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Research: getting the right balance for Wildfowl and Wetlands

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Many species, habitats and ecosystems are subject to a wide variety of anthropogenic influences. This has given rise to a broad diversity of conservation and management problems around the world, and the scientific community undertakes a range of applied research programmes that reflects this diversity of conservation needs. However, there is also a large body of what is often termed pure research, for which there are no explicit conservation objectives or end-users, but which nevertheless provides information that is fundamental to many areas of applied conservation. This paper discusses obtaining a balance between focussing limited conservation research resources on species where there is a need to prevent their imminent extinction, while at the same time recognising the need for providing population monitoring for more abundant species and a foundation of species and ecosystem knowledge that facilitates a conservation approach based on prevention rather than cure. Thus it is argued that because current abundance does not provide a guaranteed protection from extinction or population decline, and because we need to understand the processes that lead to population changes, there is a strong argument for developing 'balanced' research programmes that include both threatened and presently abundant species. The potential difficulties both in achieving a balanced approach between pure and applied research, and in formulating research priorities in the light of limited and patchy conservation research funding, are also discussed.

Key words: Prioritisation, pure research, applied research, advocate groups, utility, balance.

Anthropogenic influences on many species, habitats and ecosystems have increased dramatically within the last century. Human demographic changes and technological advances have had a range of consequences for the natural environment, and the need for living space, agricultural land, industry and natural resources, has resulted in the loss or degradation of many natural systems in the last two hundred years. During the 21st century, predicted geo-demographic changes suggest that the diversity of environmental threats and their spatial distribution will continue to change and put further pressures on biota and natural systems (Williams 1993; Adams 1998). For many species, the likely consequences of

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these changes are population declines, and range contraction/fragmentation. For some groups, particularly those who do not enjoy the support of large advocate organisations, extinction rates are already demonstrably above background rates and the further loss of species is a likely scenario (Gaston 1996). In contrast to this general downward trend, a number of waterbird species have taken advantage of anthropogenic changes and specific conservation measures, and are now considered by some to be in 'conflict' with human social and economic interests. A knowledge-base is therefore needed that allows relevant authorities and organisations to make and implement decisions based on current ecological information for a particular species, habitat or ecosystem, and to take action to monitor both upward and downward trends in populations. Conservation research aims to provide solutions to the wide and varied environmental problems that exist in the world, and to service the conservation needs of end-users where those needs are greatest. Given the enormity and complexity of conservation problems, exacerbated by a wide range of social, economic, political and technological factors, appropriate prioritisation and allocation of limited resources is as much a balance for the research community, as it is for those involved in the other elements of direct conservation action.

The conservation research paradigm

Conservation research addresses and influences a wide spectrum of cross-sectoral environmental issues. It can be viewed at a number of inter-related levels, and sub-divided by a variety of categorisation processes. However, broadly speaking, conservation research can be viewed as a tripartite balance between three key elements:

1. Surveillance and integrated monitoring

Assessing the numbers and spatio-temporal distributions of biota is fundamental to conservation. Schemes designed to achieve these objectives, permit the assessment of population sizes, the designation of key wetland sites, and provide data for a variety of demographic analyses (Cranswick *et al.* 1999). As a corollary to this work, there is also a need to develop integrated population monitoring schemes, in which demographic factors (survival, fecundity, *etc*) are used for similar conservation objectives. Both count data and integrated population monitoring are also important in setting thresholds for conservation action by allowing analyses of trends over long periods of time. Monitoring habitats and ecosystems is similarly important, and requires an equally robust methodology. Additionally, surveillance and monitoring must be based on well-researched and species-specific sampling methodology to ensure we have a correct understanding of population processes and that data are defensible in the light of potential criticism from agencies seeking to develop wetland sites. Research also utilises monitoring data for enhancing investigations of population dynamics, biodiversity, species distributions and many other topics.

2. Foundation science

Conservation action requires a foundation body of knowledge about the biology, ecology and behaviour of biota and natural

systems. The development of this body of knowledge involves the study of autecology and synecology, as well as research into ecosystem level function, productivity and biodiversity, and an understanding of factors that determine and limit population sizes and distribution. A range of scientific disciplines are required to continually add to this foundation and to identify significant knowledge gaps.

3. Issue related research

A wide variety of criteria have been developed to assess when a species is believed to be threatened with the possibility of extinction, or when a group's abundance brings it into 'conflict' with human social and economic interests. These criteria provide a focus for the assessment of species specific knowledge gaps, and this in turn leads to the identification of research needs for the scientific community. The aim of this research is to provide an urgent short-term response to an immediate conservation need.

