normal occupation of the main wage earner in your household?

....

Are you Male... Female...

Do you live? in the country   a village   in a suburb   in a town   in a city

Which age group do you belong to? 18-34   35-54   55+

Which of the following newspapers do you read?

Daily Mail   Daily Mirror   Daily Telegraph   The Sun   The Guardian   Today
Daily Star   The Times   Daily Express   The Independent   None of them

What is your religious denomination?...**Are you practising?** YES....NO....

Approximately how many species in the world do you imagine become extinct each year ? (Please circle your choice)

Naturally	less than one	10	100	1000	10,000	100,000	more than this
As a result of human activities	less than one	10	100	1000	10,000	100,000	more than this

If you can, please name some plants or animals which became extinct before 1900...............................
....

If you can, please name some plants or animals which became extinct this century...............................
....

Please number the following countries from 1-8 according to which you think has the smallest (1) and largest (8) percentage of its plant and animal species occurring only in that country and nowhere else?

Britain Chile Antarctica Australia Zimbabwe India Greece Canada

What do you think is the minimum number of animals required to maintain a population?

one healthy male and female a large family group 50 individuals 500 5000

What do the initials SSSI stand for?

Specially selected species for investigation.....
Species of special survival interest
Site of special scientific interest.....
Strategically significant species inventory

You have just learnt that the tiger has died out in the wild. Which of the following statements is closest to your reaction?

It is sad news but that's the price of progress
Never mind we still have plenty in captivity
We must try to reintroduce them soon
It is the fault of the governments of those countries
It demonstrates the hopeless condition of human civilisation
I feel sad but very angry

WHAT ARE YOUR VIEWS ON THE ENVIRONMENT?

HOW TO ENTER

1. SIMPLY FILL IN THIS FORM . . .
2. CLIP IT OUT . . .
3. SEND IT by 1 June '96 to . . .

Canterbury City Council
Environment & Health
Military Road
CANTERBURY CT1 1YW

4. The first 3 forms drawn at random will be the winners!

REMEMBER . . .
If you don't write your name & address we can't enter you for the draw even though we'd like to know your views!

Employees and the families of Canterbury City Council Environment & Health Department and Meadow Grange Nursery will not be eligible for the prize draw.

PRIZES KINDLY SPONSORED BY

Paul Kennett
MEADOW GRANGE NURSERY

What are *your* views on the environment?

We want to find out what you think about some environmental issues (even if you think you know or care very little).
We are offering to include you in a prize draw if you reply. Whatever your opinion we would like to hear from you.
And remember, you will stand an *equal* chance of winning the prize draw. Answers will be treated in the strictest confidence.
Unless you are asked to do otherwise, simply put a tick in your chosen box. (✔)

1. **When you hear the term "wildlife", what does it mean to you? Please write down the first things which come to mind (up to 3).**

❶ . . . . ❷ . . . . ❸ . . . .

2. **Please say how worried or concerned you are about the following:**

	A great deal	A fair amount	Not very much	Not at all	Don't know
Lack of access to open space and countryside	☐	☐	☐	☐	☐
The condition of local wildlife areas	☐	☐	☐	☐	☐
The pollution of rivers and lakes	☐	☐	☐	☐	☐
The destruction of the ozone layer	☐	☐	☐	☐	☐
The disposal of nuclear waste	☐	☐	☐	☐	☐
Possible changes in the earth's climate due to carbon dioxide	☐	☐	☐	☐	☐
The extinction of species of plant or animal	☐	☐	☐	☐	☐
Damage caused to sea-life and beaches by oil tankers	☐	☐	☐	☐	☐
The depletion of the world's forest resources	☐	☐	☐	☐	☐
Disposal of industrial chemical waste	☐	☐	☐	☐	☐
Disposal of household waste in Kent	☐	☐	☐	☐	☐
Traffic congestion	☐	☐	☐	☐	☐

3. **Are you, or have you been in the past 5 years, a (paid-up) member, or supporter, of any of the following environmental and wildlife organisations?**

	Member	Supporter		Member	Supporter
RSPB	☐	☐	*Greenpeace*	☐	☐
RSPCA	☐	☐	*The National Trust*	☐	☐
EIA (Environmental Investigation Agency)	☐	☐			
WWF	☐	☐	*The Kent Trust for Nature Conservation*	☐	☐
Friends of the Earth	☐	☐			

Other (which?) . . . .

4. **What sex are you?** Male ☐ Female ☐ **How old are you?** Under 18 ☐ 18-34 ☐ 35-54 ☐ 55+ ☐
Where do you live? in the country ☐ a village ☐ in a suburb ☐ in a town ☐ in a city ☐
If you work, what is your job? . . . . **Do you help out with voluntary work?** Yes ☐ No ☐
What is (/was) the usual occupation of the main wage earner in your household? . . . .

5. **DON'T FORGET if you wish to be entered for the prize draw, please complete the following**

NAME . . . . TEL: . . . . AGE (if under 18) . . . .
ADDRESS . . . . POSTCODE . . . .
Would you be willing to take part in a short follow-up interview? Yes ☐ No ☐

Thank you for your help!

Please clip out the page and send to:
ENVIRONMENT AND HEALTH DEPARTMENT, CANTERBURY CITY COUNCIL, MILITARY ROAD, CANTERBURY, CT1 1YW

Q2 - actual *Environmental News* survey questionnaire

Q3- postgraduate symposium questionnaire

Unless asked to do otherwise, please put a tick in your chosen box. √

1. Number the following items from 1-8 according to which you think is the *least important* threat to the world's wildlife (1) and which you think is the *most important* threat (8).

a. Pollution	☐ 6	e. Breeding with other species and subspecies	☐ 2
b. Tourism	☐ 3	f. Destruction and disturbance of habitats	☐ 8
c. Global climatic change	☐ 7	g. Introduced species e.g. rats, cats and goats	☐ 5
d. Hunting and collecting	☐ 1	h. Modern agricultural practices	☐ 4

2. Which one of the following do you think probably best describes the term "Biodiversity"?

a. Whatever biologists study ☐
b. All the plants and animals on the earth ☐
c. The variety of all living things from the genetic to ecosystem level ☑
d. Everything which is living and everything which has ever lived ☐

3. Roughly how many species of plant and animal do you *imagine* there to be? (including mosses, fungi, plankton, insects and other invertebrates) **(Please circle your choice).**:

In the world	100,000	1 million	10 million	100 million	1 billion	10 billion	100 billion
In the UK	1,000	10,000	100,000	1 million	10 million	100 million	1 billion

In your nearest large area of mixed woodland (Please write a number)................................

4. Please number the following types of habitat from 1-6 according to which you think supports the least (1) to the most (6) species of plants and animals?

a. Deserts	b. Tropical rain forests	c. Marshes	d. Chalk Grassland	e. Coral reefs	f. Seashores
-	6	4	~~3~~ 1	5	~~3~~ 2

5. Please number the following countries from 1-8 according to which you think supports the least (1) to the most (8) species of plants and animals?

a. Indonesia	b. Kenya	c. Mexico	d. United States	e. Spain	f. New Zealand	g. Japan	h. Mongolia
8	7	4	5	2	6	1	3

6. Approximately how many species worldwide do you imagine become extinct each year ? (Please circle your choice)

Naturally	less than one	10	100	1000	10,000	100,000	more than this
As a result of human activities	less than one	10	100	1000	10,000	100,000	more than this

7. If you can, please name some plants or animals which became extinct before 1900 ....
Giant Sloth, Elephant Bird, Giant Lemur

8. Since 1900? American Pigeon, Gt. Bustard, Golden Toad, Marsupial frog

P.T.O.

And now a few questions about yourself:

Are you a member or sympathiser of any of the following environmental and wildlife organisations?

	member	sympathiser		member	sympathiser		member	sympathiser
RSPB	☐	☑	WWF	☐	☑	RSPCA	☐	☐
Greenpeace	☐	☑	EIA	☐	☐	National Trust	☐	☐
			Local Nature Conservation Trust	☑	☐	Others (which?)... Many ... Spanish		

Roughly how often do you do the following?	once a week	once a month	once a year	once in 5 years	once in 10 years	never
Watch wildlife documentaries on TV	☑	☐	☐	☐	☐	☐
Visit the countryside	☑	☐	☐	☐	☐	☐
Countryside conservation work	☑	☐	☐	☐	☐	☐
Visit zoos, museums or safari parks	☐	☐	☑	☐	☐	☐
Go on nature oriented holidays	☐	☐	☑	☐	☐	☐
Watch wild animals	☑	☐	☐	☐	☐	☐
Visit a National Park or protected area	☑	☐	☐	☐	☐	☐
Give money to wildlife organisations	☐	☑	☐	☐	☐	☐
Read books/magazines about wildlife	☑	☐	☐	☐	☐	☐

Please indicate your response to the following statements by putting a tick in the appropriate box

	strongly agree	mildly agree	mildly disagree	strongly disagree
It is more important for nature to survive than it is for *Homo sapiens* to survive	☐	☐	☑	☐
Nature should ultimately define what we can and cannot do with the planet	☑	☐	☐	☐
When humans interfere with nature it often produces disastrous consequences	☐	☑	☐	☐
Humans must live in harmony with nature in order to survive	☑	☐	☐	☐
The earth is like a spaceship with only limited room and resources	☑	☐	☐	☐
To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled	☑	☐	☐	☐
Mankind was created to rule over the rest of nature	☐	☐	☐	☑
Humans need not adapt to the natural environment because they can remake it for their own needs	☐	☐	☑	☐

What is the name of the job of the main wage earner in your household? ....STUDENT....

Are you Male ☑ Female ☐ **Aged** under 25 ☐ 26-35 ☑ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66+ ☐

Do you live? in the country ☐ in a village ☐ in a suburb ☐ in a town ☐ in a city ☑

Q4 - Keoladeo survey questionnaire

18) Which of the following categories does Keoladeo belong to?

Ramsar Site ☐ Man + Biosphere reserve ☐ National Park ☐
RSPB reserve ☐ World Heritage Site ☐ Protected Forest ☐

19) Which of the following are **major threats** to Keoladeo National Park?

Poaching ☐ Grazing ☐ Water hyacinth ☐ Feral Cattle ☐
Juliflora ☐ Vehicles ☐ Grass cutting ☐ Pythons ☐
Tourism ☐ Flooding ☐ Amphibious grasses ☐ Trampling ☐

20) Which of the following mammal species are found at Keoladeo?

Sambhar ☐ Leopard ☐ Porcupine ☐ Nilgai ☐ Fruit bat ☐

21) Keoladeo is: artificially created ☐ or: a natural habitat ☐

22) Keoladeo is best: left alone ☐ or: strictly managed ☐

23) What are local people allowed to collect from the park? ....

....

24) Since you visited the park, have you: bought a bird book? ☐
borrowed a bird book from the library? ☐ been bird watching in the UK? ☐
given money to a wildlife organisation? ☐ joined a wildlife organisation? ☐

25) What is (was) the name of the job of the main wage earner in your household?

....

26) Which three newspapers do you read most often?

....

27) Are you Male ☐ Female ☐

28) Which of the following levels of education have you completed?

Primary school ☐ Secondary school ☐ College ☐
Undergraduate degree ☐ Postgraduate degree ☐ None of these ☐

29) Are you aged under 25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56-65 ☐ 66+ ☐

30) Do you live in the country ☐ a village ☐ a suburb ☐ a town ☐ a city ☐

Your name or initials...................................... Date of **visit** / /1996

Nationality .... Tour operator.................................

Thanks for participating in this survey, the results of which will help in improving future tours and wildlife conservation generally. The aim is to find out how *you* see things, what *you* think. Remember, there are no right or wrong answers to most questions (even the experts do not know!), so please give *your own* opinions. All answers will be treated in the strictest confidence. *Unless asked otherwise, please put a tick √ in your chosen box.*

1) How important were the following attractions to your visit to India?
Please circle on the scale of 1 (Unimportant) to 5 (Very Important).
Also tick √ your most important reason (tick one box only)

History/Archaeology	1 2 3 4 5	☐	Art/Architecture	1 2 3 4 5	☐
Marine Environment	1 2 3 4 5	☐	Wildlife Viewing	1 2 3 4 5	☐
Markets/Shopping	1 2 3 4 5	☐	Culture/People	1 2 3 4 5	☐
Landscape	1 2 3 4 5	☐	Other..................	1 2 3 4 5	☐

2) Had you visited Keoladeo before? Yes ☐ No ☐ How many times? ....

3) If Keoladeo wasn't on the tour would you have booked anyway?
Yes ☐ No ☐

4) What do you remember most about Keoladeo?...

....

....

5) Which of the following had you done before arriving at Keoladeo?

Read materials from libraries/book shops etc. ☐ Read the tour materials ☐
Watched relevant films/videos ☐ Attended relevant meetings/talks ☐
Other preparation, what?...

6) At Keoladeo, what was the single most useful source for learning? *(tick one)*

Fellow travellers ☐ Park Guides ☐ The Visitor Centre ☐
Your own books ☐ Just watching ☐ Other.......................

7) When you hear the term "wildlife", what does it mean to you?
Write down the first three things which come to mind

....

8) Please number the following types of habitat from 1-6 according to which *you* think supports the *most* (1) to the *least* (6) species of plants and animals?

