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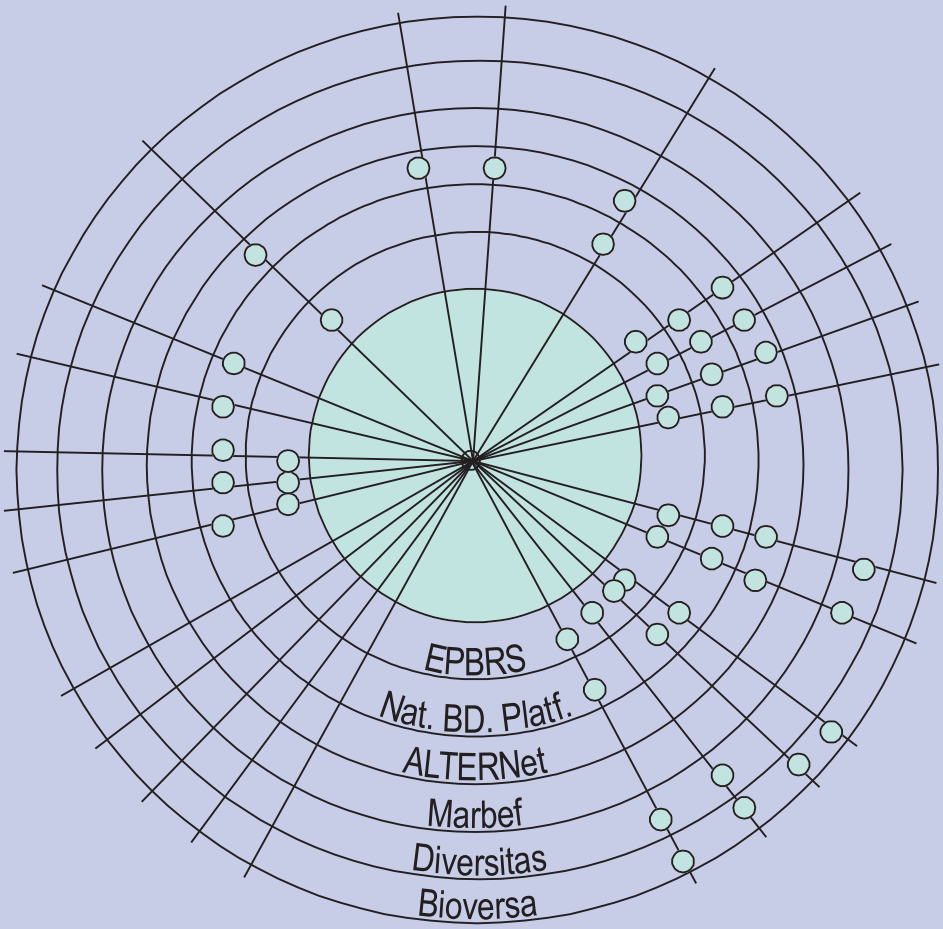
REPORTS OF FINNISH ENVIRONMENT INSTITUTE 16 | 2006

Views on biodiversity research in Europe

Mikael Hildén, Eeva Furman, Riku Varjopuro and Ludivine Brégeon



Finnish Environment Institute

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Mikael Hildén, Eeva Furman, Riku Varjopuro and Ludivine Brégeon

Helsinki 2006

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PREFACE

ALTER-Net is an EU Network of Excellence and its main goal is to build durable research capacity in Europe in the field of biodiversity and facilitate its governance. It is developing a research framework and some of the capacity required for assessing and forecasting changes of biodiversity, understanding the structure, functions and dynamics of ecosystems, communication of biodiversity issues and improving the decision making processes related to the governance of biodiversity. Within this process it highlights the importance of the policy-science dialogue and strives towards continuous improvement of the science-policy interface. Therefore, this survey on research priorities which ALTER-Net has jointly developed with the European Platform for Biodiversity Research (EPBRS) and the Finnish Environment Institute (SYKE) is an important step in the ALTER-Net-project.

The questionnaire forming the basis of the study was based on a comprehensive list of important research topics presented in the 'Message from Malahide' and the results represent the views of EPBRS members and participants in the biodiversity related networks of excellence, ERA-Nets and national biodiversity platforms. The summary results from 27 questionnaires indicate that the three most important research recommendations are as follows:

1. Improve understanding of the major anthropogenic and natural drivers of biodiversity change, and their individual and combined impacts. Important drivers and pressures include habitat fragmentation, climate change, pollution (including eutrophication), invasive organisms, loss of genetic diversity, sea- and land-use change.
2. Develop, test and evaluate indicators, and harmonise habitat and landscape classifications, to deliver policy-relevant information on the status and trends of biodiversity, the drivers of biodiversity change and the success of policies designed to halt the loss of biodiversity by 2010, and progress towards targets of the EC Biodiversity Strategy. Develop indicators of sustainable management of renewable resources, ecosystem integrity and ecosystem goods and services, vulnerability of livelihoods, public awareness and participation, and funding to biodiversity.
3. Further develop an accessible Europe-wide geo-referenced inventory of species and habitat distribution, status and trends, underpinned by significant new taxonomic effort, and support similar research in developing countries. This should include quantification of genetic diversity for species of economic or conservation importance, and improved understanding of traditional knowledge and uses of species and habitats.

The report also highlights very clearly that past research in the above mentioned areas has not always been effective in supporting the governance of biodiversity in such a way that loss of biodiversity is reduced and thus the authors claim that alternative routes of research are needed for more effective governance.

The report was used as the background paper for the EPBRS electronic conference held in September this year and will be used as input to the EPBRS meeting in Helsinki in November 2006, as well as in the ALTER-Net project.

My thanks go to all those who responded to the survey and in particular to the staff at SYKE who collated the results and produced this summary report.

Terry Parr
Coordinator of the ALTER-Net

CONTENTS

Preface 3

Abstract 5

1 Background of the survey 6

2 Materials and Methods 7

3 Results 10

3.1 **Research carried out** 10

3.1.1 Research in the countries 10

3.1 2 Research in the responding organisations 11

3.1.3 Use of research 11

3.2 **Research needs** 13

3.3 **Obstacles in the use of research** 16

3.4 **General recommendations on the use of research** 17

4 Discussion 18

Acknowledgements 21

References 21

Appendix 1. Questionnaire 22

Appendix 2. Classification of the recommendations 26

Appendix 3. Responses about the research recommendations 27

Appendix 4. Top 3 research recommendations 31

Appendix 5. Obstacles to use of research 32

Documentation pages 34

Abstract

The message that emerges from this survey of key European biodiversity researchers and managers on biodiversity research is that there is a need to do more along the same lines as hitherto. With this framing of the problem a simple recipe for action emerges: Put more money into conservation; educate decision makers in biodiversity, find links between different biodiversity efforts and make the public understand biodiversity. At the same time the survey indicates that progress in biodiversity protection is difficult to achieve. According to the responders only a few research recommendations appear to contribute to real change. An alternative problem framing is therefore that more attention needs to be put on policy and politics. This may require a reassessment of research needs. First, the depth of knowledge should match policy needs. For example, the basic mechanisms of present biodiversity loss are sufficiently known for policy purposes, but there is much less understanding of how one can develop measures for safeguarding biodiversity that gain wide acceptance without excessively straining state budgets. Second, the survey showed that there is a lack of understanding of how science can contribute to policy and policy implementation, except by providing normative statements on the need for biodiversity protection. Research into relevant processes of awareness-, decision- or value formation is needed to develop understanding of decision making or problems of public education. Third, there is a need to experiment with incentives that turn awareness into action for biodiversity. One should study how people can use what they know already to protect biodiversity rather than assume that people must know even more before they can do something. This rethinking implies that the discussion on research needs should be broadened considerably and should include also people who are not biodiversity experts.

1 Background of the survey

The European Commission supports several initiatives to enhance European integration in the field of biodiversity research. European Union's Heads of State agreed at the Gothenburg Summit in 2001 to halt the decline of biodiversity by 2010. This has set new challenges for biodiversity research and many recommendations for biodiversity research have been tabled.

The European Platform for Biodiversity Research Strategy (EPBRS) and the Network of Excellence ALTER-Net have, encouraged by the EU Commission DG Research, initiated the collection of information and views on biodiversity research and research recommendations from the members and participants of the biodiversity related networks of excellence, the biodiversity ERA-NETs and national biodiversity platforms.

The idea was to use survey techniques for an exploratory compilation of views on biodiversity research and research recommendations. The responses provide a basis for some tentative conclusions concerning biodiversity research strategies, and material for an open electronic conference in mid-September and to a meeting the 16-19th of November 2006 in Finland, both organised by the EPBRS.

2 Materials and Methods

The survey was based on the biodiversity research recommendations which the EPBRS tabled at its meeting in Killarney (2004) and which were later adopted as part of the "Message from Malahide", that emerged from the stakeholder conference entitled ***'Biodiversity and the EU – Sustaining Life, Sustaining Livelihoods'*** held under the Irish Presidency in Malahide, Ireland from 25th to 27th May 2004.

The questionnaire (Appendix 1) was developed through several meetings and discussions between representatives of SYKE, ALTER-Net and EPBRS. An initial version was distributed for comments within the ALTER-Net and EPBRS and the questionnaire was discussed at an ALTER-Net meeting in Rome (March 6-8, 2006) after which it was finalised.

The aim was to compile views on biodiversity research as represented by researchers, research funding organisations and biodiversity administrators in partner organisations of ALTER-Net and MARBEF (EU's biodiversity-focussed Networks of Excellence), in BiodivERsA (an ERA-NET related to the biodiversity research) as well as in National Biodiversity Platforms (see Table 1). To ALTER-Net partners it was sent via its 'Council' in which all partners are represented whereas to other networks it was distributed through their secretaries/coordinators with a request to forward it in their networks. The national biodiversity research platforms were reached through EPBRS coordination.

The survey did not aim at a quantitative assessment of views, because it was not possible to specify exactly the population to be sampled and the way the questionnaires were distributed did not allow controlling which and how many organisations or persons received it. The survey was thus an exploratory exercise to give tentative information on how the research recommendations from the EPBRS/"Message from Malahide" have been received, how biodiversity research experts weight biodiversity research needs and which obstacles for use of scientific results they have identified.

On the basis of numbers of members and partners in different networks addressed, and taking into account the overlap in their memberships a sample of 60-80 could have been expected. In total, 30 responses were received but 27 questionnaires were analysed due to the late arrival of the last responses. All the responses of these 27 responders are presented in the appendixes 3, 4 and 5. The majority of the responding institutes or persons are members of national Biodiversity Platforms, EPBRS and ALTER-Net (Table 1). None of the responders represented MARBEF.

Table 1. The number of responders with membership in selected networks.

Name of the Networks	Number
National Biodiversity Platform	17
EPBRS	16
ALTER-Net	13
DIVERSITAS	4
BIODIVERSA	4
Other:	
ILTER	2
GBIF	1
IMoSEB	1
EDIT	1
Euraqua	1
ENSI	1

The networks illustrate the linkages between organisations. In general, organisations participate in several networks. There is a clear pattern which shows that the EU funded networks listed in this study build linkages mainly between research institutes while the universities rely on the EPBRS and national networks (see Figure 1).