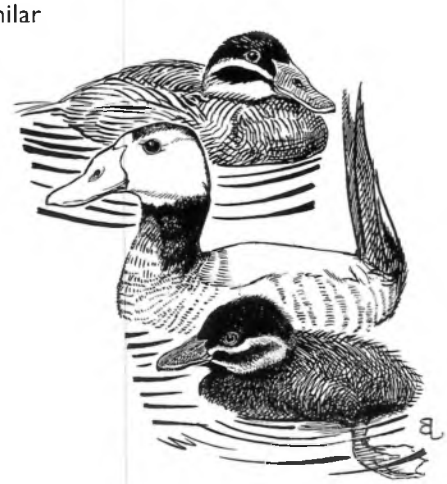
Prioritisation

For most conservation research groups, access to funds for their research is often limited by a wide variety of external factors beyond their control, and in the past this has influenced the nature and focus of some programmes. Beyond the ability to secure funding, conservation scientists aim to provide the highest possible utility from their work for the end-user community. Given the near extinction of a number of species (and habitats), it is easy to assume that species most endangered should form the primary focus of conservation research programmes, and many conservationists believe that society has a responsibility to use funds for direct action to save these species. Indeed much of the criticism levelled at the more 'fundamental' studies conducted by some research teams takes the form of *"Rome burns while researchers fiddle"*! On the surface, this can seem a seductive argument, but there are a number of shortcomings with this approach. Firstly, in most areas of the world, species threatened by imminent extinction represent only a relatively small proportion of biodiversity. A distinction needs to be made here between imminent extinction and those species that are threatened. In some senses, all species are threatened (mostly by human-related activities), and the demise of the Passenger Pigeon *Ectopistes migratorius* and the Great Auk *Plautus impennis*, or more contemporarily the downward trends in populations of Skylark *Alauda arvensis* and Corn Bunting *Miliaria calandra*, clearly illustrate that current abundance is no guarantee of short-term survival (Mace & Kershaw 1997; McKinney 1997). Secondly, these cases illustrate the need for monitoring of demographic trends and the establishment of baseline autecological and ecosystem level information about *all* species, abundant or otherwise. In this way, extinction can be prevented before the need arises to pull a species back from the brink. Information on more abundant species is often more easily collected and can provide a model for understanding the population processes and threats to critically endangered species. Lastly, there is also a great need for research programmes focussed on particular groups, such as waterbirds, to maintain contextual integrity in their approach to species research. In other words, the

successful conservation of waterbirds will in many cases be a function of the successful conservation of wetlands, and prioritisation of research issues should be similarly linked (see also discussion on advocate groups).

Pure and applied research

In the conservation world, there has been a lot of discussion about research utility and the relative importance of what is often termed pure versus applied research. These discussions have developed a considerable polarity of views and, in some circles, criticism of the type mentioned earlier. However, there remains much confusion about what exactly constitutes the differences between pure and applied research, both in definition and in utility. Pure research is often used interchangeably with the term curiosity driven research, and this is seen as being somehow distinct from applied research. But on closer inspection, the difference is often largely a semantic one. The nature of both types of research is the same, it is conducted by similar methods, and is subject to the same peer review and scrutiny. The only difference is that one is conducted for the furtherance of knowledge without direct reference to apparent or immediate utility, while applied research generally has a named end-user, and is directed towards a defined set of conservation objectives. In reality of course, much so called pure research does actually end up being 'used' in one form or another, and this blurs the distinction even further. Unfortunately, we are unable to predict what conservation problems will occur in the future, and in developing a knowledge base to buffer against unforseen problems, pure research can be considered a fundamental element of applied conservation. No-one in the 1960's, for example, predicted the alarming decrease of many farmland bird populations to present day levels, but the solutions to halting and reversing these declines come under the auspices of both pure and applied fields. Of course it is easy to understand why the feeling of a need to focus research on immediate threats has evolved. From one perspective it is important that scientists are free to conduct investigative research and follow natural curiosity without being bound by a framework of agendas and lobby interests. Indeed this 'curiosity driven' approach provides researchers with a broad scope in developing and testing new hypotheses, and hence provide a wide variety of new information about species and populations. However, from another perspective, it is hard for some



White-headed Duck
Oxyura leucocephala

conservation scientists to be comfortable with spending vast sums of limited financial resources on more 'obscure' areas of research; and so the schism develops and is perpetuated. However, a simplistic analysis of the distribution of funds leading to a research group's priorities being set by one approach or the other, is not helpful. The question, both within research groups, and indeed nationally, is therefore not one of either/or, but a balance between servicing urgent conservation needs for a smaller number of species (and habitats) and the responsibility to provide knowledge that prevents other, sometimes extremely abundant, species from walking down the road to extinction.