Deserts Tropical rain forests Marshes Grassland Coral reefs Seashores

9) Please number the following items from 1-6 according to which *you* think is the *most important* threat to the world's wildlife (1) and which you think is the *least important* threat (6).

Interbreeding with other species and subspecies	Natural disasters
Destruction and disturbance of habitats	Modern agricultural practices
Introduced species e.g. rats, cats, goats	Hunting and collecting

10 Please number the following countries from 1-8 according to which *you* think supports the *most* (1) to the *least* (8) species of plants and animals?

Indonesia	Kenya	Mexico	United States
Mongolia	Spain	Japan	New Zealand

11) Approximately how many of all the species which exist in the world do you *imagine* become extinct each year ? *Please guess and circle your choice*

Naturally	less than one	10	100	1000	10,000	100,000	more than this
As a result of human activities	less than one	10	100	1000	10,000	100,000	more than this

12) Have you ever heard the term "Biodiversity"? Yes ☐ No ☐

Whether you have or not, which one of the following do *you* think best describes the term "Biodiversity"?

Whatever biologists study ☐
All the plants and animals on the earth ☐
The variety of all living things from the genetic to ecosystem level ☐
Everything which is living and everything which has ever lived ☐

13) Name some plants or animals which became extinct before 1900

....

Name some plants or animals which became extinct this century

....

14) Roughly how many species of plant and animal do you *imagine* there to be? (including mosses, fungi, plankton, insects + other invertebrates) *Circle a number*

In the world	100,000	1 million	10 million	100 million	1 billion	10 billion	100 billion
In the UK	1,000	10,000	100,000	1 million	10 million	100 million	1 billion
At Keoladeo	1,000	10,000	100,000	1 million	10 million	100 million	1 billion

In the large area of mixed woodland nearest to your home (*Write a number*).........

15) Roughly how often do you do the following?

	once / week	once / month	once / year	once in 5 years	hardly ever	never
Watch wildlife documentaries on TV	☐	☐	☐	☐	☐	☐
Visit the countryside	☐	☐	☐	☐	☐	☐
Do countryside conservation work	☐	☐	☐	☐	☐	☐
Visit zoos, museums or safari parks	☐	☐	☐	☐	☐	☐
Go on nature oriented holidays	☐	☐	☐	☐	☐	☐
Watch animals in the wild	☐	☐	☐	☐	☐	☐
Visit a National Park or protected area	☐	☐	☐	☐	☐	☐
Give money to wildlife organisations	☐	☐	☐	☐	☐	☐
Read books/magazines about wildlife	☐	☐	☐	☐	☐	☐

16) Of the activities listed in Question 15, from which two do you think that you learn most about wildlife?

....

17) Are you, or have you been in the past 5 years, a member or sympathiser of any of the following environmental and wildlife organisations?

	member	sympathiser		member	sympathiser
RSPB	☐	☐	WWF	☐	☐
RSPCA	☐	☐	Greenpeace	☐	☐
Local Nature Conservation Trust	☐	☐	Others (which?)	☐	☐

Thank you for agreeing to participate in this survey.

I'm going to ask you a number of questions to try and find out your opinions about wildlife.

What I want to know is what **you** think, what **your** personal opinion is.
So please don't tell me what you think I want to know, just what you think.

Please remember also that for nearly all of the questions I ask you, there are no right or wrong answers. Even the so-called "experts" do not know.

So just give the questions a moment's thought and then tell me your feelings, your estimation or guess.

I shall try to go quite smoothly through the interview, but if you have any problems at any stage, please don't hesitate to stop me.

Finally, can I say that the results of this survey will remain completely confidential.

QUESTION GROUP A - ACTIVITY QUESTIONS
The first group of questions I am going to ask you are about the things that you **do** in relation to wildlife.

QUESTION GROUP B - ATTITUDE QUESTIONS
The second of questions I am going to ask you are about the way you **feel** about wildlife.

QUESTION GROUP C - KNOWLEDGE QUESTIONS
The third group of questions I am going to ask you are about the things that you **know** about wildlife.

QUESTION GROUP D: SOCIO-ECONOMIC DATA
The final group of questions I am going to ask you are some general **things about yourself**.

QB1. **When you hear the term "wildlife", what does it mean to you?**
Write down the first two things which come to mind

1.. 2..

QA1. **Roughly how often do you do the following?**

	once/ week	once/ month	twice/ year	once/ year	once in 5 years	hardly ever	never
A. Watch wildlife TV documentaries	❒	❒	❒	❒	❒	❒	❒
B. Walk in countryside/on the coast	❒	❒	❒	❒	❒	❒	❒
C. Do practical conservation work	❒	❒	❒	❒	❒	❒	❒
D. Visit zoos, natural history museums or safari parks	❒	❒	❒	❒	❒	❒	❒
E. Go on nature oriented holidays	❒	❒	❒	❒	❒	❒	❒
F. Go and watch animals in the wild	❒	❒	❒	❒	❒	❒	❒
G. Go on a guided wildlife tour	❒	❒	❒	❒	❒	❒	❒
H. Give money to wildlife organisations (in addition to annual subscriptions)	❒	❒	❒	❒	❒	❒	❒
I. Read books/magazines about wildlife	❒	❒	❒	❒	❒	❒	❒
J. Discuss wildlife issues with family/friends	❒	❒	❒	❒	❒	❒	❒

QA2. **Of the activities listed above, from which do you think that you learn/have learnt the most and the second most about wildlife?** 1............. 2...................

QA3. **Which of the following activities have you done in the past 3 years?**

	YES	NO	N/A
A. Separated paper or glass from domestic rubbish and recycled it	❐	❐	
B. Separated plastic from domestic rubbish and recycled it.	❐	❐	
C. Separated batteries from domestic rubbish and recycled them.	❐	❐	
D. Chosen not to use your car because of environmental reasons	❐	❐	❐
E. Bought environmentally "friendlier" products even though more expensive	❐	❐	
F. Avoided buying products which have been tested on animals	❐	❐	
G. Put food out in your garden for the birds	❐	❐	❐
H. Deliberately gardened with a view to encouraging wildlife	❐	❐	❐
I. Signed a petition about an environmental/wildlife issue Which?	❐	❐	
J. Written a letter to/visited your MP/councillor about a wildlife/conservation issue Which?	❐	❐	
K. Campaigned about an environmental/wildlife issue Which?	❐	❐	

QA4. **Do you keep any animals at home?** YES ☐ NO ☐

QA5. **If so, which animals do you keep?**

....

QA6. **Are you, or have you been in the past 3 years, a member of any of the following organisations?**

A. RSPB - Royal Society for the Protection of Birds ☐

B. WWF - Worldwide Fund for Nature ☐

C. RSPCA - Royal Society for the Protection of Cruelty to Animals ☐

D. Greenpeace ☐

E. The National Trust ☐

F. Rambler's Association ☐

G. A Local Nature Conservation Trust (for example The Kent Trust) ☐

H. FoE - Friends of the Earth ☐

I. Others WHICH ONES? .... ☐

QB2. **Please indicate your response to the following statements by putting a tick in the appropriate box**

	strongly agree	mildly agree	mildly disagree	strongly disagree
A. The balance of nature is very delicate and easily upset	❐	❐	❐	❐
B. The earth is like a spaceship with only limited room and resources	❐	❐	❐	❐
C. Plants and animals DO NOT exist primarily to be used by humans	❐	❐	❐	❐
D. Modifying the environment for human use seldom causes serious problems	❐	❐	❐	❐
E. There are no limits to growth for advanced nations like the United Kingdom	❐	❐	❐	❐
F. Mankind has the right to rule over the rest of nature	❐	❐	❐	❐

QB3. **If you had the time and money, which things might you do personally in order to conserve wildlife?**

....

....

Cannot think of any ❐

QB4. **When you think of nature and wildlife which of the following feelings are closest to your heart.**
(*Chose no more than three*)

A. Wonder ❒	B. Fascination ❒	C. Mild interest ❒	D Curiosity ❒
E. Fear ❒	F. Disgust ❒	G. Responsibility ❒	H. Mild dislike ❒
I. Love ❒	J. Indifference ❒	K. Usefulness ❒	L. Protectiveness ❒

Others - which ....

QB5. **How do you think we can best preserve nature?**
(*Please select which you think is the most important (1), second most important (2) and third most important (3) thing to do*)

A. Leave it to its own devices ❒
B. Study it closely ❒
C. Protect it with laws ❒
D. Manage it strictly ❒
E. Put a fence around it and keep people away ❒
F. Use it sustainably ❒
G. Educate people about it ❒
H. Develop more ways of collecting and storing it ❒

QB6. **How would you describe the relationship you had with nature during your childhood?**

....

....

QB7. **Can you describe a particular experience you have had of wildlife which sticks in your mind?**
This can be a positive or negative experience.

....

....

How old were you at the time? ....

QB8. **If, as some people predict, the world were to lose half of its species of plant and animal by the year 2050, what do you think would be the most likely outcome?** *Tick one only*

Life on earth would come to an end	☐
Human beings would become extinct	☐
Humans would be severely affected but survive	☐
Humans would be slightly affected	☐
There would be little noticeable difference	☐

QC1. **Have you ever heard the term "Biodiversity"?** Yes ❐ No ❐

QC2. **"Biodiversity" (Biological diversity) means all the variety of life on earth. Can you tell me all the different types of variety you think this might include?**

....

QC3. **In what ways do you think "Biodiversity" might be important to humans and to the world in general?**

....

QC4. **Please indicate which of the following statements you think are true, and which you think are false**

The information which tells the body to produce characteristics such as blue eyes or black hair:

	TRUE	FALSE	NOT SURE
A. is stored in cells in our bodies	❐	❐	❐
B. is contained in DNA	❐	❐	❐
C. is controlled by the brain	❐	❐	❐
E. comes from chemicals in the environment	❐	❐	❐
F. is carried on genes	❐	❐	❐

QC5. **Which of the following groups of animals do you imagine to be the most genetically varied? and the least?** *Write "M" next to the one with the Most and "L" next to the one with the least*

A. birds........... B. amphibians........... C. insects........... D. mammals...........

QC6. **What amount of the genetic information an individual person carries is actually expressed?**

A. nearly 100%	❐	B. about 50%	❐	C. about 10%	❐
D. about 1%	❐	E. much less than 1%	❐	F. no idea	❐

QC7. **Which of the following would your children** - ***biologically*** - **inherit from you?**

	definitely	perhaps	almost certainly not
A. Height	❐	❐	❐
B. Half your DNA	❐	❐	❐
C. Sense of humour	❐	❐	❐
D. Eye colour	❐	❐	❐
E. Your ability to cook	❐	❐	❐

QC8. **Which of the following may result in genetic changes?**

	Yes	No
A. Exposure to radioactivity	☐	☐
B. Eating certain foods	☐	☐
C. The normal production of sperm and eggs	☐	☐

QC9. **What are the characteristics which define an animal or a plant as a species? In other words, what do all "species" have in common?**

....

....

QC10. **Please number the following types of habitat from 1-6 according to which you think supports the most (1) to the least (6) number of different species of plants and animals?**

Deserts Tropical Rain forests Marshes Grassland Coral Reefs Seashores

QC11. **What activities can you think of which have happened in the British countryside during the last 20 years and which have led to reductions in wildlife?**

....

QC12. **Imagine that a large mature wood is cut down . What happens to the animals and plants?**

....

QC13. **Please number the following items from 1-3 according to which you think is the most, second most and third most important threat to the world's wildlife.**

A. Interbreeding with other species and subspecies ☐
B. Natural disasters ☐
C. Destruction and disturbance of habitats ☐
D. Introduced species e.g. rats, cats, goats ☐
E. Hunting and collecting ☐

QC14. **Please number the following countries 1-5 according to which you think has the most (1) and the least (5) number of species of plants and animals?**

A. Indonesia ☐
B. Kenya ☐
C. Mexico ☐
D. United States ☐
E. Mongolia ☐

QC15. **Approximately how many of all the species which exist in the world do you *imagine* become extinct each year ?** (*Please guess and circle your choice*)

Naturally:	less than one	10	100	1000	10,000	100,000	more than this
As a result of human activities	less than one	10	100	1000	10,000	100,000	more than this

QC16. **Name some plants and/or animals which became extinct before 1900**

....

QC17. **Name some plants and/or animals which became extinct this century**

....

QC18. **What do you think was the main reason the Dodo became extinct?**

....

QC19. **Roughly how many species of plant and animal do you imagine there to be? (including mosses, fungi, plankton, insects + other invertebrates)** (*Please guess and circle your choice*)

In the world:	100,000	1 million	10 million	100 million	1 billion	10 billion	100 billion
In the UK:	1,000	10,000	100,000	1 million	10 million	100 million	1 billion

In the large area of mixed woodland nearest to your home (*write a number*) ....

QC20. **Roughly what proportion of the world's species do you imagine have actually been identified by science?**

A. nearly all ❐
B. over half ❐
C. about a quarter ❐
D. 1 in 10 ❐
E. 1 in 1000 ❐
F. 1 in a million ❐

QC21. **Number the following countries 1-5 according to which you think has the largest (1) and the smallest (5) percentage of its land plant and animal species living *only* in that country? (endemic)**

A. Britain ❐
B. Chile ❐
C. Australia ❐
D. South Africa ❐
E. Greece ❐

QC22. **What would be the most important consequences of the Black Rhino becoming extinct?**

....