The majority of the responses came from research institutes or universities, but several organisations share their activities between several fields: e.g. research and administration (Table 2). A basic division was made between organisations carrying out research and training and organisations managing biodiversity and/or funding research. In the analyses the research institutes and universities have been pooled together and are henceforth called "research organisations" and the responders "researchers". Authorities and research funding organisations have been pooled and are henceforth called "management organisations" and the responders "managers".

Table 2. The different fields of responders' organisations

Field of the organisations	Number of organisations	Only in the mentioned field
Research	15	10
Administration	6	2
University or other higher	8	4
Research funding organisation	7	3
Other specified :		
Governmental agency	1	0
Environmental agency	1	0

The questionnaire was found technically difficult to answer as it was based on a Microsoft Excel sheet and distributed only in an electronic format. The low rate of responses may also reflect the demanding task to answer questions that required broad knowledge of biodiversity research and policy needs in the institute and nationally.

The analysis is based on counts of responses and their cross-tabulations with the characteristics of the responders organisation and the themes of the recommendations (the authors grouped the recommendations according to the science they are based on, see the Appendix 2) in order to identify possible systematic differences between the different types of organisation.

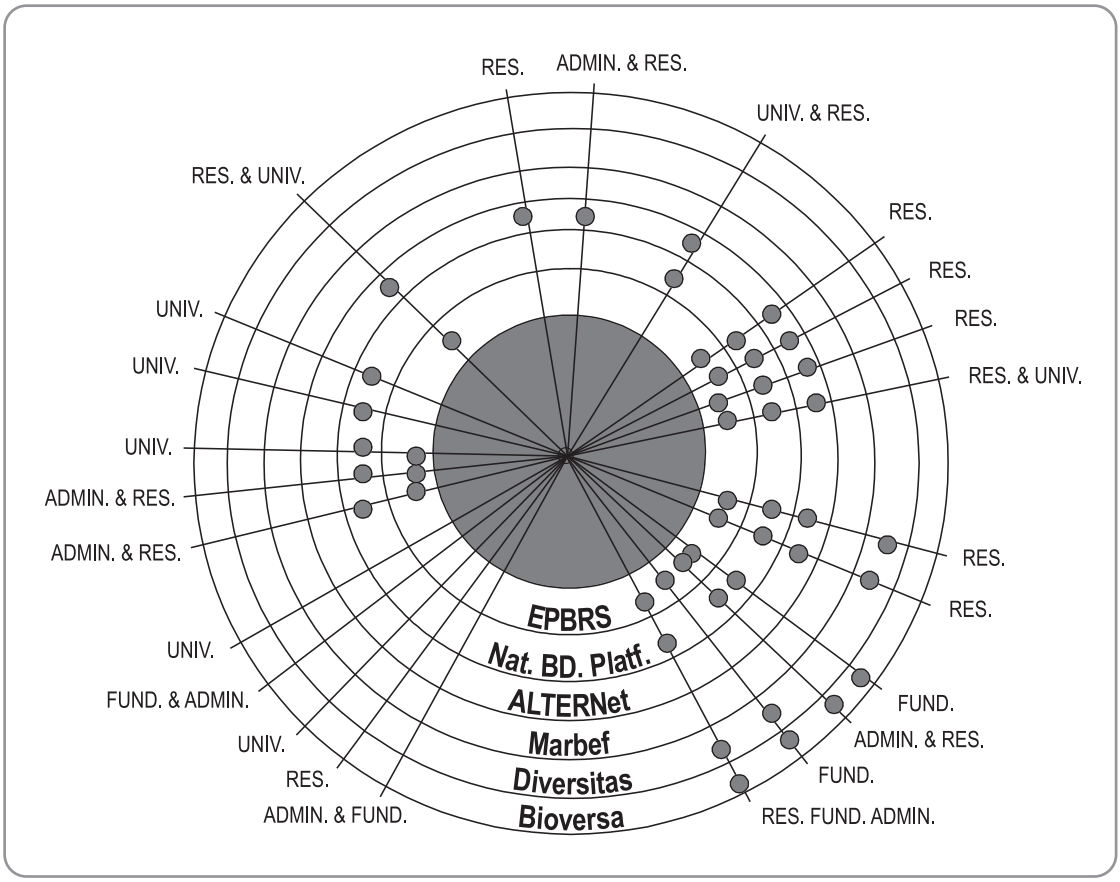

Fig. 1. A diagram of the membership of the various responders´ organisations in six biodiversity research related networks: EPBRS, national biodiversity platforms, ALTER-Net, Marbef, Diversitas and Bioversa. A dot indicates membership in a network. The various organisations have one or several roles: university, research organisation, administration or funding organisation.

3 Results

3.1

Research carried out

The first part of the questionnaire requested information on research carried out related to the topics of the various recommendations. Information was requested separately for research carried out in the responder's country (3.1.1) and in the responder's institute (3.1.2). In addition, information was requested on the effects of research on conservation policies or practices (3.1.3). All responses are presented in the Appendix 3.

3.1.1

Research in the countries

On average 40 % of the responders considered there to be several projects or a major research effort in the country corresponding to the topics raised in the recommendations (Fig. 2). On average 7 % of the responders could not identify any research corresponding to a particular research recommendation.

However, more than a third of the responders felt that they did not know or were unable to specify what research is going on, suggesting that there are no easily accessible overviews of ongoing research at country level. The highest number of non-responses was attracted by sector specific recommendations. In fact, 10 recommendations among the 26 are sector specific (see Appendix 2). For instance, 60% gave no response for the recommendation number 23: *Investigate new and alternative approaches to ensure the future economic and environmental sustainability of the aquaculture sector*. The results suggest that it is difficult to get a comprehensive overview of biodiversity research and that specific sector oriented research efforts are easily marginalised.

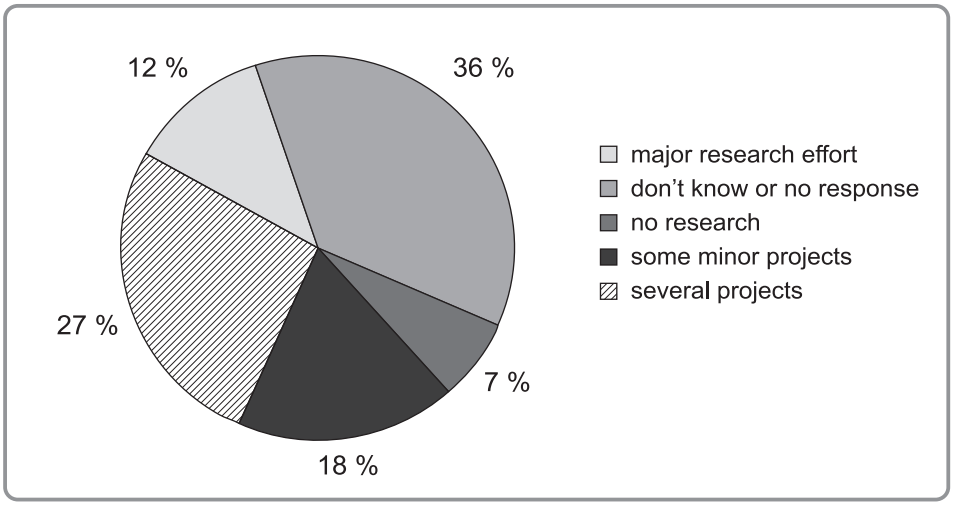

Fig. 2. Research in the fields related to the research recommendations in the Message from Malahide carried out in the countries, average of all responses

3.1 2

Research in the responding organisations

The analysis of research carried out in the organisations was restricted to those organisations whose focus is on conducting research. Thus only 17 organisations of the 27 answers have been taken in account (Fig. 3). A quarter of the organisations answered 'no research', and the highest figures of no research were mainly received for the focused on the specialised sector recommendations. A third of the answers indicate that there are 'some minor projects' and the other third that there are important efforts corresponding to the topics of the recommendations. The responders were obviously more familiar with the situation in their own institutes than in their country and thus the no-response figure was lower, but still considerable (15 %). Despite of the missing 15 % responses ('no response') and an average of 25 % responses 'no research', the data indicates that substantial research recommended by the EPBRS is taking place, or that many of the recommendations reflect existing strong research interests. The relatively high percentage of 'no research' responses is understandable, as the research recommendations also include specific sector research activities that only few institutes conduct.

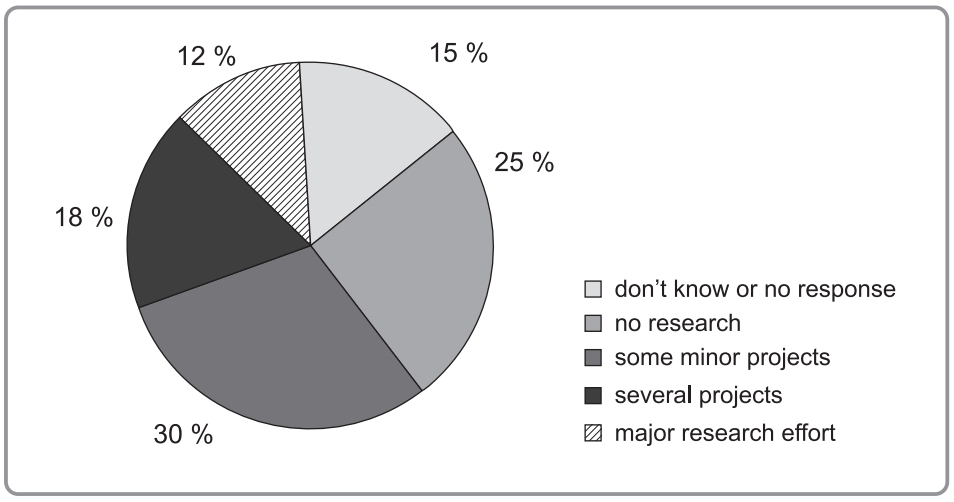

Fig. 3. Research in the fields related to the research recommendations in the Message from Malahide in the responding research organisations.

3.1.3

Use of research

The views on the effects of the research that has been conducted differ very clearly between the management organisations and those carrying out research (Figures 4 & 5). Of the responders from research organisations 14% say that they don't see 'significant effect' of the research on the practices or policies while the figure is only 3% for those from the management organisations. The researchers are also more pessimistic than the managers with respect to the option 'clearly verifiable effects' or 'major change in policy or practice' with 13% for researchers and 28% for managers.

We can also observe that the majority of the responders (around 50%) doesn't know the effects of the research corresponding to the recommendations on conservation policies or practices. One explanation is that the effects are felt to be too difficult to detect due to many intermediating levels and processes, and thus 'I don't know' is an easy way out. Most researchers used this option. This can be interpreted to mean

that few research responders have opportunities to follow the processes from research to policy, or that they are not interested in it.