New research challenges

Another area where research groups have to find a balance, is between continuing to service their traditional research strengths, while ensuring the issues they are addressing are still providing the highest utility yield in a changing world with changing conservation problems. Embracing new topics of conservation research should, however, be seen as an opportunity as much as a difficulty. The potential for extending funding potential through new multidisciplinary collaborations should not be missed or ignored, and this more eclectic approach also allows researchers to participate in new areas whilst preventing criticisms of research weaknesses through lack of 'track record' in the new areas. Given the rapidity of environmental changes and threats now ranged against biodiversity, it is essential that scientists understand the need for a flexible and responsive approach to conservation research. This will be a balance between the need to give their work both breadth and depth, while keeping pace with the current issues that are at the very heart of conservation problems. For example, in terms of waterbirds and wetlands, the ever present threats from land development and habitat loss continue to dominate the conservation scene. For researchers, new challenges therefore exist, to devise methods for large scale monitoring of populations in relation to land use changes, to identify the relative influence of different development threats, and to predict where these are going to occur in the future in relation to hotspots of wetland biota. This work combines pure research areas such as metapopulation dynamics, ecotone interactions, ecosystem function *etc*, but will be of enormous utility to conservationists and policy makers alike. There are many other examples of new research areas that need to be addressed with equal balance and prioritisation. It is, for example important to echo Boyd's (1999) comments on the importance of longitudinal (long-term) studies, and the need to balance the vital long-term insights from this type of work against the perception of greater conservation 'productivity' from the immediate gains from more lateral (short-term) studies. Beyond the core of topics covered by biology, ecology, behaviour *etc*, there are the rather more nebulous research areas that will nonetheless gain in importance as anthropogenic threats to wetland biodiversity increase into the 21st Century. Climate change, ecosystem invasion by alien species, un-sustainable abstraction of water resources, to name but a few, will bring with them new research needs. More research will also need to focus on areas where biology and ecology meet the human dimension head on: development, economics, education,

policy and politics (Sutherland 1998). Since the Bruntland Commission report on Our Common Future (Bruntland 1987), the idea of sustainable development and use has become widespread in conservation philosophy and literature, although it has been interpreted in many different and often divergent ways (Redclift 1987; Adams 1990, 1993; Lélé 1991). Indeed, most of the major conservation and environmental agreements, conventions and directives, now embrace the philosophy of sustainable (wise) use. The conservation research community will have a key role to play in monitoring the ecological consequences of the adoption of this principle, and in taking part in the science behind the oft quoted phrase: "...the conservation of biodiversity is a key test of sustainability". Another area where new research is needed, is in the post-hoc evaluation of conservation action and legislation. These types of analyses are rarely conducted and there is an urgent need for quantitative and qualitative indications of how successful conservation measures have been. This requires a more sophisticated approach than merely suggesting that success can be measured against the number of birds today compared with the number of birds set out in the actions original objectives. Future planning will need to integrate a knowledge of how cost-effective the action was, and how it affected the conservation of other, non-target species (Simmonson & Thomas 1999). There are many other areas that could be cited, and others will emerge as we go in to the new millennium. Perhaps more than ever, there is a need for a well balanced research paradigm, both within individual research teams and within the wider research community as a whole.

Advocate groups

Conservation action and its associated costs are not evenly or proportionately distributed across global biodiversity. The total number of insect species out-number bird species many hundreds of times, but a great deal more is spent conserving birds than insects. This is largely a function of a sectoral approach, where the advocacy of major organisations is, for perfectly understandable reasons, focussed on popular and/or flagship species. This skewed advocacy is mirrored by a disproportionate research focus on what constitutes only a fraction of global biodiversity. In the future, the programmes of both individual research groups, and nationally or internationally coordinated work, will have to find a new balance, and use their research expertise to begin to integrate research on the less well-known groups. In many areas, this will require a greater level of collaboration between currently disparate research teams, as well as more investigations of the use of well known species as 'surrogates' of the diversity of less well-known groups (Balmford *et al.* 1996; Kershaw 1996; Ward *et al.* 1999). There is another important consideration in this area. At the United Nations Conference on Environment and Development (the 'Earth Summit') in Rio de Janeiro (1992), the importance of global biodiversity was recognised by over 170 nations who have ratified the Summit's Convention on Biological Diversity (CBD). This is an agreement with the monumental task of halting declines in biodiversity across the globe. Almost uniquely, the CBD recognises the need to conserve nested levels of organismal, ecological and genetic diversity and not to focus solely at the species level. Signatory nations agree to develop Biodiversity Action Plans