QD1. **Gender** Male ❒ Female ❒

QD2. **What is (was) the name of the job of the main wage earner in your household?**

....

QD3. **Which three newspapers do you read most often?**

....

QD4. **Which of the following levels of education have you completed?**

A. Primary school ❒

B. Secondary school - GCSEs ❒

C. Secondary school/College - A levels ❒ Biology/science?...

D. College ❒ What subject? ....

E. Undergraduate degree ❒ What subject? ....

F. Postgraduate degree ❒ What subject? ....

QD5. **Which age group do you belong to?**

A. under 25 ❒ B. 26-35 ❒ C. 36-45 ❒ D. 46-55 ❒ E. 56-65 ❒ F. 66+ ❒

QD6. **Do you live in:** A. the country/a village ❒ B. a suburb/town/city ❒

QD7. **Could you please tell me your religion?** .... **Do you practice?** Yes ❒ No ❒

QC23. **Can you name 5 species of British wild bird?**

....

QC24. **Can you name 5 species of British reptile and amphibian?**

....

QC25. **Can you name 5 species of British wild flower?**

....

QC26. **Can you name 5 species of British insect?**

....

QC27. **Which of the following is normally illegal to do in the UK without a licence?**

	Illegal	Legal
Wearing alligator shoes	❐	❐
Importing carved ivory	❐	❐
Killing a frog	❐	❐
Digging up a wild plant	❐	❐
Shooting a grey squirrel	❐	❐

Q5 - Schedule

[Sit next to/at right angles to interviewee]

"Thank you for agreeing to participate in this survey."

"I'm going to ask you a number of questions to try and find out your opinions about wildlife."

"We will fill in this questionnaire together." [interviewer to enter data, show + read first page]

"What I want to know is what **you** think, what **your** personal opinion is."

"I am interested in what you have to say and not what you think I want to hear."

"So please don't tell me what you think I want to know, just what you think."

"I am going to ask four types of questions: questions about your activities, attitudes and knowledge relating to wildlife, and some general questions about yourself."

"Please bear in mind that because some questions are designed to sample people who know absolutely nothing about the subject and those who were experts, you should not worry about any difficult ones"

"In fact, nearly all of the questions I will ask you, there are no right or wrong answers. Indeed, even the scientists themselves do not know the correct answer to many of these questions."

"So just give each question a moment's thought and then tell me your feelings, your estimation or guess."

"I shall try to go quite smoothly through the interview, but if you have any problems at any stage, please don't hesitate to stop me."

"Finally, can I say that the results of this survey will remain completely confidential."

"Are you happy with this?" [If yes] "OK let's start......." [If no - repeat instructions]

[questions relating to topics not yet covered will be fielded with "Yes, good, we will be coming to that shortly"]

[At end of interview] "Thanks very much for participating. You answered the questions very well. Please do not mention your interview to anyone else - because you might influence the answers of someone else I am going to talk to."

Comments on individual questions.
[C3] In response to remark that the members of a species looked the same - "Yes, they *look* the same, but in what other ways are they the same and different from other species?"
For those respondents who do not mention reproduction - "What is it that guarantees that a gorilla is a gorilla and a human a human?".
Following C3 - "Just to make it clear, a species is a group of organisms which are alike. Usually sharp and distinct differences exist between each species and any other, and members of a species can interbreed freely with one another, but not with members of another species. The places inhabited by a particular species, are usually distinct from those inhabited by their most nearly-related species. Take the example of the apes. Humans, gorillas, urang utangs, and chimpanzees are quite similar, but rather different from each other, they cannot reproduce with each other, and (at least in early times) have lived in different places."

[C12] If respondent suggests that there may not be anywhere for the animals to go - "OK, but what would be the reason for this?"

Appendix III - Data indices formulae

Individual variables.

C10X - calculated by summing the integer value distances of the respondent's selections from correct answer, and dividing by 2.

C14X - calculated by summing the integer value distances of the respondent's selections from correct answer, and dividing by 2.

C21X - calculated by summing the integer value distances of the respondent's selections from correct answer, and dividing by 2.

Wildlife-related Activity Index [WAX] = A1A + (A1B x 3) + (A1C x 5) + (A1D x 3) + (A1E x 4) + (A1F x 4) + (A1G x 4) + (A1I x 2) + (A1J x 2)

where A1* indicates wildlife-related activity variable (frequencies scored from "once/week"=6 to "never"=1), min.=28, max.=168, and where multiplier indicates weighting according to following allocation:

weighting score	**1**	**2**	**3**	**4**	**5**
A1* variables	A	I,J	B,D	E,F,G	C

based on 16 people's rankings according to degree of commitment they thought each activity involved.

Environment-related Activity Index [EAX] = (A3A + A3G - 4) + ((A3B + A3D +A3E + A3F + A3I - 10) x 2) + ((A3C + A3H + A3J - 6) x 3) + ((A3K - 2) x 5) with sign of resulting number reversed

where A3* indicates environment-related activity variable (scored yes=1, no=2), min.=0, max.=23, and where multiplier indicates weighting according to following allocation

weighting score	**1**	**2**	**3**	**5**
A3* variables	A,G	B,D,E,F,I	C,H,J	K

based on 25 people's rankings according to degree of commitment they thought each activity involved.

Biodiversity Understanding Index [BUX] = 138 - ((C1X x 3) + (C2X x 3) + (C3X x 3) + (C9X x 3) + (C10X x 2) + C11X + (C12X x 3) + C13X + (C14X x 2) + (C15X + C16/7X) + C19X + (C20X x 2) + (C21X x 2))

where C*X indicates 'ignorance indices' for Cognitive variable, where BUX min.=0, max.= 138, and where multiplier indicates weighting. Each question was weighted so that respondents' scores for each biodiversity parameter were out of a similar total. Respondent scores (measures of 'ignorance') were subtracted from the maximum possible score attainable i.e. 138 to give an understanding index.

Identification Accuracy Indices - [IAB, IAR, IAF, IAI, IAX]

score	**1**	**2**	**3**	**4**
taxon	order	family	genus	species

IA* = (no. orders mentioned x 1) + (no. families mentioned x 2) +
(no. genera mentioned x 3) + (no. species mentioned x 4) where max.=20

Overall Identification Accuracy Index [IAX] = IAB + IAR + IAF + IAI (min.=0, max.=80)

Details of individual codings for questions C23, C24, C25, C26.
C23 - birds - "thrush", "crow" = genus
C24 - reptiles/amphibians - "frog", "toad", "newt", "lizard" = genus
C25 - flowers - "daisy", "buttercup" = genus. "primrose", "dandelion" = species
C26 - insects - "white butterfly", "blue butterfly" = genus

Organisational membership [MEX] = no. wildlife/environmental organisation memberships.

Genetic Understanding Index [GUX] = 21- (C4X + C5X + C6df + C7X + C8X)

where C*X indicates 'ignorance index' for Cognitive variable (max. score = 21) and C6df is total number of places distant from correct answers.

Pet Ownership Index [POX] = total no. of pets

but high multiples of small pets, such as fish and insects, are scored as one pet.

Appendix IV - Survey Summary Data

Appendix IVa - Environmental News Survey Data
Appendix IVb - Keoladeo Visitor Survey Data
Appendix IVc - Main Survey Data

Appendix IVa - Environmental News Survey Data

residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	country	19	8.3	8.3	8.3
	village	63	27.6	27.6	36.0
	suburb	33	14.5	14.5	50.4
	town	68	29.8	29.8	80.3
	city	45	19.7	19.7	100.0
	Total	228	100.0	100.0	

socio-economic class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	45	19.7	22.4	22.4
	2	60	26.3	29.9	52.2
	3	65	28.5	32.3	84.6
	4	16	7.0	8.0	92.5
	5	4	1.8	2.0	94.5
	students	7	3.1	3.5	98.0
	housewife	4	1.8	2.0	100.0
	Total	201	88.2	100.0	
Missing	9	27	11.8		
Total		228	100.0		

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	92	40.4	40.4	40.4
	female	136	59.6	59.6	100.0
	Total	228	100.0	100.0	

age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<18	7	3.1	3.1	3.1
	18-34	33	14.5	14.7	17.8
	35-54	91	39.9	40.4	58.2
	55+	94	41.2	41.8	100.0
	Total	225	98.7	100.0	
Missing	9	3	1.3		
Total		228	100.0		

/

species named

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	173	75.9	79.4	79.4
	insects	6	2.6	2.8	82.1
	mammals	32	14.0	14.7	96.8
	birds	2	.9	.9	97.7
	2+3	4	1.8	1.8	99.5
	2+3+4	1	.4	.5	100.0
	Total	218	95.6	100.0	
Missing	9	10	4.4		
Total		228	100.0		

classes named

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	97	42.5	44.5	44.5
	insects	7	3.1	3.2	47.7
	herpetofauna	1	.4	.5	48.2
	mammals	1	.4	.5	48.6
	birds	47	20.6	21.6	70.2
	flowers	7	3.1	3.2	73.4
	trees	9	3.9	4.1	77.5
	I+B	10	4.4	4.6	82.1
	I+F	1	.4	.5	82.6
	I+T	1	.4	.5	83.0
	I+B+F	2	.9	.9	83.9
	I+M+B	12	5.3	5.5	89.4
	M+B	1	.4	.5	89.9
	M+B+F	6	2.6	2.8	92.7
	B+F	10	4.4	4.6	97.2
	B+T	4	1.8	1.8	99.1
	B+T+F	2	.9	.9	100.0
	Total	218	95.6	100.0	
Missing	99	10	4.4		
Total		228	100.0		

habitat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	171	75.0	78.4	78.4
	wood/forest	18	7.9	8.3	86.7
	river/lake/pond	5	2.2	2.3	89.0
	sea	5	2.2	2.3	91.3
	hedgerow	3	1.3	1.4	92.7
	field/meadow	7	3.1	3.2	95.9
	garden/local	3	1.3	1.4	97.2
	3+4	3	1.3	1.4	98.6
	3+5	1	.4	.5	99.1
	2+6	1	.4	.5	99.5
	5+7	1	.4	.5	100.0
	Total	218	95.6	100.0	
Missing	99	10	4.4		
Total		228	100.0		

ecosystem

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	147	64.5	67.4	67.4
	countryside	40	17.5	18.3	85.8
	nature	23	10.1	10.6	96.3
	C+N	8	3.5	3.7	100.0
	Total	218	95.6	100.0	
Missing	9	10	4.4		
Total		228	100.0		

rel. to humans

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	127	55.7	55.7	55.7
	autonomous	22	9.6	9.6	65.4
	endangered	11	4.8	4.8	70.2
	exploited	13	5.7	5.7	75.9
	animal rights	1	.4	.4	76.3
	conservation/reserves	9	3.9	3.9	80.3
	aesthetic	10	4.4	4.4	84.6
	A+Ex	2	.9	.9	85.5
	A+En+Ex	12	5.3	5.3	90.8
	A+C/R	2	.9	.9	91.7
	A+Ae	3	1.3	1.3	93.0
	En+Ex	3	1.3	1.3	94.3
	En+C/R	1	.4	.4	94.7
	Ex+AR	2	.9	.9	95.6
	Ex+C/R	3	1.3	1.3	96.9
	AR+C/R	4	1.8	1.8	98.7
	C/R+Ae	3	1.3	1.3	100.0
	Total	228	100.0	100.0	

level of concern - access to countryside

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	1	.4	.4	.4
	not at all	9	3.9	3.9	4.4
	not very much	42	18.4	18.4	22.8
	a fair amount	97	42.5	42.5	65.4
	a great deal	79	34.6	34.6	100.0
	Total	228	100.0	100.0	

level of concern - local wildlife areas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	3	1.3	1.3	1.3
	not at all	3	1.3	1.3	2.6
	not very much	21	9.2	9.2	11.8
	a fair amount	101	44.3	44.3	56.1
	a great deal	100	43.9	43.9	100.0
	Total	228	100.0	100.0	

level of concern - pollution rivers and lakes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	2	.9	.9	.9
	not at all	1	.4	.4	1.3
	not very much	4	1.8	1.8	3.1
	a fair amount	33	14.5	14.5	17.5
	a great deal	188	82.5	82.5	100.0
	Total	228	100.0	100.0	

level of concern - thiniing of ozone layer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	3	1.3	1.3	1.3
	not at all	2	.9	.9	2.2
	not very much	19	8.3	8.3	10.5
	a fair amount	59	25.9	25.9	36.4
	a great deal	145	63.6	63.6	100.0
	Total	228	100.0	100.0	

level of concern - nuclear waste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not at all	6	2.6	2.6	2.6
	not very much	10	4.4	4.4	7.0
	a fair amount	39	17.1	17.1	24.1
	a great deal	173	75.9	75.9	100.0
	Total	228	100.0	100.0	

level of concern - global warming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	5	2.2	2.2	2.2
	not at all	3	1.3	1.3	3.5
	not very much	26	11.4	11.4	14.9
	a fair amount	61	26.8	26.8	41.7
	a great deal	133	58.3	58.3	100.0
	Total	228	100.0	100.0	

level of concern - species extinction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not at all	3	1.3	1.3	1.3
	not very much	11	4.8	4.8	6.1
	a fair amount	51	22.4	22.4	28.5
	a great deal	163	71.5	71.5	100.0
	Total	228	100.0	100.0	

level of concern - sealife oil damage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	1	.4	.4	.4
	not at all	2	.9	.9	1.3
	not very much	6	2.6	2.6	3.9
	a fair amount	53	23.2	23.2	27.2
	a great deal	166	72.8	72.8	100.0
	Total	228	100.0	100.0	

level of concern - forest depletion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not at all	2	.9	.9	.9
	not very much	11	4.8	4.8	5.7
	a fair amount	55	24.1	24.1	29.8
	a great deal	160	70.2	70.2	100.0
	Total	228	100.0	100.0	

level of concern - chemical waste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	3	1.3	1.3	1.3
	not very much	12	5.3	5.3	6.6
	a fair amount	52	22.8	22.8	29.4
	a great deal	161	70.6	70.6	100.0
	Total	228	100.0	100.0	

level of concern - household waste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	4	1.8	1.8	1.8
	not at all	3	1.3	1.3	3.1
	not very much	28	12.3	12.3	15.4
	a fair amount	81	35.5	35.5	50.9
	a great deal	112	49.1	49.1	100.0
	Total	228	100.0	100.0	

level of concern - traffic congestion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not at all	2	.9	.9	.9
	not very much	14	6.1	6.1	7.0
	a fair amount	73	32.0	32.0	39.0
	a great deal	139	61.0	61.0	100.0
	Total	228	100.0	100.0	