When analysing the recommendations one by one, it appears that the effects are relatively speaking easier to verify for the first three "natural sciences" recommendations (recommendations number 1, 2 and 3, see Appendix 1). Also the recommendations 5 and 11 appear to have some important effects on the policies. When the recommendations are grouped according to the underlying type of research, differences are found in views on various recommendation groups as well as between researchers and managers (Table 3)

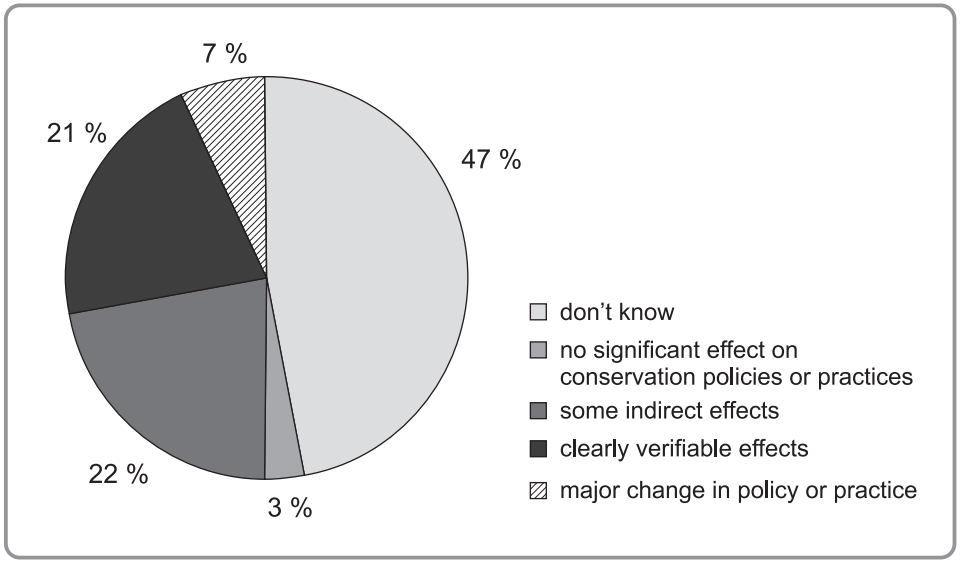

Fig. 4. Effects of the research recommended in the Message from Malahide on the conservation policies or practices: views of the management organisations.

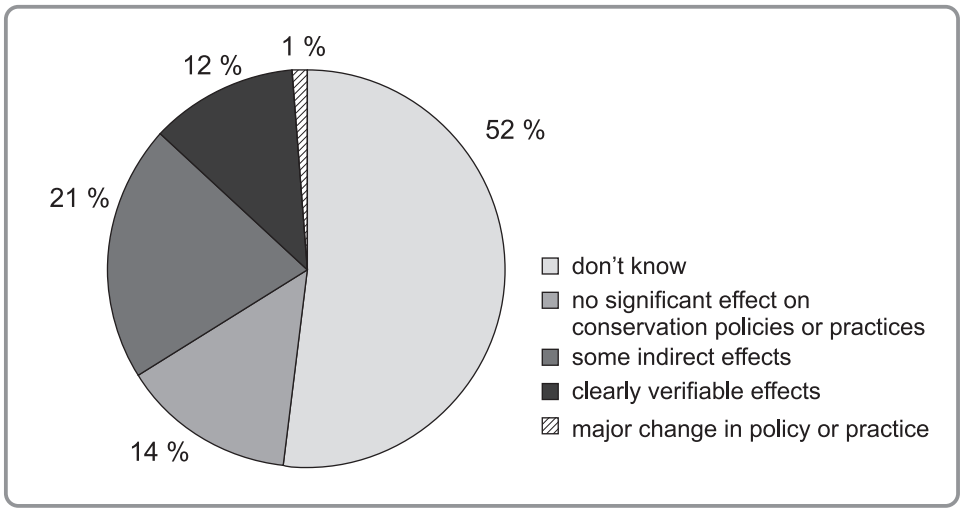

Fig. 5. Effects of the research recommended in the Message from Malahide on the conservation policies or practices: views of the research organisations.

Table 3. Distribution of views on the significance of the research. The results are given as ranges of percentages of the group (research organizations or managers). The data used in this analysis included 17 research and 9 manager organisations. The first number represents the minimum percentage observed and the second the maximum percentage.

	No significance % of replies		**Some indirect effects** % of replies		**Clearly verifiable effects** % of replies		**Major change in policy or practice** % of replies		**Cannot judge** % of replies	
Type of research	Researchers	Managers	Researchers	Managers	Researchers	Managers	Researchers	Managers	Researchers	Managers
Natural sciences	12-18	0-11	18-30	0-33	6-24	11-33	0-6	0-22	35-53	11-56
Social sciences	12-24	0-11	12-24	11-33	6-18	11-55	0-6	0-11	47-53	33-56
Natural and social sciences combined	12-18	0-33	12-24	0-44	0-12	11-33	0	0	59-65	33-67
Sector specific research	6-18	0-11	6-35	0-33	6-24	11-33	0-6	0-11	47-77	44-78

The patterns suggest the following:

1. Most researchers have great difficulties in assessing the significance of research, and the greatest uncertainties are found in social science research. There were 12-13 researchers of the 17 who could not judge or thought that social science has had no role whatsoever (see full data in Appendix 3).
2. Managers and funding organizations generally have a more optimistic view and are more confident in judging the role of research, but they also generally see social science contributions to be smaller than the natural science contributions.
3. There are some interesting exceptions - the development of methods and the species interaction studies do not get much appreciation, some of these are found in the category combinations of natural sciences and social sciences.
4. The sector specific research gets little attention in general.

3.2

Research needs

The responders were asked to identify the three most important research recommendations for halting the decline of biodiversity and put them in order. In a follow-up question they were given an opportunity to explain why. Of the 27 analysed questionnaires only 13 had ranked the recommendations. These are presented in figure 5. However, 19 responses gave either the explanation to the ranking or a more general outline of what kind of research is important for halting the decline. We return to these open questions in the chapter 3.4.

The Message from Malahide list 26 research recommendations. Fourteen of them were not even once selected to be among the three most important ones (Figure 6 and Appendix 4). The ones which did not attract attention were related to specific sectors (nine on the fourteen recommendations: agriculture, fisheries, or developing countries) indicating that the halting of the decline is seen as a task that emphasises broader research topics more than any sector specific ones. Five recommendations (17, 12 10, 9 and 8) were recommended only by one institute and only one of them (recommendation 10) was named as the most important. Thus the focus was on seven recommendations.

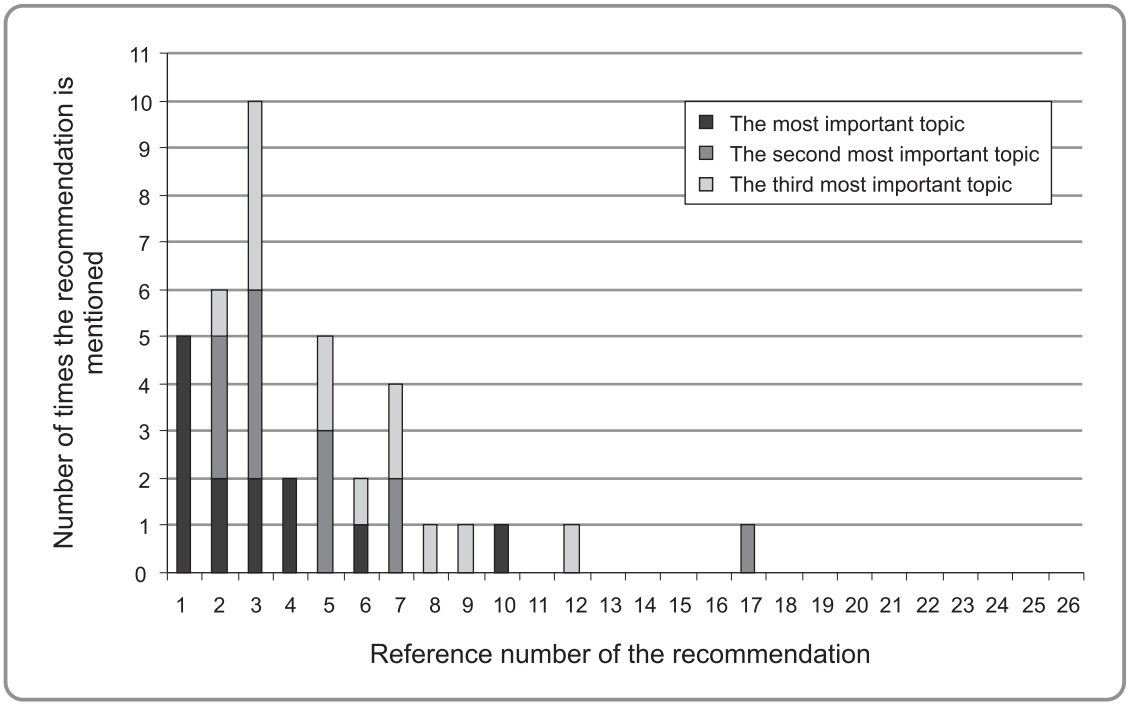

Fig. 6. Illustration of the distribution of the responses for the "three most important topics" from the recommendations in the Message from Malahide. The number of the recommendations refers to Appendix1, section 2.

There were some differences in how important the seven recommendations were seen to be. Recommendation 1 was identified to be the most important by five responders while, for example, recommendation 3 was seen among the three most important by 10 responders, but only two considered it to be the most important. The other commonly emphasised recommendations were 2 and 5, and to some extent 7. The latter recommendation is among the ones that have mainly social science emphasis. Table 4 shows how the various recommendations have been ranked.

The seven most highly ranked are those that are also listed as the first seven recommendations of the questionnaire, and in the original list. They are the most general, and also very broadly formulated. It is therefore natural that they attract attention.

The results of the survey thus indicate that the three most important recommendations are 1, 2 and 3. They are as follows:

1. *improve understanding of the major anthropogenic and natural drivers of biodiversity change, and their individual and combined impacts. Important drivers and pressures include (concised from the original list), e.g. habitat fragmentation, climate change, pollution (including eutrophication), invasive organisms, loss of genetic diversity, sea- and land-use change.*
2. *develop, test and evaluate indicators, and harmonise habitat and landscape classifications, to deliver policy-relevant information on the status and trends of biodiversity, the drivers of biodiversity change and the success of policies designed to halt the loss of biodiversity by 2010, and progress towards targets of the EC Biodiversity Strategy. Develop indicators of sustainable management of renewable resources, ecosystem integrity and ecosystem goods and services, vulnerability of livelihoods, public awareness and participation, and funding to biodiversity.*
3. *further develop an accessible Europe-wide geo-referenced inventory of species and habitat distribution, status and trends, underpinned by significant new taxonomic effort, and support similar research in developing countries. This should include quantification of genetic diversity for species of economic or conservation importance, and improved understanding of traditional knowledge and uses of species and habitats.*

These refer to the status and trends and the pressures and drivers of change. It is evident that the responders strongly believe that the decline of biodiversity is mainly a natural science problem that can be solved using (mainly) natural sciences. The top three recommendations are fairly pure natural science recommendations, and only one social science recommendation (recommendation 6 which has, in fact, a strong emphasis on natural science) has received a single "most important" mentioning. The only "pure" social science recommendations that have received significant attention are recommendations 5 and 7, but clearly only as "assisting" recommendations (Table 4).

The recommendations for specific sectors received little weight. The recommendations with a broader focus were ranked higher, which indicates that responders conceive halting the decline of biodiversity as a task that requires broad activities rather than sector-specific research. The developing country recommendations also received little weight, but this probably reflects the responders' perception that the 2010 target is set for biodiversity in Europe only.

The recommendations which have attracted research activities (projects) in the responders country correlated with the recommendations seen to be among the three most important. In 70% of the responses, the fields of the three emphasised recommendations correspond to several projects or major research efforts. This may reflect a genuine concern and focus, but it may also reflect a certain conservatism or "research momentum" that is not easily redirected.

Table 4. Numbers of times that a recommendation in the Message from Malahide is mentioned by the researchers (8 responses) or the managers (5 responses). Only 13 of the 27 responders replied to this question. The table includes only those recommendations that have been mentioned at least once (see Appendix 4).

	First most important topic			**Second most important topic**			**Third most important topic**		
Recommendations:	Management organisations	Research organisations	**Total**	Management organisations	Research organisations	**Total**	Management organisations	Research organisations	**Total**
1. natural sciences	1	4	**5**	0	0	**0**	0	0	**0**
2. natural sciences	0	2	**2**	1	2	**3**	1	0	**1**
3. natural sciences	2	0	**2**	1	3	**4**	1	3	**4**
4. natural sciences	1	1	**2**	0	0	**0**	0	0	**0**
5. social sciences	0	0	**0**	1	2	**3**	1	1	**2**
6. social sciences	0	1	**1**	0	0	**0**	1	0	**1**
7. social sciences	0	0	**0**	1	1	**2**	1	1	**2**
8. social sciences	0	0	**0**	0	0	**0**	0	1	**1**
9. social sciences	0	0	**0**	0	0	**0**	0	1	**1**
10. social & natural sciences	1	0	**1**	0	0	**0**	0	0	**0**
12. natural sciences	0	0	**0**	0	0	**0**	0	1	**1**
17. sector, natural sciences	0	0	**0**	1	0	**1**	0	0	**0**

3.3

Obstacles in the use of research

The third part of the questionnaire presented 27 assertions on obstacles to the use of research in policy making. The responders were asked to mark whether they agree or disagree with them by using the scale of agree completely, agree partially, no position, disagree partly, disagree strongly and cannot consider claim (Section 3, Appendix 1).The majority of the responders have agreed totally or partially (72% of the responses) with all the obstacles raised in the questionnaire (Figure 7).

The strongest approval (around 90% or more, generally agree) was given for the following statements:

- the benefits of preserving biodiversity have not been made sufficiently visible in the public debate,
- the conservation of biodiversity loses in competition with other interests,
- policy makers have a lack of knowledge of relevant biodiversity research,
- policy-makers have an insufficient understanding of biodiversity, and
- policy-makers lack awareness of the value of biodiversity.

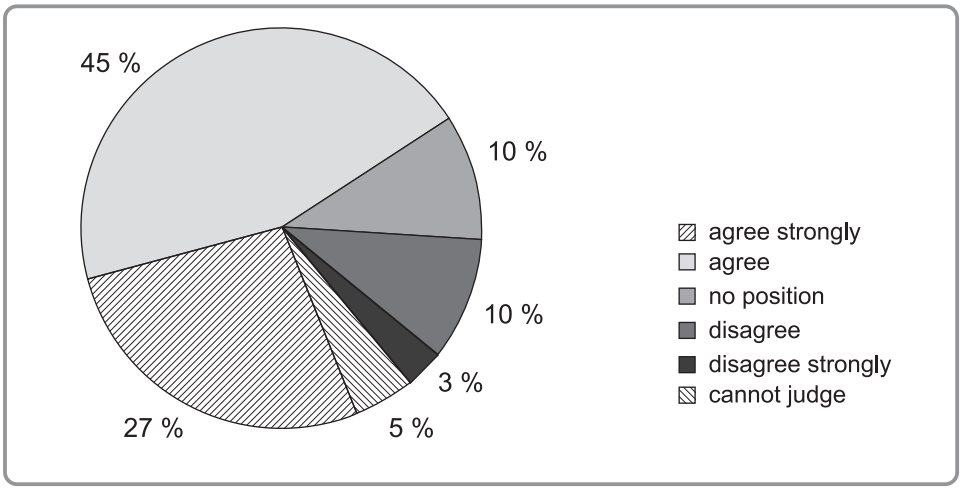

Fig. 7. The responders' position to the statements on the obstacles to the use of research findings (responses from researchers and managers pooled)

The views of persons representing research and management organisations were remarkably similar. What emerges from the responses is a general lamentation:

- Biodiversity is marginalised in society: biodiversity loses in competition with other interests; short term interests dominate; policy makers do not appreciate biodiversity; there is a lack of public pressure;
- There is a lack of resources for producing management advice;
- There are cognitive barriers: Research is not communicated in a convincing way; there is a lack of forums for exchange of information between researchers and policy makers; researchers do not understand management needs; policy makers do not understand biodiversity, its value or research results; relevant policy processes are not researched.

Some differences in views emerged concerning a question of time resources. About a third of the responders disagreed with the statement that time would be a serious constraint for researchers to participate in policy processes.

Some variation in the opinions was also observed for the two statements:

- Biodiversity researchers do not value uses of natural resources (10 out of 25 disagreed)
- Resource managers have not recognized the importance of preserving biodiversity (8 out of 25 disagreed).

The positions of the managers and researchers did not differ on the statement that was made on the biodiversity researchers' views on the use of natural resources: the same percentage agreed and respectively disagreed with the statement in both groups. With respect to the statement on resource managers' recognition of the value of biodiversity about half of those representing management organisations agreed that this is a problem, whereas only about a third of the researchers agreed with the proposition. This probably reflect the fact that many of the responding managers represent high level policy managers, who consider that the practical on the ground management of natural resources is far from the ideal from a biodiversity point of view. The ongoing debate on the balance between the need for protected areas versus conservation through sustainable management of natural resources may also explain a part of the variation seen in responses to these two questions.

3.4

General recommendations on the use of research

Some remarks given at the end of the questionnaire to halt the loss of biodiversity by 2010 said that it could be necessary to have international agreements that are based on scientific research. More specific research programmes could be directly targeted towards the Biodiversity goals of 2010, and more international collaboration, in the field of research, in specification of research programs, in funding of international research as well as in the management of biodiversity resources, is suggested. The need for stronger science-policy interfaces was also stressed.

Other remarks emphasised the need to educate the public with positive experiences and feelings about nature in general and biodiversity in particular. Restricting the emphasis to economic and social benefits should be avoided. A strong emphasis on basic knowledge about biological diversity is needed: this will serve as a basis for policy development and management. Furthermore, the work on integrating knowledge into management and politics should be reinforced. The development of education concerning biodiversity is thus important. More co-operation is needed between biodiversity researchers, administration, teacher education and school education. The development of the awareness of citizens is seen very important.

In relation with the most important topics and more specifically with the recommendation number 5, one of the priorities in the awareness raising could be to raise the understanding of the value of biodiversity among the public, the managers and other stakeholders. This is seen crucial also for the application of measures to halt the loss. It's essential to understand the combined effects of different pressures and to understand the natural drivers of change when undertaking measures to control the anthropogenic pressures/drivers.

Finally, some responders from the research community do not think there is a need to focus on halting the loss of biodiversity in Europe, with the argument that the problem is not really serious in Europe. However, others stress that it is important to use the goal to involve the public and increase the awareness, and to find links between the policy makers and the researchers.

4 Discussion

Research needs are always developing, and they are strongly affected by the social context in which they are voiced. According to the responders natural science research is more useful for halting the loss of biodiversity than the social sciences or research in specific sectors and areas such as agriculture, fishing or others. This is based on the assumption that biodiversity loss is a general phenomenon that proceeds almost in all environments and that the loss can only be halted when enough is known of the ecological and biological processes that cause the loss.

There is little doubt that one needs information on the actual changes in the biodiversity, if one wants to plan measures to stop the loss. Furthermore, recent policy trends emphasize the need to assess and quantify the impacts of policies on biodiversity (Delbaere 2006). A focus on the natural sciences will strengthen the current trend, which seems to emphasize the evaluation of effectiveness more than the policy development and implementation. Yet one can argue that the implementation of existing management rules for biodiversity and the development of new innovative approaches are necessary, if the 2010 goal is to be reached.

This will, however, require a change in thinking. This survey suggests that it is not easy to achieve such a change, because it will partly challenge well established research communities and research uses in management. Recurring points of the comments and on the requests of the organizations are to improve the taxonomy bases, improve the awareness raising and improve the research-policy interfaces.

The lamentation over the problems of use of biodiversity research (Section 3.3) in combination with the research recommendations (Section 3.2) and use of research (3.1.3) is revealing. The results suggest that there is a feeling of general societal marginalisation among people involved with biodiversity issues. At the same time there is a strong feeling that the answer to all problems is to produce more research of the same kind as before. The implicit assumption appears to be that once a sufficient volume has been built up the force of the mass will overcome the problems.

The inertia and conservatism is also confirmed by analyses of published research. Fazey et al. (2005) have analysed what has been published by three conservations journals (Biodiversity & Conservation, Biological Conservation and Conservation Biology). Although conservation biology is often considered to require "synthetic, eclectic and multidisciplinary" approaches, only 13 % of the published articles were based on cross-disciplinary research. Fazey et al. (2005) conclude that "20% and 37% of studies had high relevance to policy and management, respectively. However, only 12,6% of studies actively went out to test or review conservation actions."

The lack of academic research on effects of policies contradicts Delbaere's (2006) observation of an increasing interest in evaluation of effectiveness, and shows that there are gaps in the policy relevance of current biodiversity research. The problem is also recognised by the responders to the survey (more than 4/5 agree with the statement that biodiversity researchers have incomplete understanding of relevant

policy processes and 3/4 agree that research on relevant policy processes have not been carried out.

There is a matching problem at the level of management. A survey by Pullin et al. (2004) suggests that only 23% of practitioners 'always' or 'usually' used scientific publications when compiling management plans. Knowledge of managers was characterised by Pullin et al. (2004) as 'experience-based' while primary scientific publications, use of which would have brought an 'evidence-based' approach to conservation, were found to be too difficult to access, too time-consuming to read and also that findings are too difficult to interpret in the context of the managers' work. Fazey et al. (2005) further explain the practical difficulties in using scientific research: it takes too much time to data to be published and the conclusions drawn are not enough clear. Furthermore, only 6% of studies they analysed were reviews that are in general found useful for the managers to apply.