Membership - RSPB

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	128	56.1	56.1	56.1
	supporter	56	24.6	24.6	80.7
	member	44	19.3	19.3	100.0
	Total	228	100.0	100.0	

Membership - RSPCA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	153	67.1	67.1	67.1
	supporter	66	28.9	28.9	96.1
	member	9	3.9	3.9	100.0
	Total	228	100.0	100.0	

Membership - EIA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	215	94.3	94.3	94.3
	supporter	12	5.3	5.3	99.6
	member	1	.4	.4	100.0
	Total	228	100.0	100.0	

Membership - WWF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	138	60.5	60.5	60.5
	supporter	69	30.3	30.3	90.8
	member	21	9.2	9.2	100.0
	Total	228	100.0	100.0	

Membership - FOE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	169	74.1	74.1	74.1
	supporter	42	18.4	18.4	92.5
	member	17	7.5	7.5	100.0
	Total	228	100.0	100.0	

Membership - Greenpeace

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	146	64.0	64.0	64.0
	supporter	56	24.6	24.6	88.6
	member	26	11.4	11.4	100.0
	Total	228	100.0	100.0	

Membership - National Trust

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	132	57.9	57.9	57.9
	supporter	51	22.4	22.4	80.3
	member	45	19.7	19.7	100.0
	Total	228	100.0	100.0	

Membership - Kent Wildlife Trust

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	176	77.2	77.2	77.2
	supporter	35	15.4	15.4	92.5
	member	17	7.5	7.5	100.0
	Total	228	100.0	100.0	

Appendix IVb - Keoladeo Visitor Survey Data

level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	secondary	22	17.2	17.3	17.3
	college	23	18.0	18.1	35.4
	undergraduate	37	28.9	29.1	64.6
	postgraduate	45	35.2	35.4	100.0
	Total	127	99.2	100.0	
Missing	System	1	.8		
Total		128	100.0		

main newspaper read

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	30	23.4	23.4	23.4
	tabloid	16	12.5	12.5	35.9
	quality-r	59	46.1	46.1	82.0
	qualiry-l	23	18.0	18.0	100.0
	Total	128	100.0	100.0	

residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	rural	38	29.7	30.4	30.4
	urban	87	68.0	69.6	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

occupationally-based social class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I - professional	57	44.5	47.9	47.9
	II - intermediate	41	32.0	34.5	82.4
	III - skilled	15	11.7	12.6	95.0
	IV - semi-skilled	3	2.3	2.5	97.5
	VI - misc	3	2.3	2.5	100.0
	Total	119	93.0	100.0	
Missing	System	9	7.0		
Total		128	100.0		

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	67	52.3	52.8	52.8
	female	60	46.9	47.2	100.0
	Total	127	99.2	100.0	
Missing	System	1	.8		
Total		128	100.0		

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age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<26	11	8.6	8.7	8.7
	26-35	28	21.9	22.0	30.7
	36-45	28	21.9	22.0	52.8
	46-55	22	17.2	17.3	70.1
	56-65	25	19.5	19.7	89.8
	66+	13	10.2	10.2	100.0
	Total	127	99.2	100.0	
Missing	System	1	.8		
Total		128	100.0		

visit India for - history/archaeology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4.7	5.0	5.0
	2	11	8.6	9.2	14.2
	3	29	22.7	24.2	38.3
	4	45	35.2	37.5	75.8
	5	29	22.7	24.2	100.0
	Total	120	93.8	100.0	
Missing	System	8	6.3		
Total		128	100.0		

visit India for - art/architecture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	7.0	7.5	7.5
	2	7	5.5	5.8	13.3
	3	21	16.4	17.5	30.8
	4	44	34.4	36.7	67.5
	5	39	30.5	32.5	100.0
	Total	120	93.8	100.0	
Missing	System	8	6.3		
Total		128	100.0		

visit India for - marine areas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	65	50.8	59.6	59.6
	2	19	14.8	17.4	77.1
	3	20	15.6	18.3	95.4
	4	1	.8	.9	96.3
	5	4	3.1	3.7	100.0
	Total	109	85.2	100.0	
Missing	System	19	14.8		
Total		128	100.0		

visit India for - wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.3	2.4	2.4
	2	7	5.5	5.6	8.0
	3	21	16.4	16.8	24.8
	4	26	20.3	20.8	45.6
	5	68	53.1	54.4	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

visit India for - markets/shops

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	33	25.8	28.9	28.9
	2	26	20.3	22.8	51.8
	3	23	18.0	20.2	71.9
	4	31	24.2	27.2	99.1
	5	1	.8	.9	100.0
	Total	114	89.1	100.0	
Missing	System	14	10.9		
Total		128	100.0		

visit India for - culture/people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.6	1.6	1.6
	2	9	7.0	7.3	8.9
	3	16	12.5	13.0	22.0
	4	24	18.8	19.5	41.5
	5	72	56.3	58.5	100.0
	Total	123	96.1	100.0	
Missing	System	5	3.9		
Total		128	100.0		

visit India for - landscape

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3.1	3.4	3.4
	2	9	7.0	7.6	10.9
	3	28	21.9	23.5	34.5
	4	47	36.7	39.5	73.9
	5	31	24.2	26.1	100.0
	Total	119	93.0	100.0	
Missing	System	9	7.0		
Total		128	100.0		

no. of times visited Keoladeo

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	116	90.6	90.6	90.6
	1	8	6.3	6.3	96.9
	3	1	.8	.8	97.7
	4	1	.8	.8	98.4
	6	2	1.6	1.6	100.0
	Total	128	100.0	100.0	

remember most - birds/wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	110	85.9	85.9	85.9
	not	18	14.1	14.1	100.0
	Total	128	100.0	100.0	

remember most - people/rickshaws

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	29	22.7	22.7	22.7
	not	99	77.3	77.3	100.0
	Total	128	100.0	100.0	

remember most - place/beauty

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	27	21.1	21.1	21.1
	not	101	78.9	78.9	100.0
	Total	128	100.0	100.0	

remember most - quiet/tranquility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	28	21.9	21.9	21.9
	not	100	78.1	78.1	100.0
	Total	128	100.0	100.0	

before trip - materials/ shops/libraries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	84	65.6	65.6	65.6
	no	44	34.4	34.4	100.0
	Total	128	100.0	100.0	

before trip - tour materials

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	59	46.1	46.1	46.1
	no	69	53.9	53.9	100.0
	Total	128	100.0	100.0	

before trip - saw films/TV

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	17	13.3	13.3	13.3
	no	111	86.7	86.7	100.0
	Total	128	100.0	100.0	

before trip - went to meetings/talks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	12	9.4	9.4	9.4
	no	116	90.6	90.6	100.0
	Total	128	100.0	100.0	

on trip learnt most - fellows

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	14	10.9	10.9	10.9
	no	114	89.1	89.1	100.0
	Total	128	100.0	100.0	

on trip learnt most - park guides

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	80	62.5	62.5	62.5
	no	48	37.5	37.5	100.0
	Total	128	100.0	100.0	

on trip learnt most - visitor centre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	2.3	2.3	2.3
	no	125	97.7	97.7	100.0
	Total	128	100.0	100.0	

on trip learnt most - own books

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	15	11.7	11.7	11.7
	no	113	88.3	88.3	100.0
	Total	128	100.0	100.0	

on trip learnt most - observation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	41	32.0	32.0	32.0
	no	87	68.0	68.0	100.0
	Total	128	100.0	100.0	

on trip learnt most - tour guide

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	14	10.9	10.9	10.9
	no	114	89.1	89.1	100.0
	Total	128	100.0	100.0	

Keoladeo - ramsar site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	24	18.8	19.2	19.2
	no	101	78.9	80.8	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

Keoladeo - biosphere reserve

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	7	5.5	5.6	5.6
	no	118	92.2	94.4	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

Keoladeo - National park

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	107	83.6	85.6	85.6
	no	18	14.1	14.4	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

Keoladeo - RSPB reserve

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	5	3.9	4.0	4.0
	no	120	93.8	96.0	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

Keoladeo - world heritage site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	39	30.5	31.2	31.2
	no	86	67.2	68.8	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

Keoladeo - protected forest

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	16	12.5	12.8	12.8
	no	109	85.2	87.2	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

threats - poaching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	46	35.9	38.0	38.0
	no	75	58.6	62.0	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - grazing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	23.4	24.8	24.8
	no	91	71.1	75.2	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - water hyacinth

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	42	32.8	34.7	34.7
	no	79	61.7	65.3	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - feral cattle

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	41	32.0	33.9	33.9
	no	80	62.5	66.1	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - juliflora

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	6	4.7	5.0	5.0
	no	115	89.8	95.0	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - vehicles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	23.4	24.8	24.8
	no	91	71.1	75.2	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - pythons

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	.8	.8	.8
	no	120	93.8	99.2	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - tourism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	40	31.3	33.1	33.1
	no	81	63.3	66.9	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - flooding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	11	8.6	9.1	9.1
	no	110	85.9	90.9	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - amphibious grasses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	13	10.2	10.7	10.7
	no	108	84.4	89.3	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats - trampling

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	25	19.5	20.7	20.7
	no	96	75.0	79.3	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

on site- sambhar

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	85	66.4	67.5	67.5
	no	41	32.0	32.5	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

on site- leopard

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	7	5.5	5.6	5.6
	no	119	93.0	94.4	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

on site- porcupine

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	45	35.2	35.7	35.7
	no	81	63.3	64.3	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

on site- nilgai

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	63	49.2	50.0	50.0
	no	63	49.2	50.0	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

on site- fruit bat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	51	39.8	40.5	40.5
	no	75	58.6	59.5	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

origin of site

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	artificial	71	55.5	58.2	58.2
	natural	51	39.8	41.8	100.0
	Total	122	95.3	100.0	
Missing	System	6	4.7		
Total		128	100.0		

is site managed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	left	11	8.6	9.2	9.2
	managed	108	84.4	90.8	100.0
	Total	119	93.0	100.0	
Missing	System	9	7.0		
Total		128	100.0		

since visit - bought book

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	53	41.4	41.4	41.4
	no	75	58.6	58.6	100.0
	Total	128	100.0	100.0	

since visit - borrowed book

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	26	20.3	20.3	20.3
	no	102	79.7	79.7	100.0
	Total	128	100.0	100.0	

since visit - been birdwatching

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	58	45.3	45.3	45.3
	no	70	54.7	54.7	100.0
	Total	128	100.0	100.0	

since visit - given money wildlife/env. org.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	67	52.3	52.3	52.3
	no	61	47.7	47.7	100.0
	Total	128	100.0	100.0	

joined wildlife/env. org.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	16	12.5	12.5	12.5
	no	112	87.5	87.5	100.0
	Total	128	100.0	100.0	

species richness - desserts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.6	1.7	1.7
	3	4	3.1	3.3	5.0
	4	9	7.0	7.4	12.4
	5	13	10.2	10.7	23.1
	6	93	72.7	76.9	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

species richness - forest

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	99	77.3	81.8	81.8
	2	10	7.8	8.3	90.1
	3	8	6.3	6.6	96.7
	4	2	1.6	1.7	98.3
	5	1	.8	.8	99.2
	6	1	.8	.8	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

species richness - marshes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	4.7	5.0	5.0
	2	26	20.3	21.5	26.4
	3	47	36.7	38.8	65.3
	4	26	20.3	21.5	86.8
	5	14	10.9	11.6	98.3
	6	2	1.6	1.7	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

species richness - grassland

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.6	1.7	1.7
	2	16	12.5	13.2	14.9
	3	21	16.4	17.4	32.2
	4	40	31.3	33.1	65.3
	5	35	27.3	28.9	94.2
	6	7	5.5	5.8	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