The seed of change may somewhat paradoxically lie in the large proportion of lack of positions ("don't know" or "no response") concerning the most important research tasks. One could claim that this reflects poor communication between researchers and managers, and that there is a need for further and better research dissemination. An alternative position is that there is genuine uncertainty and lack of knowledge on how to proceed. In this case the answer is not better dissemination, but the creation of exploratory dialogues and adaptive processes that search for new answers from new angles. The difficulty of establishing such innovative work should not, however, be underestimated. It is much easier to convince researchers and research funding organisations alike than what is needed is more in depth research of what is already partly known that to convince them of a need for partial reorientation with respect to themes, approaches and methods.

Studies have shown that decision-makers feel that scientific advice has not been provided in a form most utilizable. (Otronen and Tirkkonen 2002, Pullin et al. 2004). The Science meets Policy forum in London (2005) also found challenges in collaboration between policy makers and scientists and listed as crucial the lack of incentives for engagement, the fact that the engagement does not cover the entire policy cycle, lack of capacity in communication and lack of comprehension of inter-disciplinarity and the length of time scales needed (Scott et al. 2006).

In the evaluation of the Finnish National Action Plan for Biodiversity a survey on the science-policy interface was conducted (Anon. 2005). According to the results the decision-makers and managers have a need for unambiguous information on the questions at hand in decision-making. They have experienced that the scientists too often fail to provide such information and sometimes the quarrels between scientific schools have only confused the exchange between science and decision-making. While the scientists may not always understand or appreciate the complexities of decision-making, the decision-makers, on the other hand, are not familiar with the processes of scientific knowledge production.

One of the proposals to enhance science-policy interface is a long-term close interaction and integration of decision-making and knowledge production as an alternative to the present forms of communication. The new approach would be an adaptive management that maintains a long-term interaction between decision-makers and scientists. 'Evidence-based conservation' (Sutherland et al. 2004) is presented as a practical way of organizing the interface between science and decision-making. However, the present problems in science communication suggest that a lot must change to make evidence-based conservation to happen. For instance, the time-lag between analysis and publication and the lack of reviews in conservation biology publications have been mentioned as obstacles to 'evidence-based conservation' (Fazey et al 2005).

'Evidence-based conservation' can also easily be seen as a last straw to make pure natural science research policy relevant. 'Evidence-based conservation' is firmly based on an ideal of primacy of (natural) science advice in decision-making giving other forms of knowledge a subordinate role. The approach, while explicitly downplaying other forms of knowledge, runs a risk of similarly undervaluing other interests than those of conservation biologists. As Fazey et al (2005) point out "[i]n conservation, many problems require non-biological solutions because the causes of conservation issues often stem from the unsustainable nature of human activities". They suggest care in adopting the approach even though they find that it has several strengths. The ideal of using the best evidence available is a basis of all rational management, but when scientific advice is incorporated in broader and more deliberative processes of adaptive management the balance between different stakeholders is less biased (Sutherland et al. 2006).

Research recommendations for biodiversity have been issued by many different organisations and in different contexts. Under the Convention on Biological Diversity the Subsidiary Body on Scientific, Technical and Technological Advice[1] has provided a large number of recommendations. Recommendations for research have also been produced by national and regional bodies, among them the EPBRS[2]. Very recently biodiversity managers and researchers in UK produced a list of 100 policy relevant research questions "that should produce a greater synergy between policy, practice and research, and could inform researchers and research funders as to where their efforts might best be focused" (Sutherland et al. 2006) – the same goal that EPBRS has on a European-wide scale.

At best the research recommendations summarize current understanding of an issue and identify questions and issues that have to be addressed in order to make progress towards, in this case, the goal of halting the loss of biodiversity. At worst recommendations are produced in power struggles, in which groups use recommendations to increase or consolidate their share of available resources or power over research agendas.

The risk of internal power struggles over the use of resources is likely to increase when the research is "decontextualised" - when research becomes an autonomous field with only weak or no links to well specified problems that have to be addressed. When, on the other hand, practical problems dominate completely, research recommendations may instead become part of the struggle over the definition of the problem that may have little to do with scientific issues.

Research recommendations should ideally steer between these dangers and become part of an innovative dialogue that not only leads to an exchange of information across manager-researcher-interest group barriers. For example Pullin et al. (2004) and Fazey et al. (2005) approach the science-policy interface as a rather technical communication problem.

Although communication is an important aspect, conflicts of interests have been raised as a second broad category of problems in utilization of scientific knowledge. The latter includes social, economic and political interests (Norton 1998, Scott 2001). The challenge is thus to aim towards the creation of new understanding of the problems at hand – to reassess the problem frames (Schön and Rein 1994). This obviously sets limits on how many and how often recommendations can and should be tabled as there should be sufficient time to test and consider critically the outcome of recommendations and to develop the understanding of what research is demanded and why.

[1] Subsidiary Body on Scientific, Technical and Technological Advice. http://www.biodiv.org/recommendations/default.aspx [August 27 2006]

[2] See, for example, http://research.amnh.org/biodiversity/center/programs/metro.html [August 27 2006] and http://www.hurricanes.nasa.gov/earth-sun/science/conservationbiology/Summary_Group1.htm [August 27 2006]

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Appendix 1. Questionnaire

Section 1

The first section of the questionnaire asked the background information:

1. Name
2. Gender:
3. Age: *Mark with X*

    20 – 29
    30 – 39
    40 – 49
    50 – 59
    60 -

4. Organisation:
5. Country:
6. Which of the following categories **does your institute or organisation represent**? *Mark with X*

    Research
    Administration
    Research funding organisation
    University or other higher education
    NGO
    Other, please specify:

7. Mark with X, which of the following networks **you or your institute is a member**.

    EPBRS
    National Biodiversity Platform
    ALTER-Net
    MARBEF
    DIVERSITAS
    BIODIVERSA
    Other, please specify:

8. Your tasks in the organisation are **mainly** related to:

    Biodiversity policy development
    Biodiversity policy implementation and enforcement
    Practical management of biodiversity
    Biodiversity research
    Biodiversity monitoring
    Biodiversity research funding
    Teaching biodiversity
    Other, please specify:

Section 2

In the section 2, an assessment of the recommendations produced by EPBRS in Killarney was requested. Below all the recommendations are listed, separated into different themes in bold character.

Status and trends

1. Further develop an accessible Europe-wide geo-referenced inventory of species and habitat distribution, status and trends, underpinned by significant new taxonomic effort, and support similar research in developing countries. This should include quantification of genetic diversity for species of economic or conservation importance, and improved understanding of traditional knowledge and uses of species and habitats.

2. Develop, test and evaluate indicators, and harmonise habitat and landscape classifications, to deliver policy-relevant information on the status and trends of biodiversity, the drivers of biodiversity change and the success of policies designed to halt the loss of biodiversity by 2010, and progress towards targets of the EC Biodiversity Strategy. Develop indicators of sustainable management of renewable resources, ecosystem integrity and ecosystem goods and services, vulnerability of livelihoods, public awareness and participation, and funding to biodiversity.

Pressures and drivers of change

3. Improve understanding of the major anthropogenic and natural drivers of biodiversity change, and their individual and combined impacts. Important drivers and pressures include (*consised from the original list*), e.g. habitat fragmentation, climate change, pollution (including eutrophication), invasive organisms, loss of genetic diversity, sea- and land-use change.
4. Further develop models at relevant scales, within and across disciplines, to understand and predict the effects of these drivers on biodiversity. Produce and implement decision support tools incorporating these models.
5. Improve understanding of public beliefs, perceptions, attitudes and preferences regarding biodiversity, and how these relate to behaviour and public policy; increase knowledge of the various values of biodiversity (not limited to economic) and improve methods for their evaluation.
6. Improve understanding of the ways humans use biodiversity, and the ways those uses affect biodiversity, ecosystem goods and services and ecological-economic system resilience. Quantify the contribution of biodiversity to livelihoods and further understand how changes in biodiversity and ecosystem functions influence livelihoods, and improve and assess strategies for sustainable livelihoods and lifestyles.

Response and policy evaluation

7. Further develop participatory and conflict management methods and effective and cost-effective policy instruments, implementing sustainable use, conservation and restoration of species and habitats, and improve methods to implement the ecosystem approach and to monitor and evaluate policy.
8. Investigate forms of governance and management of biodiversity use, conservation and restoration in different sectors, taking into account uncertainty, irreversibility, and the complex nature of ecosystems, including research into implementation of the precautionary principle, addressing legal issues including cross-border and multi-level governance and jurisdiction.

Specific priorities for Biodiversity Action Plan on Conservation of Natural Resources

9. Assess and evaluate legislation, policy and sectoral activities, at all scales, that impact the conservation of natural resources, and identify solutions to conflicts.
10. Develop and assess methods of conserving natural resources that achieve sustainable lifestyles and that reduce impact on biodiversity.
11. Develop concepts, tools and methods to achieve favourable conservation status of habitats and species and establish baselines and targets.
12. Understand how species interact and contribute to ecosystem function, structure and services, and discriminate anthropogenic and natural dynamics in ecosystems.
13. Develop concepts, tools and methods to enable species recovery and to restore and manage the various functions of degraded ecosystems with reference to their resilience.

Specific priorities for Biodiversity Action Plan on Agriculture

14. Assess the performance of the reformed CAP in achieving the target of halting biodiversity loss by developing a harmonized framework for evaluation, and urgently support the development of monitoring systems using agreed indicators.

15. Define harmonized farming and landscape classification systems for the identification of priority biodiversity objectives, establish reference condition and targets and develop appropriate policy instruments for specific farm contexts and habitats.
16. Improve the design, implementation, monitoring and evaluation of agri-environmental instruments at the scales at which they most effectively deliver on the 2010 biodiversity targets.
17. Develop ecologically-based agricultural and food supply systems that enhance biodiversity and utilize its benefits, starting with research for conservation programmes for the most vulnerable and potentially useful species.
18. Analyse land managers' attitudes, motives and behaviour in order to promote and enhance their role as conservers of biodiversity in different farming contexts.

Specific priorities for Biodiversity Action Plan on Fisheries

19. Develop the ecosystem-based approach to the management of fisheries and aquaculture supported by appropriate sociological and socio-economic research.
20. Improve the understanding of the population structure of commercial species, using genetic and traditional approaches, to optimise stock management.
21. Improve understanding of the ecosystem effects of fishing activities and how they may be reduced in particular through fishing gear developments including selectivity.
22. Pursue further research into the ecological impacts of aquaculture to facilitate informed and sustainable development and management.
23. Investigate new and alternative approaches to ensure the future economic and environmental sustainability of the aquaculture sector.

Specific priorities for Biodiversity Action Plan on Economic and Development Cooperation

24. Identify and quantify the causes of biodiversity change in developing countries and the impact of this change on livelihoods.
25. Develop and evaluate economic, social, institutional, political, policy and environmental instruments in developing countries to alleviate the impacts of biodiversity change on livelihoods and to develop sustainable use and management of renewable resources
26. Develop and evaluate long-term biodiversity monitoring programmes and indicators that contribute to the assessment of the 2010 WSSD target in developing countries.

There were four questions about each of the 26 research recommendations. The first concerned the research in the responder's organisation. The responders were asked to mark with:

- 0 if there is "no research" in their organisation corresponding the recommendation
- 1 if there are "some minor projects" in their organisation corresponding the recommendation
- 2 if there are "several projects" in their organisation corresponding the recommendation
- 3 if there is "major research efforts or complete program" in their organisation correspond-ing the recommendation
- ? when they did not know the response

The second question was similar, but now about research in their country.

The third question was "Have the results of the research corresponding the recommendation changed conservation policies or practices in your country?". The responders were asked to mark with:

- 0 if there are "no significant effects on conservation policies or practices"
- 1 if there are "some indirect effects"
- 2 if there are "clearly verifiable effects"
- 3 if there is "major change in policy or practice
- ? when they did not know the response

The fourth question was: "Identify the 3 most important research topics from the point of view of producing results that can be used to halt the biodiversity decline by marking the corresponding recommendation by 1 for the most important, the next by 2 and the third most important by 3". They were also asked to give reasons for their selection.

Section 3

In the section 3 concentrated on the obstacles to the use of research findings. The responders were asked to "Consider the following claims on possible obstacles to the use of biodiversity research to halt the loss of biodiversity and tick in the appropriate column your agreement/ disagreement with the claim (assertions are not in any particular order)". The agreements were presented in 6 different columns "agree completely", "agree partially", "no position", "disagree partly", "disagree strongly", "cannot consider claim".

The claims were:

The benefits of preserving biodiversity have not been made sufficiently visible in the public debate
There is lack of resources for biodiversity research that could produce management advice
Biodiversity researchers lack the time to participate policy processes
There is a lack of exchange of information between different areas of biodiversity research
Resource managers have an insufficient understanding of biodiversity
The conservation of biodiversity loses in competition with other interests
There is a lack of mechanisms that would encourage managers to use biodiversity research results
Policy makers have a lack of knowledge of relevant biodiversity research
Biodiversity researchers have an incomplete understanding of relevant policy processes
Areas of importance for practical management of natural resources are not investigated from a biodiversity point of view
Resource managers lack the time to familiarize themselves with biodiversity research
Too few researchers have the skills needed to translate biodiversity research results into practical management advice
Syntheses and evaluations of biodiversity research have not been made to identify key findings from a policy point of view
Resource managers have a lack of knowledge of relevant biodiversity research
Policy makers have an insufficient understanding of biodiversity
There is not enough public pressure to conserve biodiversity relative to other societal goals
Relevant policy issues are not communicated to biodiversity researchers to focus research accordingly
Biodiversity researchers do not value policy making
Long term implications of research results remain unnoticed due to short term considerations that dominate the policy agenda
Policy makers lack awareness of the value of biodiversity
Research has not been carried out on relevant policy processes
Research results are not communicated to policy-makers in an understandable and convincing way
There is a lack of forums for the exchange of information and views between policy makers, researchers and managers
Biodiversity researchers have an incomplete understanding of the management of natural resources
Policy makers lack the time to familiarize themselves with biodiversity research
Biodiversity researchers do not value uses of natural resources
Resource managers have not recognized the importance of preserving biodiversity

In the last and fourth section, the organisations were invited to give comments or ideas on 'halting the loss of biodiversity by 2010'.

Appendix 2. Writers' classification of the recommendations

See numbers of recommendations in Appendix 1.

	Natural sciences	**Social sciences**	**Natural and social sciences**	**Sectoral natural sciences**	**Sectoral social sciences**	**Sectoral Natural and social sciences**
Recommendation's Number	1	5	10	17	18	14
	2	6	24	20	23	15
	3	7	25	21		16
	4	8	26	22		19
	11	9				
	12					
	13					

Appendix 3. Responses regarding the research recommendations. Two questions about how well the research conducted in responders' **organisation** or **country** corresponds to the recommendations (see the questionnaire section 2 in appendix 1). Response options: 0 = "no research", 1= "some minor projects", 2 = "several projects", 3="major research efforts or complete program", ?= "do not know". One question about the **effects of research** on policies and management practices. Response options: 0 = "no significant effects", 1= "some indirect effects", 2 = "clearly verifiable effects", 3="major change in policy or practice", ?= "do not know".

Recommendation	Responder	Resp. 1	Resp. 2	Resp. 3	Resp. 4	Resp. 5	Resp. 6	Resp. 7	Resp. 8	Resp. 9	Resp. 10	Resp. 11	Resp. 12	Resp. 13	Resp. 14	Resp. 15	Resp. 16	Resp. 17	Resp. 18	Resp. 19	Resp. 20	Resp. 21	Resp. 22	Resp. 23	Resp. 24	Resp. 25	Resp. 26	Resp. 27
	Organisation type	administration, funding	funding, administration	research	research, higher education	administration, funding	funding	research, higher education, administration, funding	research	funding	higher education	research	research	research	research, higher education	administration	research	higher education	research	research, higher education	funding	research	research, administration	administration	higher education	higher education	research	research
1	Research in organisation	1	1		2	3	2	NA	3	0	2	1	3	3	1	1	1	2	2	3	0	1	1	0	2	3	3	1
	Research in country	3	3		2	3	2		2	3	3	2	2		3	3	2	3	2	2		2	3	2	3	3	2	2
	Effects of research	2	2		2	3	2		1	1	2	0	1		0	1	0		1	1			1	3		2		1
2	Research in organisation	1	1		3	2	2	NA	2	0	2	1	3	2	3	3	2	1	2	3	1	1	3	2	2	2	3	2
	Research in country	2	1		2	2	1		1	3	3	2	2		2	3	1	2	1	2		2	2	2	3	2	2	2
	Effects of research	2	1		2	3	1		0	3	2	1	1		2	2	0		1	1			1	2		1		2
3	Research in organisation	1	3	3	2	3	2	NA	2	0	2	2	3	0	3	3	3	2	2	3	2	2	2		2	2	3	1
	Research in country	3	3		3	3	2		1	3	3	1	2		2	3	3	2	1	3		2	2			3	2	3
	Effects of research	2	2			3	1		0	3	2	0	1		2	1	1		2	1			1			1		2
4	Research in organisation	0	1	3	2	1	2	NA	1	0	1	1	2	0	3	3	3	2	3	1	1	2			1	0	3	1
	Research in country		1	3	3	3	2		1	3	2	0	1		1	3	1	2	2	1		2	0			1	2	2
	Effects of research					2	1		1	3	1	0	1		2	1	0		2	1						2		1
5	Research in organisation	2	1	2	0	2	2	NA	2	0	1	0	3	1	3	3	1	2	2	2	1	1		1	1	0	2	1
	Research in country	2	2			2	1		1	3	1	0	2		2	3	1	2	1	1		2	0	2		1	1	1
	Effects of research	2				1	2		1	2	1	0			2	2	0		2	1				2		0		2
6	Research in organisation	1	2	2	0	1	2	NA	1	0	1	1	2	2	3	2	2	2	1	1	1	1		1	1	0	1	0
	Research in country	2	2			2	2		1	3	1	0	1		2	2	1	2	1	1		2	0	2		1	1	1
	Effects of research					1	2		1	2	1	0			1	2	0		2	1				2		0		0
7	Research in organisation	1	1	3	1	1	2	NA	0	0	1	0		NA	3	2	3	1	2	2	1	1			2	0	2	1
	Research in country	2		3		3	2			3	2	0	1		2	2	1	1	1	2		2	0				1	1
	Effects of research					3	2			2	2	0			1	1	0		2	1						0		1

Recommendation	Responder	Organisation type	Resp. 1	Resp. 2	Resp. 3	Resp. 4	Resp. 5	Resp. 6	Resp. 7	Resp. 8	Resp. 9	Resp. 10	Resp. 11	Resp. 12	Resp. 13	Resp. 14	Resp. 15	Resp. 16	Resp. 17	Resp. 18	Resp. 19	Resp. 20	Resp. 21	Resp. 22	Resp. 23	Resp. 24	Resp. 25	Resp. 26	Resp. 27
8	Research in organisation	administration, funding	0		2	0	0	2	NA	0	0	0	2	1	1	0	2	3	0	1	1	1	1			0	1	1
	Research in country		1				2	2			3	2	0	2	0	2	2	1	2	2	1		2	0		0	1	1
	Effects of research		0				1	1			2	2	0	1	0	1	0			1	1		1			1	1	
9	Research in organisation		3	1	2	0	2	2	NA	0	0	1	0		1	2	2	2	2	3	1	1	0			0	1	2
	Research in country		2				2	2			3	1	0			2	1	1	2	2	1		2	0		2	1	2
	Effects of research		2				2	1			2	1	0			1	1			3								
10	Research in organisation		1			0	2	2	NA	0	0	1	1		1	3	0	1	2	1	1	2	1	3	1	0	1	1
	Research in country		1			2	2	2			3	1	1			2	0	1		1	1		2	0		2	1	1
	Effects of research		0				0	2			2	1	0			2	0			2				2				
11	Research in organisation		2	1		2	3	2	NA	2	0	1	0	2	3	2	2	2	2	3	1	1	0	3	1	0	1	1
	Research in country		2			2	3	3		2	3	2	1	2		2	2	2		2	1		2	0		1	2	1
	Effects of research		2			3	3	2		1	2	1	0	2		2	1			2	1		1			0		1
12	Research in organisation		1	2		3	0	2	NA	1	0	2	2	3	0	3	2	2	2	3	2	1	0	2	2	1	2	0
	Research in country		3			3	2	2		1	3	2	1			2	2	2	2	2	1		2	0	2	2	1	1
	Effects of research					2	0	1		0	2	1	0			1	1			1	1		1			1		0
13	Research in organisation		1	1		1	0	2	NA	1	0	1	2	3	0	3	3	1	3	3	1	1	0		0	1	2	2
	Research in country					2	3	3		1	3	1	1	1		2	3	1	2	2	1		2	0		3	2	2
	Effects of research					2	2	2		0	3	1	0	1		1	3									2		2
14	Research in organisation		0			1	3	0	NA	0	0	1	1	1	0	2	1	0			1	1	1			0	1	2
	Research in country					2	3	2		0	3	2	1	3		1	1	1			2		2	0		2	1	3
	Effects of research		0				3	1		0	1	2	1	1		1	1	0			1		1			1		2
15	Research in organisation		3	1		0	2	0	NA	1	0	1	0	3		2	1	1			1	0	0			0	1	2
	Research in country						3	2		1	3	1	0	2		1	1	1			2		2	0		1	1	2
	Effects of research		1				3	1		1	2	1	1	1		1	1	0			1		1			0		2