species richness - coral reef

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	12	9.4	9.9	9.9
	2	57	44.5	47.1	57.0
	3	21	16.4	17.4	74.4
	4	17	13.3	14.0	88.4
	5	12	9.4	9.9	98.3
	6	2	1.6	1.7	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

species richness - shores

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.8	.8	.8
	2	12	9.4	9.9	10.7
	3	21	16.4	17.4	28.1
	4	29	22.7	24.0	52.1
	5	44	34.4	36.4	88.4
	6	14	10.9	11.6	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

threats to biodiversity - intbreeding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.8	.8	.8
	2	1	.8	.8	1.7
	3	2	1.6	1.7	3.4
	4	19	14.8	16.1	19.5
	5	48	37.5	40.7	60.2
	6	47	36.7	39.8	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

threats to biodiversity - natural disasters

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3.1	3.4	3.4
	2	4	3.1	3.4	6.8
	3	2	1.6	1.7	8.5
	4	18	14.1	15.3	23.7
	5	41	32.0	34.7	58.5
	6	49	38.3	41.5	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

threats to biodiversity - destruction/disturbance of habitats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	96	75.0	81.4	81.4
	2	14	10.9	11.9	93.2
	3	6	4.7	5.1	98.3
	4	1	.8	.8	99.2
	5	1	.8	.8	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

threats to biodiversity - agriculture

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	10.2	11.0	11.0
	2	63	49.2	53.4	64.4
	3	30	23.4	25.4	89.8
	4	8	6.3	6.8	96.6
	5	3	2.3	2.5	99.2
	6	1	.8	.8	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

threats to biodiversity - introduced species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3.1	3.4	3.4
	2	16	12.5	13.6	16.9
	3	45	35.2	38.1	55.1
	4	37	28.9	31.4	86.4
	5	10	7.8	8.5	94.9
	6	6	4.7	5.1	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

threats to biodiversity - hunting/collecting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3.1	3.4	3.4
	2	21	16.4	17.8	21.2
	3	33	25.8	28.0	49.2
	4	33	25.8	28.0	77.1
	5	13	10.2	11.0	88.1
	6	14	10.9	11.9	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Indonesia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	58	45.3	49.2	49.2
	2	30	23.4	25.4	74.6
	3	14	10.9	11.9	86.4
	4	5	3.9	4.2	90.7
	5	4	3.1	3.4	94.1
	6	1	.8	.8	94.9
	7	4	3.1	3.4	98.3
	8	2	1.6	1.7	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Kenya

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	35	27.3	29.7	29.7
	2	43	33.6	36.4	66.1
	3	19	14.8	16.1	82.2
	4	6	4.7	5.1	87.3
	5	7	5.5	5.9	93.2
	6	3	2.3	2.5	95.8
	7	4	3.1	3.4	99.2
	8	1	.8	.8	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Mexico

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.3	2.5	2.5
	2	8	6.3	6.8	9.3
	3	25	19.5	21.2	30.5
	4	22	17.2	18.6	49.2
	5	21	16.4	17.8	66.9
	6	20	15.6	16.9	83.9
	7	13	10.2	11.0	94.9
	8	6	4.7	5.1	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - U.S

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	8.6	9.3	9.3
	2	21	16.4	17.8	27.1
	3	31	24.2	26.3	53.4
	4	32	25.0	27.1	80.5
	5	13	10.2	11.0	91.5
	6	6	4.7	5.1	96.6
	7	4	3.1	3.4	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Mongolia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.6	1.7	1.7
	3	3	2.3	2.5	4.2
	4	10	7.8	8.5	12.7
	5	16	12.5	13.6	26.3
	6	17	13.3	14.4	40.7
	7	23	18.0	19.5	60.2
	8	47	36.7	39.8	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Spain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.8	.8	.8
	2	2	1.6	1.7	2.5
	3	6	4.7	5.1	7.6
	4	10	7.8	8.5	16.1
	5	25	19.5	21.2	37.3
	6	30	23.4	25.4	62.7
	7	37	28.9	31.4	94.1
	8	7	5.5	5.9	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - Japan

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.8	.8	.8
	2	1	.8	.8	1.7
	3	1	.8	.8	2.5
	4	13	10.2	11.0	13.6
	5	15	11.7	12.7	26.3
	6	24	18.8	20.3	46.6
	7	24	18.8	20.3	66.9
	8	39	30.5	33.1	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

species richness - New Zealand

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	7.8	8.5	8.5
	2	12	9.4	10.2	18.6
	3	22	17.2	18.6	37.3
	4	19	14.8	16.1	53.4
	5	18	14.1	15.3	68.6
	6	16	12.5	13.6	82.2
	7	8	6.3	6.8	89.0
	8	13	10.2	11.0	100.0
	Total	118	92.2	100.0	
Missing	System	10	7.8		
Total		128	100.0		

natural extinction rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1	14	10.9	11.3	11.3
	10	39	30.5	31.5	42.7
	100	33	25.8	26.6	69.4
	1000	25	19.5	20.2	89.5
	10,000	10	7.8	8.1	97.6
	100,000	3	2.3	2.4	100.0
	Total	124	96.9	100.0	
Missing	System	4	3.1		
Total		128	100.0		

human-caused extinction rate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1	1	.8	.8	.8
	10	12	9.4	9.7	10.5
	100	26	20.3	21.0	31.5
	1000	43	33.6	34.7	66.1
	10,000	32	25.0	25.8	91.9
	100,000	6	4.7	4.8	96.8
	more	4	3.1	3.2	100.0
	Total	124	96.9	100.0	
Missing	System	4	3.1		
Total		128	100.0		

heard of biodiversity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	101	78.9	78.9	78.9
	no	27	21.1	21.1	100.0
	Total	128	100.0	100.0	

extinctions pre 1900

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	three	37	28.9	28.9	28.9
	two	28	21.9	21.9	50.8
	one	33	25.8	25.8	76.6
	none	30	23.4	23.4	100.0
	Total	128	100.0	100.0	

extinctions post 1900

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	12	9.4	9.4	9.4
	2	13	10.2	10.2	19.5
	1	32	25.0	25.0	44.5
	0	71	55.5	55.5	100.0
	Total	128	100.0	100.0	

species in world

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100,000	1	.8	.8	.8
	1 million	2	1.6	1.6	2.4
	10 million	23	18.0	18.5	21.0
	100 million	27	21.1	21.8	42.7
	1 billion	18	14.1	14.5	57.3
	10 billion	32	25.0	25.8	83.1
	100 billion	21	16.4	16.9	100.0
	Total	124	96.9	100.0	
Missing	System	4	3.1		
Total		128	100.0		

species in UK

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1,000	4	3.1	3.3	3.3
	10,000	18	14.1	14.6	17.9
	100,000	31	24.2	25.2	43.1
	1 million	30	23.4	24.4	67.5
	10 million	28	21.9	22.8	90.2
	100 million	8	6.3	6.5	96.7
	1 billion	4	3.1	3.3	100.0
	Total	123	96.1	100.0	
Missing	System	5	3.9		
Total		128	100.0		

species. at Keoladeo

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1,000	14	10.9	11.3	11.3
	10,000	33	25.8	26.6	37.9
	100,000	33	25.8	26.6	64.5
	1 million	25	19.5	20.2	84.7
	10 million	13	10.2	10.5	95.2
	100 million	3	2.3	2.4	97.6
	1 billion	3	2.3	2.4	100.0
	Total	124	96.9	100.0	
Missing	System	4	3.1		
Total		128	100.0		

species in local wood

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100	21	16.4	19.1	19.1
	1,000	40	31.3	36.4	55.5
	10,000	24	18.8	21.8	77.3
	100,000	11	8.6	10.0	87.3
	1 million	12	9.4	10.9	98.2
	100 million	2	1.6	1.8	100.0
	Total	110	85.9	100.0	
Missing	System	18	14.1		
Total		128	100.0		

watch wildlife TV

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	69	53.9	53.9	53.9
	once/month	40	31.3	31.3	85.2
	once/year	11	8.6	8.6	93.8
	once/5 years	1	.8	.8	94.5
	hardly ever	5	3.9	3.9	98.4
	never	2	1.6	1.6	100.0
	Total	128	100.0	100.0	

walk in countryside

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	81	63.3	64.3	64.3
	once/month	34	26.6	27.0	91.3
	once/year	11	8.6	8.7	100.0
	Total	126	98.4	100.0	
Missing	System	2	1.6		
Total		128	100.0		

do practical conservation work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	8	6.3	6.6	6.6
	once/month	11	8.6	9.1	15.7
	once/year	29	22.7	24.0	39.7
	once/5 years	6	4.7	5.0	44.6
	hardly ever	22	17.2	18.2	62.8
	never	45	35.2	37.2	100.0
	Total	121	94.5	100.0	
Missing	System	7	5.5		
Total		128	100.0		

visit zoos/natural history museums

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	1	.8	.8	.8
	once/month	25	19.5	20.0	20.8
	once/year	62	48.4	49.6	70.4
	once/5 years	11	8.6	8.8	79.2
	hardly ever	23	18.0	18.4	97.6
	never	3	2.3	2.4	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

go on natural history holidays

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/month	3	2.3	2.4	2.4
	once/year	92	71.9	74.8	77.2
	once/5 years	12	9.4	9.8	87.0
	hardly ever	11	8.6	8.9	95.9
	never	5	3.9	4.1	100.0
	Total	123	96.1	100.0	
Missing	System	5	3.9		
Total		128	100.0		

watch animals in the wild

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	45	35.2	36.3	36.3
	once/month	25	19.5	20.2	56.5
	once/year	38	29.7	30.6	87.1
	once/5 years	7	5.5	5.6	92.7
	hardly ever	8	6.3	6.5	99.2
	never	1	.8	.8	100.0
	Total	124	96.9	100.0	
Missing	System	4	3.1		
Total		128	100.0		

visit National Park

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	17	13.3	13.6	13.6
	once/month	37	28.9	29.6	43.2
	once/year	52	40.6	41.6	84.8
	once/5 years	16	12.5	12.8	97.6
	hardly ever	2	1.6	1.6	99.2
	never	1	.8	.8	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

give £ wildlife/env. organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	3	2.3	2.4	2.4
	once/month	21	16.4	16.8	19.2
	once/year	74	57.8	59.2	78.4
	once/5 years	5	3.9	4.0	82.4
	hardly ever	15	11.7	12.0	94.4
	never	7	5.5	5.6	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

readbooks/magazines about wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once/week	37	28.9	29.6	29.6
	once/month	44	34.4	35.2	64.8
	once/year	30	23.4	24.0	88.8
	once/5 years	4	3.1	3.2	92.0
	hardly ever	7	5.5	5.6	97.6
	never	3	2.3	2.4	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

most important source of learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	TV	51	39.8	40.8	40.8
	c/side	12	9.4	9.6	50.4
	con work	1	.8	.8	51.2
	zoos	2	1.6	1.6	52.8
	nat. hols	11	8.6	8.8	61.6
	watch	17	13.3	13.6	75.2
	N. park	7	5.5	5.6	80.8
	read	24	18.8	19.2	100.0
	Total	125	97.7	100.0	
Missing	System	3	2.3		
Total		128	100.0		

2nd most important source of learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	TV	17	13.3	18.5	18.5
	c/side	5	3.9	5.4	23.9
	zoos	6	4.7	6.5	30.4
	nat. hols	11	8.6	12.0	42.4
	watch	18	14.1	19.6	62.0
	N. park	8	6.3	8.7	70.7
	read	27	21.1	29.3	100.0
	Total	92	71.9	100.0	
Missing	System	36	28.1		
Total		128	100.0		

RSPB membership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member	50	39.1	39.1	39.1
	sympathiser	18	14.1	14.1	53.1
	neither	60	46.9	46.9	100.0
	Total	128	100.0	100.0	

WWF membership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member	17	13.3	13.3	13.3
	sympathiser	39	30.5	30.5	43.8
	neither	72	56.3	56.3	100.0
	Total	128	100.0	100.0	

RSPCA membership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member	18	14.1	14.1	14.1
	sympathiser	34	26.6	26.6	40.6
	neither	76	59.4	59.4	100.0
	Total	128	100.0	100.0	

Greenpeace membership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member	22	17.2	17.2	17.2
	sympathiser	47	36.7	36.7	53.9
	neither	59	46.1	46.1	100.0
	Total	128	100.0	100.0	

Wildlife Trust membership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	member	46	35.9	35.9	35.9
	sympathiser	28	21.9	21.9	57.8
	neither	54	42.2	42.2	100.0
	Total	128	100.0	100.0	

other memberships

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	49	38.3	62.8	62.8
	1	14	10.9	17.9	80.8
	2	10	7.8	12.8	93.6
	3	4	3.1	5.1	98.7
	4	1	.8	1.3	100.0
	Total	78	60.9	100.0	
Missing	System	50	39.1		
Total		128	100.0		