Recommendation	Responder	Organisation type	Resp. 1	Resp. 2	Resp. 3	Resp. 4	Resp. 5	Resp. 6	Resp. 7	Resp. 8	Resp. 9	Resp. 10	Resp. 11	Resp. 12	Resp. 13	Resp. 14	Resp. 15	Resp. 16	Resp. 17	Resp. 18	Resp. 19	Resp. 20	Resp. 21	Resp. 22	Resp. 23	Resp. 24	Resp. 25	Resp. 26	Resp. 27
16	Research in organisation	administration, funding	2	–		–	3	0	NA	–	0		–	–	2	–	2	–									0	–	–
	Research in country					–	3	2		0	3		–	3		–	2	–									–	–	2
	Effects of research		0				3	1		0	2		0	1		1	0	0									1		1
17	Research in organisation	research	3			0	3	0	NA	–	0		0	–	0	3	–	0									0	–	0
	Research in country						3	2		–	3		0	3		2	1										2	–	2
	Effects of research		1				3	1			2		–	1		1	0										–		2
18	Research in organisation	research, higher education	2	1	–	0	2	1	NA	0	0		–		0	3	2	1									0	2	
	Research in country			1		–	2	2		–	3	2	0	1		0	2										2	1	
	Effects of research						1	1			2	2	0			0	2	0									0	–	
19	Research in organisation	research	2		0	0	2	3	NA		0	2	0	1	0	3	2	1		2	0		1				1	1	
	Research in country					2	2	2			2	3	0	3		1	2			3	2		2	0			0	1	2
	Effects of research		1			2	3	1			1	2		1		1	2			2	2						0		1
20	Research in organisation	research	0		0	0		3	NA		0	2	1	1	0	1		0		0	0	0	0				0	2	
	Research in country		2			2		3			3	2	0	3		1				2	1	2	0				2	1	
	Effects of research		1			2		2			1	2	0	1		1					3						1		
21	Research in organisation	research, higher education	1		0	0	3	3	NA		0	2	0		1	1		0		0	0	1	1				0	1	0
	Research in country						3	3			3	2	1			0				2	1		2	0			1	2	
	Effects of research		1				2	2			1	2	0			0				2	1						0		1
22	Research in organisation	administration, funding	0		0	0	3	3	NA		0	1	0		1	0	2	0		3	1	0	1				0	2	0
	Research in country						2	2			2	2	0	1		0				2	2						0		1
	Effects of research																												

Recommendation	Responder	Organisation type	Resp. 1	Resp. 2	Resp. 3	Resp. 4	Resp. 5	Resp. 6	Resp. 7	Resp. 8	Resp. 9	Resp. 10	Resp. 11	Resp. 12	Resp. 13	Resp. 14	Resp. 15	Resp. 16	Resp. 17	Resp. 18	Resp. 19	Resp. 20	Resp. 21	Resp. 22	Resp. 23	Resp. 24	Resp. 25	Resp. 26	Resp. 27
			administration, funding	funding, administration	research	research, higher education	administration, funding	funding	research, higher education, funding, administration	research	funding	higher education	research	research	research	research, higher education	administration	research	higher education	research	research, higher education	funding	research	research, administration	administration	higher education	higher education	higher education	research
23	Research in organisation		0		0	0		3	NA		0		1		0	0		0		2	0	1	1			0		0	1	0
	Research in country							3			3		0			0				1	1			2		0		2	2	0
	Effects of research							1			1		0			0				2	1			0		0		1	0
24	Research in organisation		1			0	1	2	NA		0	1	0			2	1	0	1	2	2	0	1			0		0	1
	Research in country		3				2	2			3	2	0			1	1	1			2		2	0		1		2	2	0
	Effects of research		1				1	1			2	1	0			1	1	0			1					0		1	0	
25	Research in organisation		0			0	1	2	NA		0	1	0		0	3		1	0	2	1	0	1			0		0	1	0
	Research in country		2				2	2			2	3	0			1		2			1		2	0		1		2	2	0
	Effects of research						1	1			2	2	0			1		1			1					0		1	0	
26	Research in organisation		0			1	0	0	NA		0		0	1	3	3	0	1	1	0	1	0	1			0		0	1	0
	Research in country						1	2			3		0			0	0	2			1		2	0		2		2	2	0
	Effects of research					1	1	1			2		0			1	0	0			1					1		1	0	

Appendix 4. Top 3 research recommendations (responses). Responders were asked to rank the three most important research recommendations: "Identify three most important research topics from the point of view of producing results that can be used to halt the biodiversity decline".

Responder	Organisation type	Recommendations																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			
Resp. 1	administration, funding																													
Resp. 2	funding, administration				1		3	2																						
Resp. 3	research																													
Resp. 4	research, higher education																													
Resp. 5	administration, funding		3	1		2																								
Resp. 6	funding	1		2				3																						
Resp. 7	research, higher education, funding, administration																													
Resp. 8	research																													
Resp. 9	funding																													
Resp. 10	higher education	1	2	3																										
Resp. 11	research																													
Resp. 12	research	1	2	3																										
Resp. 13	research																													
Resp. 14	research, higher education																													
Resp. 15	administration																													
Resp. 16	research			2			1	3																						
Resp. 17	higher education	1				2			3									2												
Resp. 18	research																													
Resp. 19	research, higher education																													
Resp. 20	funding			3							1																			
Resp. 21	research		1			3		2																						
Resp. 22	research, administration		2	1		3																								
Resp. 23	administration																													
Resp. 24	higher education			3	1	2																								
Resp. 25	higher education	1		2									3																	
Resp. 26	research																													
Resp. 27	research		1	2						3																				

Appendix 5. Obstacles to use of research (responses). The responders mark how much they agree with the assertions about obstacles to use of biodiversity research results. Options: 2= "agree completely", 1= "agree partially", 0= "no position", -1= "disagree partly", -2= "disagree strongly", blank= "cannot consider claim".

Responders	**Resp. 1**	**Resp. 2**	**Resp. 3**	**Resp. 4**	**Resp. 5**	**Resp. 6**	**Resp. 7**	**Resp. 8**	**Resp. 9**	**Resp. 10**	**Resp. 11**	**Resp. 12**	**Resp. 13**	**Resp. 14**	**Resp. 15**	**Resp. 16**	**Resp. 17**	**Resp. 18**	**Resp. 19**	**Resp. 20**	**Resp. 21**	**Resp. 22**	**Resp. 23**	**Resp. 24**	**Resp. 25**	**Resp. 26**	**Resp. 27**
Organisation type	administration, funding	funding, administration	research	research, higher education	administration, funding	funding	research, higher education, funding, administration	research	funding	higher education	research	research	research	research, higher education	administration	research	higher education	research	research, higher education	funding	research	research, administration	administration	higher education	higher education	research	research
The benefits of preserving biodiversity have not been made sufficiently visible in the public debate	1	1	1	1	1	1	2	2	1	2	2	1	2	1	1	2		1	2	2	1	2	1	2	1		1
There is lack of resources for biodiversity research that could produce management advice	2	0	0	1	1	2	2	2	1	1	1	2	2	-1	-1	1	2	1	1	1	2	-1	1	1	1		-2
Biodiversity researchers lack the time to participate policy processes	2	1	0	2	1	1	-1	1	1	1	2	-1	1	1	-1	1	2	-1	1	2	-1	-1	1	1	-1		-2
There is a lack of exchange of information between different areas of biodiversity research	2	0	1	1	1	1	1	1	0	1	2	-1	1	-1	-2	2	2	1	2	2	2	-1	2	1	2		1
Resource managers have an insufficient understanding of biodiversity	2	1	-2	0	-1	1	-2	1	1	1	2	1	1	1	1	-1	2	2	1	1	0	2	1	0	0		1
The conservation of biodiversity loses in competition with other interests	2	1	1		-1	2	1	2	1	1	2	2	2	1	1	2	2	1	2	1	1	2	2	1	1		2
There is a lack of mechanisms that would encourage managers to use biodiversity research results	2	1	0	1	1	1	1	2	1	1	2	2	2	2	-2	1	2	2	2	2	0	1	1	1	2		0
Policy makers have a lack of knowledge of relevant biodiversity research	2	0	1	1	1	1	1	2	1	1	2	1	2	1	1	1	2	2	2	1	1	2	1	1	0		1
Biodiversity researchers have an incomplete understanding of relevant policy processes	2	1	1	1	2	1	2	1	2	1	1	-1	1	-2	-2	2	1	2	1	0	1	-1	1	1	1		2
Areas of importance for practical management of natural resources are not investigated from a biodiversity point of view	2		1	-1	-1	1	1	1	1	-1	1	1	2	-2	-2	1	2	1	-1	1	0	2	0	1	1		1
Resource managers lack the time to familiarize themselves with biodiversity research	2	1	0		2	1	-1	1	0	1	1	-1	2	1	0	1	-1	2	2	2	-1	2	0	0	1		1
Too few researchers have the skills needed to translate biodiversity research results into practical management advice	2	2	1	0	1	2	1	1	2	-1	2	2	1	1	-1	2	1	2	1	2	1	-1	1	1	2		2

Responders	Organisation type	Resp. 1	Resp. 2	Resp. 3	Resp. 4	Resp. 5	Resp. 6	Resp. 7	Resp. 8	Resp. 9	Resp. 10	Resp. 11	Resp. 12	Resp. 13	Resp. 14	Resp. 15	Resp. 16	Resp. 17	Resp. 18	Resp. 19	Resp. 20	Resp. 21	Resp. 22	Resp. 23	Resp. 24	Resp. 25	Resp. 26	Resp. 27
		administration, funding	funding, administration	research	research, higher education	administration, funding	funding	research, higher education, funding, administration	research	funding	higher education	research	research	research	research, higher education	administration	research	higher education	research	research, higher education	funding	research	research, administration	administration	higher education	higher education	research	research
	Syntheses and evaluations of biodiversity research have not been made to identify key findings from a policy point of view	1	1	1	-1	-1	-1	1	1	1	1	2	1	2	1	-2	1	-1	1	1	2	2	-1	2	2			1
	Resource managers have a lack of knowledge of relevant biodiversity research	1	1	0		1	1	1	1	1	1	1	1	2	1	0	1		1	1	0	0	2	1	0	1		1
	Policy makers have an insufficient understanding of biodiversity	1	1	1	1	-1	1	2	2	1	1	2	2	2	1	-1	1	2	1	2	2	2	2	1	0	0		2
	There is not enough public pressure to conserve biodiversity relative to other societal goals	2	1	1	1	2	2	1	2	-1	2	2	-1	2	2	0	1	2	1	2	2	1	2	2	2	1		1
	Relevant policy issues are not communicated to biodiversity researchers to focus research accordingly	1	-1	1	1	1	1	2	1	1	1	2	-1	2	1	-1	2	1	2	1	2	0	-1	1	-1	1		0
	Biodiversity researchers do not value policy making	2	0	1	0	1	1	2	1	2	-1	2	1	2	-1	-2	1	1	1	-1	1	1	1	0	0	0		1
	Long term implications of research results remain unnoticed due to short term considerations that dominate the policy agenda	1	1	1	-1	-1	0	1	2	2	1	2	2	1	2	1	2	2	2	2	1	2	2	0	1	2		2
	Policy makers lack awareness of the value of biodiversity	1	0	1	1	1	1	1	1	1	1	2	2	2	1	1	1	2	2	1	2	1	2	1	1	1		1
	Research has not been carried out on relevant policy processes	1	1	2	0	1	1	1	0	1	1	1	1	1	1	-1	1	1	1	2	0	2	1	0	0	0		1
	Research results are not communicated to policy-makers in an understandable and convincing way	1	1	1	-1	-1	2	1	2	1	1	2	1	1	1	-1	1	-2	2	1	1	2	-1	2	0	1		1
	There is a lack of forums for the exchange of information and views between policy makers, researchers and managers	2	1	1	1	-1	2	2	2	1	1	2	2	0	2	-2	1	-1	0	2	1	0	2	2	0	2		2
	Biodiversity researchers have an incomplete understanding of the management of natural resources	1	0	1	0	1	1	1	1	1	1	2	-1	2	-1	-2	1	1	0	-1	0	0	-2	0	-1	2		1
	Policy makers lack the time to familiarize themselves with biodiversity research	2	0	0		1	2	-1	1	1	1	2	2	1	1	1	1	-2	0	1	2	2	2	1	1	0		2
	Biodiversity researchers do not value uses of natural resources	1	0	0	0	-1	1	1	-2	0	-1	-2	2	0		-1	1	-1	1	-1	-1	0	1	-2	-2	-1		1
	Resource managers have not recognized the importance of preserving biodiversity	1	1	-2		-1	1	-1	-1	0	-1	1	-1	0	1	-1	-1	1	1	0	0	0	2	1	0	1		1