Appendix IVc - Main Survey Data

group code

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kent Trust member	37	31.4	31.4	31.4
	Estate worker	10	8.5	8.5	39.8
	Government officer	18	15.3	15.3	55.1
	Elected Member	21	17.8	17.8	72.9
	Skilled worker	8	6.8	6.8	79.7
	Semi/unskilled	24	20.3	20.3	100.0
	Total	118	100.0	100.0	

educational level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	primary	14	11.9	11.9	11.9
	secondary-o	28	23.7	23.7	35.6
	secondary-a	15	12.7	12.7	48.3
	college	24	20.3	20.3	68.6
	ugde	19	16.1	16.1	84.7
	pgde	18	15.3	15.3	100.0
	Total	118	100.0	100.0	

studied biology?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	primary	67	56.8	56.8	56.8
	secondary-"o"	32	27.1	27.1	83.9
	secondary-"a"/college	14	11.9	11.9	95.8
	ugde	1	.8	.8	96.6
	pgde	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

studied science?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	primary	39	33.1	33.1	33.1
	secondary-o	38	32.2	32.2	65.3
	secondary-"a"/college	28	23.7	23.7	89.0
	ugde	7	5.9	5.9	94.9
	pgde	6	5.1	5.1	100.0
	Total	118	100.0	100.0	

newspaper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	9	7.6	7.6	7.6
	popular tabloid	17	14.4	14.4	22.0
	middle-class tabloid	24	20.3	20.3	42.4
	quality-r	38	32.2	32.2	74.6
	quality-l	30	25.4	25.4	100.0
	Total	118	100.0	100.0	

local newspaper

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	84	71.2	71.2	71.2
	not mentioned	34	28.8	28.8	100.0
	Total	118	100.0	100.0	

residence

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	rural	47	39.8	39.8	39.8
	urban	71	60.2	60.2	100.0
	Total	118	100.0	100.0	

practising religion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	regularly	37	31.4	31.4	31.4
	a bit	17	14.4	14.4	45.8
	no	64	54.2	54.2	100.0
	Total	118	100.0	100.0	

social class of family's main wage earner

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I - professional	44	37.3	37.3	37.3
	II - intermediate	17	14.4	14.4	51.7
	III - skilled	28	23.7	23.7	75.4
	IV - semi/unskilled	28	23.7	23.7	99.2
	VI - misc	1	.8	.8	100.0
	Total	118	100.0	100.0	

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	66	55.9	55.9	55.9
	female	52	44.1	44.1	100.0
	Total	118	100.0	100.0	

age group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<26	3	2.5	2.5	2.5
	26-35	15	12.7	12.7	15.3
	36-45	18	15.3	15.3	30.5
	46-55	43	36.4	36.4	66.9
	56-65	21	17.8	17.8	84.7
	66+	18	15.3	15.3	100.0
	Total	118	100.0	100.0	

A1A watch wildlife documentaries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	3	2.5	2.5	2.5
	hardly ever/once in 5 years	4	3.4	3.4	5.9
	once a year	5	4.2	4.2	10.2
	twice a year	4	3.4	3.4	13.6
	once a month	37	31.4	31.4	44.9
	once a week	65	55.1	55.1	100.0
	Total	118	100.0	100.0	

A1B walk in countryside

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	hardly ever/once in 5 years	3	2.5	2.5	2.5
	once a year	1	.8	.8	3.4
	twice a year	5	4.2	4.2	7.6
	once a month	31	26.3	26.3	33.9
	once a week	78	66.1	66.1	100.0
	Total	118	100.0	100.0	

A1C do practical con.work

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	77	65.3	65.3	65.3
	hardly ever/once in 5 years	16	13.6	13.6	78.8
	once a year	8	6.8	6.8	85.6
	twice a year	8	6.8	6.8	92.4
	once a month	7	5.9	5.9	98.3
	once a week	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

A1D visit zoos/nat. hist. museums

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	7	5.9	5.9	5.9
	hardly ever/once in 5 years	31	26.3	26.3	32.2
	once a year	48	40.7	40.7	72.9
	twice a year	31	26.3	26.3	99.2
	once a month	1	.8	.8	100.0
	Total	118	100.0	100.0	

A1E go on nature-oriented holidays

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	79	66.9	66.9	66.9
	hardly ever/once in 5 years	17	14.4	14.4	81.4
	once a year	16	13.6	13.6	94.9
	twice a year	5	4.2	4.2	99.2
	once a month	1	.8	.8	100.0
	Total	118	100.0	100.0	

A1F watch animals in the wild

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	43	36.4	36.4	36.4
	hardly ever/once in 5 years	22	18.6	18.6	55.1
	once a year	19	16.1	16.1	71.2
	twice a year	14	11.9	11.9	83.1
	once a month	13	11.0	11.0	94.1
	once a week	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

A1G go on guided tour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	68	57.6	57.6	57.6
	hardly ever/once in 5 years	32	27.1	27.1	84.7
	once a year	11	9.3	9.3	94.1
	twice a year	2	1.7	1.7	95.8
	once a month	4	3.4	3.4	99.2
	once a week	1	.8	.8	100.0
	Total	118	100.0	100.0	

A1H give £ to wildlife/env. organisations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	31	26.3	26.3	26.3
	hardly ever/once in 5 years	20	16.9	16.9	43.2
	once a year	36	30.5	30.5	73.7
	twice a year	24	20.3	20.3	94.1
	once a month	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

A1I read wildlife books/mags.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	15	12.7	12.7	12.7
	hardly ever/once in 5 years	16	13.6	13.6	26.3
	once a year	8	6.8	6.8	33.1
	twice a year	25	21.2	21.2	54.2
	once a month	40	33.9	33.9	88.1
	once a week	14	11.9	11.9	100.0
	Total	118	100.0	100.0	

A1J discuss wildlife issues

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	never	4	3.4	3.4	3.4
	hardly ever/once in 5 years	8	6.8	6.8	10.2
	once a year	6	5.1	5.1	15.3
	twice a year	13	11.0	11.0	26.3
	once a month	44	37.3	37.3	63.6
	once a week	43	36.4	36.4	100.0
	Total	118	100.0	100.0	

A2A learnt most about wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	TV documentaries	55	46.6	46.6	46.6
	walk in countryside	18	15.3	15.3	61.9
	do conservation work	2	1.7	1.7	63.6
	visit zoos/museums	3	2.5	2.5	66.1
	nature holidays	1	.8	.8	66.9
	watch wildlife	10	8.5	8.5	75.4
	guided tour	5	4.2	4.2	79.7
	read books/mags	21	17.8	17.8	97.5
	discuss	3	2.5	2.5	100.0
	Total	118	100.0	100.0	

A2B learnt second most about wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	TV	23	19.5	19.5	19.5
	walk c/side	32	27.1	27.1	46.6
	con. work	2	1.7	1.7	48.3
	visit zoos	12	10.2	10.2	58.5
	nature hols.	4	3.4	3.4	61.9
	watch wildlife	9	7.6	7.6	69.5
	guided tour	3	2.5	2.5	72.0
	read books/mags	19	16.1	16.1	88.1
	discuss	14	11.9	11.9	100.0
	Total	118	100.0	100.0	

A3A recyle paper/glass

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	11	9.3	9.3	9.3
	yes	107	90.7	90.7	100.0
	Total	118	100.0	100.0	

A3B recycle plastic

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	51	43.2	43.2	43.2
	yes	67	56.8	56.8	100.0
	Total	118	100.0	100.0	

A3C recycle batteries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	n/a	2	1.7	1.7	1.7
	no	91	77.1	77.1	78.8
	yes	25	21.2	21.2	100.0
	Total	118	100.0	100.0	

A3D not used car

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	n/a	10	8.5	8.5	8.5
	no	58	49.2	49.2	57.6
	yes	50	42.4	42.4	100.0
	Total	118	100.0	100.0	

A3E bought env. friendlier products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	25	21.2	21.2	21.2
	yes	93	78.8	78.8	100.0
	Total	118	100.0	100.0	

A3F chose non-animal tested products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	37	31.4	31.4	31.4
	yes	81	68.6	68.6	100.0
	Total	118	100.0	100.0	

A3G put food out for birds

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	n/a	2	1.7	1.7	1.7
	yes	8	6.8	6.8	8.5
	no	108	91.5	91.5	100.0
	Total	118	100.0	100.0	

A3H garden for wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	n/a	3	2.5	2.5	2.5
	no	41	34.7	34.7	37.3
	yes	74	62.7	62.7	100.0
	Total	118	100.0	100.0	

A3I signed petition about wildlife/env. issue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	50	42.4	42.4	42.4
	yes	68	57.6	57.6	100.0
	Total	118	100.0	100.0	

A3J written to MP/counsellor about wildlife/env. issue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	88	74.6	74.6	74.6
	yes	30	25.4	25.4	100.0
	Total	118	100.0	100.0	

A3K campaigned about wildlife/env. issue

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	98	83.1	83.1	83.1
	yes	20	16.9	16.9	100.0
	Total	118	100.0	100.0	

A4 keep animals at home

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	26	22.0	22.0	22.0
	yes	92	78.0	78.0	100.0
	Total	118	100.0	100.0	

A5A dogs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	76	64.4	64.4	64.4
	1	26	22.0	22.0	86.4
	2	12	10.2	10.2	96.6
	3	3	2.5	2.5	99.2
	4	1	.8	.8	100.0
	Total	118	100.0	100.0	

A5B cats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	69	58.5	58.5	58.5
	1	24	20.3	20.3	78.8
	2	20	16.9	16.9	95.8
	3	3	2.5	2.5	98.3
	4	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

A5C other mammals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	93	78.8	78.8	78.8
	1	10	8.5	8.5	87.3
	2	5	4.2	4.2	91.5
	3	3	2.5	2.5	94.1
	4	1	.8	.8	94.9
	5	2	1.7	1.7	96.6
	9	2	1.7	1.7	98.3
	11	1	.8	.8	99.2
	15	1	.8	.8	100.0
	Total	118	100.0	100.0	

A5D others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	91	77.1	77.1	77.1
	1	3	2.5	2.5	79.7
	2	5	4.2	4.2	83.9
	3	1	.8	.8	84.7
	4	1	.8	.8	85.6
	5	2	1.7	1.7	87.3
	8	1	.8	.8	88.1
	9	1	.8	.8	89.0
	10	8	6.8	6.8	95.8
	11	1	.8	.8	96.6
	15	2	1.7	1.7	98.3
	25	1	.8	.8	99.2
	30	1	.8	.8	100.0
	Total	118	100.0	100.0	

A6A Member RSPB

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	86	72.9	72.9	72.9
	yes	32	27.1	27.1	100.0
	Total	118	100.0	100.0	

A6B Member WWF

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	100	84.7	84.7	84.7
	yes	18	15.3	15.3	100.0
	Total	118	100.0	100.0	

A6C Member RSPCA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	110	93.2	93.2	93.2
	yes	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

A6D Member Greenpeace

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	109	92.4	92.4	92.4
	yes	9	7.6	7.6	100.0
	Total	118	100.0	100.0	

A6E Member Nat. Trust

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	79	66.9	66.9	66.9
	yes	39	33.1	33.1	100.0
	Total	118	100.0	100.0	

A6F Member Rambler's association

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	107	90.7	90.7	90.7
	yes	11	9.3	9.3	100.0
	Total	118	100.0	100.0	

A6G Member Local Wildlife Trust

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	81	68.6	68.6	68.6
	yes	37	31.4	31.4	100.0
	Total	118	100.0	100.0	

A6H Member FoE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	115	97.5	97.5	97.5
	yes	3	2.5	2.5	100.0
	Total	118	100.0	100.0	

A6I Member other wildlife/env. organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	95	80.5	80.5	80.5
	yes	23	19.5	19.5	100.0
	Total	118	100.0	100.0	

B1A wildlife1 =

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	species	66	55.9	55.9	55.9
	community	1	.8	.8	56.8
	habitats	8	6.8	6.8	63.6
	ecosystem	20	16.9	16.9	80.5
	rel. to humans	23	19.5	19.5	100.0
	Total	118	100.0	100.0	

B1B wildlife2=

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	species	69	58.5	58.5	58.5
	community	5	4.2	4.2	62.7
	habitats	6	5.1	5.1	67.8
	ecosystem	18	15.3	15.3	83.1
	rel. to humans	20	16.9	16.9	100.0
	Total	118	100.0	100.0	

B3 what might do to conserve wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dont know	5	4.2	4.2	4.2
	give to organisations	24	20.3	20.3	24.6
	own protected area	50	42.4	42.4	66.9
	do conservation work	39	33.1	33.1	100.0
	Total	118	100.0	100.0	

B4A wonder

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	51	43.2	43.2	43.2
	yes	67	56.8	56.8	100.0
	Total	118	100.0	100.0	

B4B fascination

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	29	24.6	24.6	24.6
	yes	89	75.4	75.4	100.0
	Total	118	100.0	100.0	

B4C mild interest

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	109	92.4	92.4	92.4
	yes	9	7.6	7.6	100.0
	Total	118	100.0	100.0	

B4D curiosity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	82	69.5	69.5	69.5
	yes	36	30.5	30.5	100.0
	Total	118	100.0	100.0	

B4E fear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	110	93.2	93.2	93.2
	yes	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

B4F disgust

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	118	100.0	100.0	100.0

B4G responsibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	64	54.2	54.2	54.2
	yes	54	45.8	45.8	100.0
	Total	118	100.0	100.0	

B4H mild dislike

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	114	96.6	96.6	96.6
	yes	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

B4I love

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	87	73.7	73.7	73.7
	yes	31	26.3	26.3	100.0
	Total	118	100.0	100.0	

B4J indifference

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	117	99.2	99.2	99.2
	yes	1	.8	.8	100.0
	Total	118	100.0	100.0	

B4K usefulness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	108	91.5	91.5	91.5
	yes	10	8.5	8.5	100.0
	Total	118	100.0	100.0	

B4L protectiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	74	62.7	62.7	62.7
	yes	44	37.3	37.3	100.0
	Total	118	100.0	100.0	

B5A leave it alone

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	88	74.6	74.6	74.6
	yes	30	25.4	25.4	100.0
	Total	118	100.0	100.0	

B5B study it closely

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	61	51.7	51.7	51.7
	yes	57	48.3	48.3	100.0
	Total	118	100.0	100.0	

B5C protect it with laws

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	51	43.2	43.2	43.2
	yes	67	56.8	56.8	100.0
	Total	118	100.0	100.0	

B5D manage it strictly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	97	82.2	82.2	82.2
	yes	21	17.8	17.8	100.0
	Total	118	100.0	100.0	

B5E fence it off and keep people out

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	113	95.8	95.8	95.8
	yes	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

B5F use it sustainably

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	59	50.0	50.0	50.0
	yes	59	50.0	50.0	100.0
	Total	118	100.0	100.0	

B5G educate people about it

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	13	11.0	11.0	11.0
	yes	105	89.0	89.0	100.0
	Total	118	100.0	100.0	

B5H collect and store it

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	108	91.5	91.5	91.5
	yes	10	8.5	8.5	100.0
	Total	118	100.0	100.0	

B6 childhood experience of nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	6	5.1	5.1	5.1
	some	27	22.9	22.9	28.0
	close/good	85	72.0	72.0	100.0
	Total	118	100.0	100.0	

B7 childhood experience of nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	positive	80	67.8	67.8	67.8
	negative	23	19.5	19.5	87.3
	none	15	12.7	12.7	100.0
	Total	118	100.0	100.0	

B7A age at memorable experience of nature/wildlife

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.8	.8	.8
	3	5	4.2	4.2	5.1
	5	4	3.4	3.4	8.5
	6	3	2.5	2.5	11.0
	7	12	10.2	10.2	21.2
	8	9	7.6	7.6	28.8
	9	6	5.1	5.1	33.9
	10	13	11.0	11.0	44.9
	11	8	6.8	6.8	51.7
	12	5	4.2	4.2	55.9
	13	4	3.4	3.4	59.3
	14	2	1.7	1.7	61.0
	15	3	2.5	2.5	63.6
	16	1	.8	.8	64.4
	18	1	.8	.8	65.3
	20	2	1.7	1.7	66.9
	22	1	.8	.8	67.8
	23	1	.8	.8	68.6
	25	3	2.5	2.5	71.2
	28	1	.8	.8	72.0
	29	1	.8	.8	72.9
	30	9	7.6	7.6	80.5
	35	4	3.4	3.4	83.9
	40	2	1.7	1.7	85.6
	43	1	.8	.8	86.4
	45	4	3.4	3.4	89.8
	48	1	.8	.8	90.7
	50	5	4.2	4.2	94.9
	53	1	.8	.8	95.8
	55	2	1.7	1.7	97.5
	56	1	.8	.8	98.3
	60	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

B8 effect of losing half world's species by 2050

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	end of life	5	4.2	4.2	4.2
	humans extinct	7	5.9	5.9	10.2
	severly affected	83	70.3	70.3	80.5
	slightly affected	18	15.3	15.3	95.8
	little difference	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

B5X best way to preserve nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	leave to own devices	11	9.3	9.3	9.3
	study it	12	10.2	10.2	19.5
	protect with laws	25	21.2	21.2	40.7
	manage strictly	1	.8	.8	41.5
	use sustainably	15	12.7	12.7	54.2
	educate people	54	45.8	45.8	100.0
	Total	118	100.0	100.0	

B5Y 2nd best way to preserve nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	leave to own devices	12	10.2	10.2	10.2
	study it	25	21.2	21.2	31.4
	protect with laws	19	16.1	16.1	47.5
	manage strictly	5	4.2	4.2	51.7
	put fence around	1	.8	.8	52.5
	use sustainably	20	16.9	16.9	69.5
	educate people	35	29.7	29.7	99.2
	collect and store	1	.8	.8	100.0
	Total	118	100.0	100.0	

B5Z 3rd best way to preserve nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	leave to own devices	8	6.8	6.8	6.8
	study it	20	16.9	16.9	23.7
	protect with laws	20	16.9	16.9	40.7
	manage strictly	17	14.4	14.4	55.1
	put fence around	4	3.4	3.4	58.5
	use sustainably	24	20.3	20.3	78.8
	educate people	19	16.1	16.1	94.9
	collect and store	6	5.1	5.1	100.0
	Total	118	100.0	100.0	

B2A NEP - balance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	.8	.8	.8
	mildly disagree	4	3.4	3.4	4.2
	mildly agree	32	27.1	27.1	31.4
	strongly agree	81	68.6	68.6	100.0
	Total	118	100.0	100.0	

B2B NEP - spaceship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mildly disagree	6	5.1	5.1	5.1
	mildly agree	32	27.1	27.1	32.2
	strongly agree	80	67.8	67.8	100.0
	Total	118	100.0	100.0	

B2C NEP - human use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mildly disagree	9	7.6	7.6	7.6
	mildly agree	25	21.2	21.2	28.8
	strongly agree	84	71.2	71.2	100.0
	Total	118	100.0	100.0	

B2D NEP - modifying

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mildly agree	17	14.4	14.4	14.4
	mildly disagree	45	38.1	38.1	52.5
	strongly disagree	56	47.5	47.5	100.0
	Total	118	100.0	100.0	

B2E NEP - limits to growth

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	3	2.5	2.5	2.5
	mildly agree	13	11.0	11.0	13.6
	mildly disagree	37	31.4	31.4	44.9
	strongly disagree	65	55.1	55.1	100.0
	Total	118	100.0	100.0	

B2F NEP - mankind rules

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly agree	4	3.4	3.4	3.4
	mildly agree	12	10.2	10.2	13.6
	mildly disagree	35	29.7	29.7	43.2
	strongly disagree	67	56.8	56.8	100.0
	Total	118	100.0	100.0	

C1 heard of biodiversity?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	73	61.9	61.9	61.9
	no	45	38.1	38.1	100.0
	Total	118	100.0	100.0	

C2A biodiversity - mentioned species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	107	90.7	90.7	90.7
	no	11	9.3	9.3	100.0
	Total	118	100.0	100.0	

C2B biodiversity - mentioned habitat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	32	27.1	27.1	27.1
	no	86	72.9	72.9	100.0
	Total	118	100.0	100.0	

C2C biodiversity - mentioned community

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	5	4.2	4.2	4.2
	no	113	95.8	95.8	100.0
	Total	118	100.0	100.0	

C2D biodiversity - mentioned genetic level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	12	10.2	10.2	10.2
	no	106	89.8	89.8	100.0
	Total	118	100.0	100.0	

C3A biodiversity important - eco-stability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	83	70.3	74.8	74.8
	no	28	23.7	25.2	100.0
	Total	111	94.1	100.0	
Missing	System	7	5.9		
Total		118	100.0		

C3B biodiversity important - utilitarian

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	36	30.5	32.4	32.4
	no	75	63.6	67.6	100.0
	Total	111	94.1	100.0	
Missing	System	7	5.9		
Total		118	100.0		

C3C biodiversity important - human existence/aesthetics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	29	24.6	26.1	26.1
	no	82	69.5	73.9	100.0
	Total	111	94.1	100.0	
Missing	System	7	5.9		
Total		118	100.0		

C4A genetic information - in cell

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	true	65	55.1	55.1	55.1
	false	39	33.1	33.1	88.1
	not sure	14	11.9	11.9	100.0
	Total	118	100.0	100.0	

C4B genetic information - in DNA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	true	104	88.1	88.1	88.1
	false	8	6.8	6.8	94.9
	not sure	6	5.1	5.1	100.0
	Total	118	100.0	100.0	

C4C genetic information - controlled by brain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	true	8	6.8	6.8	6.8
	false	102	86.4	86.4	93.2
	not sure	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

C4E genetic information - from chemicals in environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	true	5	4.2	4.2	4.2
	false	108	91.5	91.5	95.8
	not sure	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C4F genetic information - carried on genes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	true	115	97.5	97.5	97.5
	false	2	1.7	1.7	99.2
	not sure	1	.8	.8	100.0
	Total	118	100.0	100.0	

C5A most genetically varied

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	birds	5	4.2	4.2	4.2
	amphs	14	11.9	11.9	16.1
	insects	66	55.9	55.9	72.0
	mammals	33	28.0	28.0	100.0
	Total	118	100.0	100.0	

C5B least genetically varied

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	birds	26	22.0	22.0	22.0
	amphs	39	33.1	33.1	55.1
	insects	19	16.1	16.1	71.2
	mammals	34	28.8	28.8	100.0
	Total	118	100.0	100.0	

C6 % genetic information expressed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100%	32	27.1	27.1	27.1
	50%	47	39.8	39.8	66.9
	10%	26	22.0	22.0	89.0
	1%	4	3.4	3.4	92.4
	very little	3	2.5	2.5	94.9
	no idea	6	5.1	5.1	100.0
	Total	118	100.0	100.0	

C7A biological inheritance - height

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	definately	22	18.6	18.6	18.6
	perhaps	85	72.0	72.0	90.7
	almost certainly not	11	9.3	9.3	100.0
	Total	118	100.0	100.0	

C7B biological inheritance - half DNA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	definately	79	66.9	66.9	66.9
	perhaps	31	26.3	26.3	93.2
	almost certainly not	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

C7C biological inheritance - sense of humour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	definately	14	11.9	11.9	11.9
	perhaps	60	50.8	50.8	62.7
	almost certainly not	44	37.3	37.3	100.0
	Total	118	100.0	100.0	

C7D biological inheritance - eye colour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	definately	30	25.4	25.4	25.4
	perhaps	81	68.6	68.6	94.1
	almost certainly not	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

C7E biological inheritance - cooking ability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	definately	10	8.5	8.5	8.5
	perhaps	24	20.3	20.3	28.8
	almost certainly not	84	71.2	71.2	100.0
	Total	118	100.0	100.0	

C8A results in genetic mutation - radioactivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	114	96.6	96.6	96.6
	no	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

C8B results in genetic mutation - certain foods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	27	22.9	22.9	22.9
	no	91	77.1	77.1	100.0
	Total	118	100.0	100.0	

C8C results in genetic mutation - production of sperm and eggs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	71	60.2	60.2	60.2
	no	47	39.8	39.8	100.0
	Total	118	100.0	100.0	

C9A species characteristics - reproduction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	39	33.1	35.5	35.5
	no	71	60.2	64.5	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

C9B species characteristics - niche

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	29	24.6	26.4	26.4
	no	81	68.6	73.6	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

C9C species characteristics - physical characteristics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	86	72.9	78.2	78.2
	no	24	20.3	21.8	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

C9D species characteristics - behaviour

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	64	54.2	58.2	58.2
	no	46	39.0	41.8	100.0
	Total	110	93.2	100.0	
Missing	System	8	6.8		
Total		118	100.0		

C10A species richness - desserts

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	2	1.7	1.7	1.7
	4	1	.8	.8	2.5
	5	9	7.6	7.6	10.2
	6	106	89.8	89.8	100.0
	Total	118	100.0	100.0	

C10B species richness - forest

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	96	81.4	81.4	81.4
	2	13	11.0	11.0	92.4
	3	3	2.5	2.5	94.9
	4	5	4.2	4.2	99.2
	5	1	.8	.8	100.0
	Total	118	100.0	100.0	

C10C species richness - marshes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.5	2.5	2.5
	2	26	22.0	22.0	24.6
	3	35	29.7	29.7	54.2
	4	30	25.4	25.4	79.7
	5	21	17.8	17.8	97.5
	6	3	2.5	2.5	100.0
	Total	118	100.0	100.0	

C10D species richness - grass

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	4.2	4.2	4.2
	2	11	9.3	9.3	13.6
	3	21	17.8	17.8	31.4
	4	37	31.4	31.4	62.7
	5	39	33.1	33.1	95.8
	6	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C10E species richness - coral

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	7.6	7.6	7.6
	2	52	44.1	44.1	51.7
	3	21	17.8	17.8	69.5
	4	16	13.6	13.6	83.1
	5	17	14.4	14.4	97.5
	6	3	2.5	2.5	100.0
	Total	118	100.0	100.0	

C10F species richness - shores

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	5	4.2	4.2	4.2
	2	16	13.6	13.6	17.8
	3	36	30.5	30.5	48.3
	4	29	24.6	24.6	72.9
	5	31	26.3	26.3	99.2
	6	1	.8	.8	100.0
	Total	118	100.0	100.0	

C11A reductions in wildlife - agricultural intensification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	54	45.8	45.8	45.8
	not mentioned	64	54.2	54.2	100.0
	Total	118	100.0	100.0	

C11B reductions in wildlife - hedge removal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	47	39.8	39.8	39.8
	not mentioned	71	60.2	60.2	100.0
	Total	118	100.0	100.0	

C11C reductions in wildlife - forestry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	17	14.4	14.4	14.4
	not mentioned	101	85.6	85.6	100.0
	Total	118	100.0	100.0	