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<tr><td>Abstract</td><td colspan="4">The European Platform for Biodiversity Research Strategy (EPBRS) and the Network of Excellence ALTER-Net have, encouraged by the EU Commission DG Research, initiated the collection of information and views on biodiversity research and research recommendations from key European biodiversity researchers and managers on biodiversity research. The survey was based on the biodiversity research recommendations which the EPBRS tabled at its meeting in Killarney (2004) and which were later adopted as part of the ”Message from Malahide”, that emerged from the stakeholder conference entitled ‘Biodiversity and the EU – Sustaining Life, Sustaining Livelihoods’ held under the Irish Presidency in Malahide in 2004.

The message that emerges from this survey is that there is a need to do more research along the same lines as hitherto. With this framing of the problem a simple recipe for action emerges: Put more money into conservation; educate decision makers in biodiversity, find links between different biodiversity efforts and make the public understand biodiversity. At the same time the survey indicates that progress in biodiversity protection is difficult to achieve.

An alternative problem framing is therefore that more attention needs to be put on policy and politics. This may require a reassessment of research needs. First, the depth of knowledge should match policy needs. Second, the survey showed that there is a lack of understanding of how science can contribute to policy and policy implementation except by providing normative statements on the need for biodiversity protection. Research into relevant processes of awareness-, decision- or value formation is needed to develop understanding of decision making or problems of public education. Third, there is a need to experiment with incentives that turn awareness into action for biodiversity. One should study how people can use what they know already to protect biodiversity rather than assume that people must know ever more before they can do something. This rethinking implies that the discussion on research needs should be broadened considerably beyond people who are strictly biodiversity experts.</td></tr>
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Tiivistelmä	Tämä raportti esittelee keskeisten eurooppalaisten biodiversiteettitutkijoiden ja -tutkimusrahoittajien näkemyksiä biodiversiteetin tutkimuksesta ja tutkimussuosituksista. Selvityksen panivat alulle European Platform for Biodiversity Research Strategy (EPBRS) ja EU:n huippuyksikkö –verkosto ALTER-Net, Euroopan komission tutkimuspääosaston tukemana. Kysely pohjautuu EPBRS:n vuonna 2004 Killarneyssa, Irlannissa, esittelemiin tutkimussuosituksiin, joissa pääteemana oli biodiversiteetin heikkenemisen pysäyttäminen vuoteen 2010 mennessä. Kyseiset suositukset otettiin mukaan Irlannin EU:n puheenjohtajuuskauden biodiversiteettikokouksen loppuraporttiin ”Message from Malahide”. Kyselyn tuloksista heijastuu näkemys, että luonnon monimuotoisuuden vähenemisen pysäyttämiseksi tarvitaan enemmän tutkimusta, mutta tutkimuksen painopisteitä sinänsä ei tarvitsisi muuttaa nykyisestä. Jos ongelma kehystetään näin, ovat ratkaisut yksinkertaisia: enemmän taloudellista panostusta suojeluun; päättäjien kouluttamista biodiversiteettiasioissa; eri suojelutoimien parempaa koordinointia ja kansalaisten tietoisuuden lisäämistä. Toisaalta tulokset osoittavat, että biodiversiteetin suojelussa tuloksia ei ole helppo saavuttaa. Vaihtoehtoinen lähestymistapa olisi kiinnittää enemmän huomiota suojelua koskevaan päätöksentekoon, suojelun toimeenpanoon ja poliittisiin ulottuvuuksiin. Tämä vaatisi tutkimuspainotusten uudelleenharkintaa. Ensinnäkin tiedon tulisi pitkälti vastata politiikan tarpeita. Toiseksi kysely osoitti, että tutkijat eivät tunne kovinkaan hyvin kuinka tutkimus voisi tukea suojelun valmistelua ja toimeenpanoa muulla tavoin kuin osoittamalla suojelutarpeita normatiivisista lähtökohdista. Tämän vuoksi on tärkeää lisätä tutkijoiden ymmärrystä päätöksenteosta tai kansalaisten tietoisuuden kohottamisen ongelmista panostamalla tutkimusta prosesseihin, jotka pohjustavat tietoisuuden muodostusta, tuottavat päätöksiä ja muokkaavat arvoja. Kolmanneksi vaihtoehtoinen lähestymistapa vaatisi kehittämään menetelmiä ja kannustimia, joilla tietoisuus muuttuu toiminnaksi. Olisi ennemminkin panostettava siihen, että kansalaiset osaisivat paremmin hyödyntää olemassa olevaa tietoa kuin lähteä siitä, että kansalaisten olisi tiedettävä biodiversiteetistä paljon nykyistä enemmän, jotta osaisivat toimia luonnon hyväksi. Uusi lähestymistapa edellyttää, että tutkimustarpeiden muotoilemiseen on saatava nykyistä huomattavasti laajempi perusta: siihen tarvitaan muitakin kuin luonnon monimuotoisuuden asiantuntijoita.			
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PRESENTATIONSBLAD

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www.environment.fi/publications</td></tr>
<tr><td>Sammandrag</td><td colspan="4">Det europeiska diskussionsforumet för biodiversitetsforskningsstrategier (EPBRS) och biodiversitetsnätverket ALTER-Net som hör till EUs nätverk för spetsenheter, har, uppmuntrade av EUs forskningsdirektorat, samlat in synpunkter på biodiversitetsforskning och forskningsrekommendationer. Åsikterna har samlats in med hjälp av ett frågeformulär som riktades till nyckelpersoner inom biodiversitetsforskning och forskningsförvaltning. Enkäten byggde på de rekommendationer som EPBRS tog fram vid sitt möte i Killarney (2004) och som sedermera antogs som en del av ”Budskapet från Malahide”. Budskapet från Malahide var ett resultat av den konferens om biodiversitet för olika intressenter som Irland ordnade under sitt ordförandeskap i Malahide 2004.

Svaren på denna enkät tyder på att många anser att man bör driva likadan forskning som hittills. Med detta som utgångspunkt kan man härleda ett enkelt recept för framtida verksamhet: sätt mera resurser på biodiversitetsskydd, utbilda beslutsfattare i biodiversitet, finn kontaktytor mellan olika biodiversitetsåtgärder och förbättra allmänhetens förståelse för biodiversitet. Samtidigt visar enkäten att det är svårt att uppnå resultat i skyddandet av biodiversitet.

En alternativ utgångspunkt är att man bör fästa större uppmärksamhet vid biodiversitetspolitik och politiska processer. Detta kan leda till att också forskningsbehoven måste omvärderas. För det första måste forskningens djup motsvara biodiversitetspolitikens behov. För det andra visade enkäten att det finns en brist på förståelse för hur forskning kan bidra till biodiversitetspolitik och dess förverkligande, förutom genom att ge normativa utlåtanden om att det finns ett behov av skydd. Det behövs forskning om relevanta processer som påverkar miljömedvetenhet, beslutsfattande och värderingar för att utveckla en djupare förståelse för hur beslut fattas och hur folkbildning kan uppnås. För det tredje finns det ett behov av att genomföra experiment som förvandlar medvetenhet till verksamhet som stöder biodiversitetsskydd. Man bör följaktligen studera vad människor kan göra för att skydda biodiversitet utgående från vad de redan vet i stället för att anta att de måste veta mycket mer för att kunna göra någonting. En sådan omvärdering av forskningen betyder att diskussionen om forskningsbehoven bör breddas betydligt till att även omfatta personer som inte är experter på biodiversitet.</td></tr>
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Put more money into conservation; educate decision makers in biodiversity, find links between different biodiversity efforts and make the public understand biodiversity – these were among the messages received from European researchers and managers when they were asked to give their research priorities to halt the biodiversity decline. All of this could be achieved by doing more standard research on biodiversity, combined with research dissemination.

But does this fit with the urgency of the problem, noting in particular the countdown to 2010? Or does it cause frustration and a feeling that ever more lobbying is needed for traditional biodiversity research?

The survey does indicate that progress in biodiversity protection is difficult to achieve. This leads to the discussion of the report which suggests alternative ways to tackle the dilemma of research priorities. More attention should be given to match the depth of knowledge with the needs in policy, to gain understanding of processes of awareness-, decision- and value formation as well as to the means which could turn the already existing knowledge possessed by people into action. This rethinking implies that the discussion on research needs should be broadened considerably beyond people who are strict biodiversity experts.

ALTER-Net is a network of excellence funded by the EU aiming at assessing and forecasting changes in biodiversity, structure, functions and dynamics of ecosystems and their services. This is being achieved in a number of ways. ALTER-Net is a focus of efforts to create a network of sites for European long-term terrestrial and freshwater biodiversity and ecosystem research (Long-Term Ecosystem Research sites, LTER). It is also developing a related network of Long-Term Socio-Ecological Research (LTSER) sites, which could be used to determine the socio-economic implications of, and public attitudes to, biodiversity loss. In 2005 ALTER-Net launched the International Press Centre for Biodiversity Research IPCB (www.biodiversityresearch.net/), a regularly updated online source of news and press releases about international biodiversity research, serving journalists and other users. SYKE is one of the 24 partners of ALTER-Net. For further info: www.alter-net.info

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