C11D reductions in wildlife - road building

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	69	58.5	58.5	58.5
	not mentioned	49	41.5	41.5	100.0
	Total	118	100.0	100.0	

C11E reductions in wildlife - other development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	70	59.3	59.3	59.3
	not mentioned	48	40.7	40.7	100.0
	Total	118	100.0	100.0	

C11F reductions in wildlife - pollution

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	mentioned	57	48.3	48.3	48.3
	not mentioned	61	51.7	51.7	100.0
	Total	118	100.0	100.0	

C12A wood clearence , fauna and flora - die

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	102	86.4	86.4	86.4
	no	16	13.6	13.6	100.0
	Total	118	100.0	100.0	

C12B wood clearence , fauna and flora - disperse

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	100	84.7	84.7	84.7
	no	18	15.3	15.3	100.0
	Total	118	100.0	100.0	

C12C wood clearence , fauna and flora - regenerate

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	49	41.5	41.5	41.5
	no	69	58.5	58.5	100.0
	Total	118	100.0	100.0	

C12D wood clearence , fauna and flora - have nowhere to go

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	21	17.8	17.8	17.8
	no	97	82.2	82.2	100.0
	Total	118	100.0	100.0	

C13A threat to wildlife - interbreeding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	30	25.4	25.4	25.4
	no	88	74.6	74.6	100.0
	Total	118	100.0	100.0	

C13B threat to wildlife - nat disasters

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	55	46.6	46.6	46.6
	no	63	53.4	53.4	100.0
	Total	118	100.0	100.0	

C13C threat to wildlife - destruction/disturbance of habitats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	115	97.5	97.5	97.5
	no	3	2.5	2.5	100.0
	Total	118	100.0	100.0	

C13D threat to wildlife - introduced species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	71	60.2	60.2	60.2
	no	47	39.8	39.8	100.0
	Total	118	100.0	100.0	

C13E threat to wildlife - hunting/collecting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	85	72.0	72.0	72.0
	no	33	28.0	28.0	100.0
	Total	118	100.0	100.0	

C13R most important threat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	nat. disasters	9	7.6	7.6	7.6
	distrub/destruct habitats	99	83.9	83.9	91.5
	introduced species	2	1.7	1.7	93.2
	hunting/collecting	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

C13S second most impt. threat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	interbreeding	11	9.3	9.3	9.3
	nat. disasters	11	9.3	9.3	18.6
	disturb/destruct habitats	10	8.5	8.5	27.1
	introduced species	39	33.1	33.1	60.2
	hunting and collecting	47	39.8	39.8	100.0
	Total	118	100.0	100.0	

C13T third most impt. threat

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	interbreeding	19	16.1	16.1	16.1
	nat. disasters	35	29.7	29.7	45.8
	destruct/disturb habitats	7	5.9	5.9	51.7
	introduced species	27	22.9	22.9	74.6
	hunting/collecting	30	25.4	25.4	100.0
	Total	118	100.0	100.0	

C14A species richness - Indonesia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	53	44.9	44.9	44.9
	2	37	31.4	31.4	76.3
	3	17	14.4	14.4	90.7
	4	9	7.6	7.6	98.3
	5	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

C14B species richness - Kenya

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	28	23.7	23.7	23.7
	2	25	21.2	21.2	44.9
	3	34	28.8	28.8	73.7
	4	24	20.3	20.3	94.1
	5	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

C14C species richness - Mexico

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.5	2.5	2.5
	2	14	11.9	11.9	14.4
	3	32	27.1	27.1	41.5
	4	45	38.1	38.1	79.7
	5	24	20.3	20.3	100.0
	Total	118	100.0	100.0	

C14D species richness - U.S

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	31	26.3	26.3	26.3
	2	36	30.5	30.5	56.8
	3	23	19.5	19.5	76.3
	4	13	11.0	11.0	87.3
	5	15	12.7	12.7	100.0
	Total	118	100.0	100.0	

C14E species richness - Mongolia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.5	2.5	2.5
	2	6	5.1	5.1	7.6
	3	12	10.2	10.2	17.8
	4	27	22.9	22.9	40.7
	5	70	59.3	59.3	100.0
	Total	118	100.0	100.0	

C15A natural extinctions/yr

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1	17	14.4	14.4	14.4
	10	39	33.1	33.1	47.5
	100	26	22.0	22.0	69.5
	1000	20	16.9	16.9	86.4
	10,000	13	11.0	11.0	97.5
	100,000	2	1.7	1.7	99.2
	more	1	.8	.8	100.0
	Total	118	100.0	100.0	

C15B human caused extinctions/yr

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1	1	.8	.8	.8
	10	10	8.5	8.5	9.3
	100	19	16.1	16.1	25.4
	1000	41	34.7	34.7	60.2
	10,000	30	25.4	25.4	85.6
	100,000	10	8.5	8.5	94.1
	more	7	5.9	5.9	100.0
	Total	118	100.0	100.0	

C16 naming extinct species pre 1900

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	16	13.6	13.6	13.6
	1	56	47.5	47.5	61.0
	2	25	21.2	21.2	82.2
	3	21	17.8	17.8	100.0
	Total	118	100.0	100.0	

C17 naming extinct species post 1900

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	97	82.2	82.2	82.2
	1	13	11.0	11.0	93.2
	2	8	6.8	6.8	100.0
	Total	118	100.0	100.0	

C18 why dodo became extinct?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	D/K	38	32.2	32.2	32.2
	flightless	13	11.0	11.0	43.2
	stupid/couldn't compete	8	6.8	6.8	50.0
	hunted	37	31.4	31.4	81.4
	habitat	11	9.3	9.3	90.7
	loss of its food	1	.8	.8	91.5
	man	1	.8	.8	92.4
	rats/cats	4	3.4	3.4	95.8
	disease	1	.8	.8	96.6
	4+8	2	1.7	1.7	98.3
	food failed	1	.8	.8	99.2
	2+4	1	.8	.8	100.0
	Total	118	100.0	100.0	

C19A species in world

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 million	3	2.5	2.5	2.5
	10 million	4	3.4	3.4	5.9
	100 million	23	19.5	19.5	25.4
	1 billion	20	16.9	16.9	42.4
	10 billion	34	28.8	28.8	71.2
	100 billion	34	28.8	28.8	100.0
	Total	118	100.0	100.0	

C19B species in UK

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1,000	1	.8	.8	.8
	10,000	9	7.6	7.6	8.5
	100,000	18	15.3	15.3	23.7
	1 million	34	28.8	28.8	52.5
	10 million	38	32.2	32.2	84.7
	100 million	13	11.0	11.0	95.8
	1 billion	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C19C species in local woods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100	10	8.5	8.5	8.5
	1,000	44	37.3	37.3	45.8
	10,000	37	31.4	31.4	77.1
	100,000	17	14.4	14.4	91.5
	1 million	5	4.2	4.2	95.8
	10 million+	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C20 % species identfied by science

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	nearly all	22	18.6	18.6	18.6
	over half	52	44.1	44.1	62.7
	about a quarter	24	20.3	20.3	83.1
	1 in 10	11	9.3	9.3	92.4
	1 in 1000	8	6.8	6.8	99.2
	1 in a million	1	.8	.8	100.0
	Total	118	100.0	100.0	

C21A level endmism - Britain

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.7	1.7	1.7
	2	20	16.9	16.9	18.6
	3	12	10.2	10.2	28.8
	4	32	27.1	27.1	55.9
	5	52	44.1	44.1	100.0
	Total	118	100.0	100.0	

C21B level endmism - Chile

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	3	2.5	2.5	2.5
	2	45	38.1	38.1	40.7
	3	49	41.5	41.5	82.2
	4	17	14.4	14.4	96.6
	5	4	3.4	3.4	100.0
	Total	118	100.0	100.0	

C21C level endmism - Australia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	101	85.6	85.6	85.6
	2	5	4.2	4.2	89.8
	3	9	7.6	7.6	97.5
	4	2	1.7	1.7	99.2
	5	1	.8	.8	100.0
	Total	118	100.0	100.0	

C21D level endmism - S. Africa

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	9.3	9.3	9.3
	2	45	38.1	38.1	47.5
	3	34	28.8	28.8	76.3
	4	15	12.7	12.7	89.0
	5	13	11.0	11.0	100.0
	Total	118	100.0	100.0	

C21E level endmism - Greece

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.5	2.5	2.5
	3	15	12.7	12.7	15.3
	4	52	44.1	44.1	59.3
	5	48	40.7	40.7	100.0
	Total	118	100.0	100.0	

C22 effects of rhino extinction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	cant think	31	26.3	26.3	26.3
	little/none/another lost	18	15.3	15.3	41.5
	aesthetic	17	14.4	14.4	55.9
	human failure/understanding	19	16.1	16.1	72.0
	ecological	13	11.0	11.0	83.1
	3+5	20	16.9	16.9	100.0
	Total	118	100.0	100.0	

C23A bird identification - order

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	117	99.2	99.2	99.2
	1	1	.8	.8	100.0
	Total	118	100.0	100.0	

C2BA bird identification - family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	88	74.6	74.6	74.6
	1	20	16.9	16.9	91.5
	2	9	7.6	7.6	99.2
	3	1	.8	.8	100.0
	Total	118	100.0	100.0	

C23C bird identification - genus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	39	33.1	33.1	33.1
	1	40	33.9	33.9	66.9
	2	30	25.4	25.4	92.4
	3	9	7.6	7.6	100.0
	Total	118	100.0	100.0	

C23D bird identification - species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	2.5	2.5	2.5
	1	3	2.5	2.5	5.1
	2	20	16.9	16.9	22.0
	3	32	27.1	27.1	49.2
	4	31	26.3	26.3	75.4
	5	29	24.6	24.6	100.0
	Total	118	100.0	100.0	

C24A reptile/amphibian identification - order

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	98	83.1	83.1	83.1
	1	19	16.1	16.1	99.2
	2	1	.8	.8	100.0
	Total	118	100.0	100.0	

C24B reptile/amphibian identification - family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	78	66.1	66.1	66.1
	1	35	29.7	29.7	95.8
	2	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C24C reptile/amphibian identification - genus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	25	21.2	21.2	21.2
	1	25	21.2	21.2	42.4
	2	34	28.8	28.8	71.2
	3	34	28.8	28.8	100.0
	Total	118	100.0	100.0	

C24D reptile/amphibian identification - species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	25	21.2	21.2	21.2
	1	17	14.4	14.4	35.6
	2	46	39.0	39.0	74.6
	3	10	8.5	8.5	83.1
	4	11	9.3	9.3	92.4
	5	9	7.6	7.6	100.0
	Total	118	100.0	100.0	

C25A flower identification - order

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	116	98.3	98.3	98.3
	1	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

C25B flower identification - family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	89	75.4	75.4	75.4
	1	27	22.9	22.9	98.3
	2	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

C25C flower identification - genus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	44	37.3	37.3	37.3
	1	50	42.4	42.4	79.7
	2	18	15.3	15.3	94.9
	3	6	5.1	5.1	100.0
	Total	118	100.0	100.0	

C25D flower identification - species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	2.5	2.5	2.5
	1	7	5.9	5.9	8.5
	2	16	13.6	13.6	22.0
	3	24	20.3	20.3	42.4
	4	47	39.8	39.8	82.2
	5	21	17.8	17.8	100.0
	Total	118	100.0	100.0	

C26A insect identification - order

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	80	67.8	67.8	67.8
	1	36	30.5	30.5	98.3
	2	2	1.7	1.7	100.0
	Total	118	100.0	100.0	

C26B insect identification - family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	14	11.9	11.9	11.9
	1	23	19.5	19.5	31.4
	2	37	31.4	31.4	62.7
	3	30	25.4	25.4	88.1
	4	13	11.0	11.0	99.2
	5	1	.8	.8	100.0
	Total	118	100.0	100.0	

C26C insect identification - genus

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	44	37.3	37.3	37.3
	1	41	34.7	34.7	72.0
	2	24	20.3	20.3	92.4
	3	8	6.8	6.8	99.2
	4	1	.8	.8	100.0
	Total	118	100.0	100.0	

C26D insect identification - species

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	75	63.6	63.6	63.6
	1	20	16.9	16.9	80.5
	2	9	7.6	7.6	88.1
	3	6	5.1	5.1	93.2
	4	3	2.5	2.5	95.8
	5	5	4.2	4.2	100.0
	Total	118	100.0	100.0	

C27A law - wearing alligator shoes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	illegal	21	17.8	17.8	17.8
	legal	97	82.2	82.2	100.0
	Total	118	100.0	100.0	

C27B law -importing carved ivory

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	illegal	106	89.8	89.8	89.8
	legal	12	10.2	10.2	100.0
	Total	118	100.0	100.0	

C27C law - killing a frog

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	illegal	53	44.9	44.9	44.9
	legal	65	55.1	55.1	100.0
	Total	118	100.0	100.0	

C27D law - digging up a wild plant

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	illegal	97	82.2	82.2	82.2
	legal	21	17.8	17.8	100.0
	Total	118	100.0	100.0	

C27E law - shooting a grey squirrel

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	illegal	29	24.6	24.6	24.6
	legal	89	75.4	75.4	100.0
	Total	118	100.0	100.0	