(BAPs) for the conservation of different levels of biodiversity, and to integrate these into cross-sectoral planning and policy. Although BAPs are often prioritised by criteria related to the threatened status of a particular species, group or habitat, the philosophy of the CBD requires the conservation of all biodiversity. The research community, and indeed funding bodies, must respond to this global theme, and balance research programmes in a way that advocate species do not receive attention at the expense of other less well known species or those that are difficult to study. It is also important here to make a distinction between the arguments outlined above, and arguments concerned with the development of an ecosystem conservation approach as opposed to a more single species conservation approach. Undoubtedly, for some species, maintaining a healthy ecosystem is not by itself necessarily going to achieve conservation goals, and single species plans in these cases are more appropriate. Nevertheless, the need for a balanced approach by advocate groups remains, and the single species work needs to be integrated and contextualised into the wider conservation picture.

Spatial scales

The importance of time scales for research programmes were alluded to earlier in this paper. However, spatial considerations are equally important in prioritising plans for research programmes. The scientific community will have to consider generating a balance between their regional expertise and developing programmes based on larger spatial scales over which the research will bring conservation benefits (or where the conservation need is greatest). Thus, for waterbirds, the balance will be an integration of a 'flyway' approach considering breeding grounds, staging areas, wintering areas, and local scale considerations eg where habitat loss threatens a rare species or an abundant one with a clumped distribution. As highlighted for longitudinal studies, this balance will be seen as a difficult option by some research groups, and one that could compromise their position as 'leaders' in a particular field and hence their funding potential. However, the need for this type of international and multi-disciplinary co-operation is clear, and new 'international' funding for research is becoming more accessible to help facilitate this type of research eg 'framework' funding from the European Commission.

Utility and dissemination

This paper has argued for the necessity of a balance between different types of studies, often pigeon-holed into definitions such as pure and applied research. It also has been argued that this approach should be integrated into the research planning process for individual research teams, and in terms of wider national and international research planning. For research projects where there is an identified end-user, these fall into a number of different categories:

- Statutory conservation agencies
- Public sector conservation groups and lobby organisations
- Cross-sectoral planners and policy makers at local, national and international scales
- The research community

To provide greater utility for the stakeholders of conservation research, research groups must develop infrastructures and communication routes to ensure a two-way flow of information with end-users. This dialogue must ensure that the needs of the end-user community can be integrated into research planning, as much as the results of research are incorporated into the work of the end-user group. This important process can greatly assist research groups in focussing on current issues as they arise, and so provide high utility work. The research community must also continue to improve methods of communicating their results to non-research end-users. This has traditionally been seen as a difficult area by many scientists who often have a limited time allocated within a particular research contract, but may also be concerned at the potential dilution of their research results. Additionally, this is also a difficult area because, for career reasons, publication of results is often targeted at journals where the impact rating is highest, rather than where the primary audience may be. As publication is such an important currency in the academic world, the status quo contributes to difficulties in planning a more balanced approach which addresses both audience and impact.

Conclusions

Many areas of conservation have limited resources and an ever increasing load from a multitude of demands. Research is no different in this regard, and there is a need for methodologies that allow prioritisation and wise use of financial and human resources. This is true of planning programmes within research groups, as well as when research planning occurs at a regional, national or international scale. This paper has highlighted the need for a balanced approach to conservation science, and a move towards an understanding of and commitment to the value of both pure and applied work. The changes that have occurred within the research department of WWT in the last 50 years (see review papers in *Wildfowl* 49), reflect an attempt to conduct research that is both focussed and within the overall remit of the group, while at the same time providing a well balanced programme of pure and applied research. Unfortunately, a balanced conservation research programme is often extremely difficult to maintain within the present framework of scientific funding, and many research groups focus on a particular research theme as a result of patchy funding opportunities, rather than as a result of a specific planning approach. Overcoming this problem will remain a major challenge for conservation scientists as we go into the 21st Century. However, explicitly planning and promoting balanced research programmes (even if elements within the programme remain without funding in the short and medium-terms) will provide an impetus for change, and help to balance the difficult decisions that many research teams face in planning their future work.

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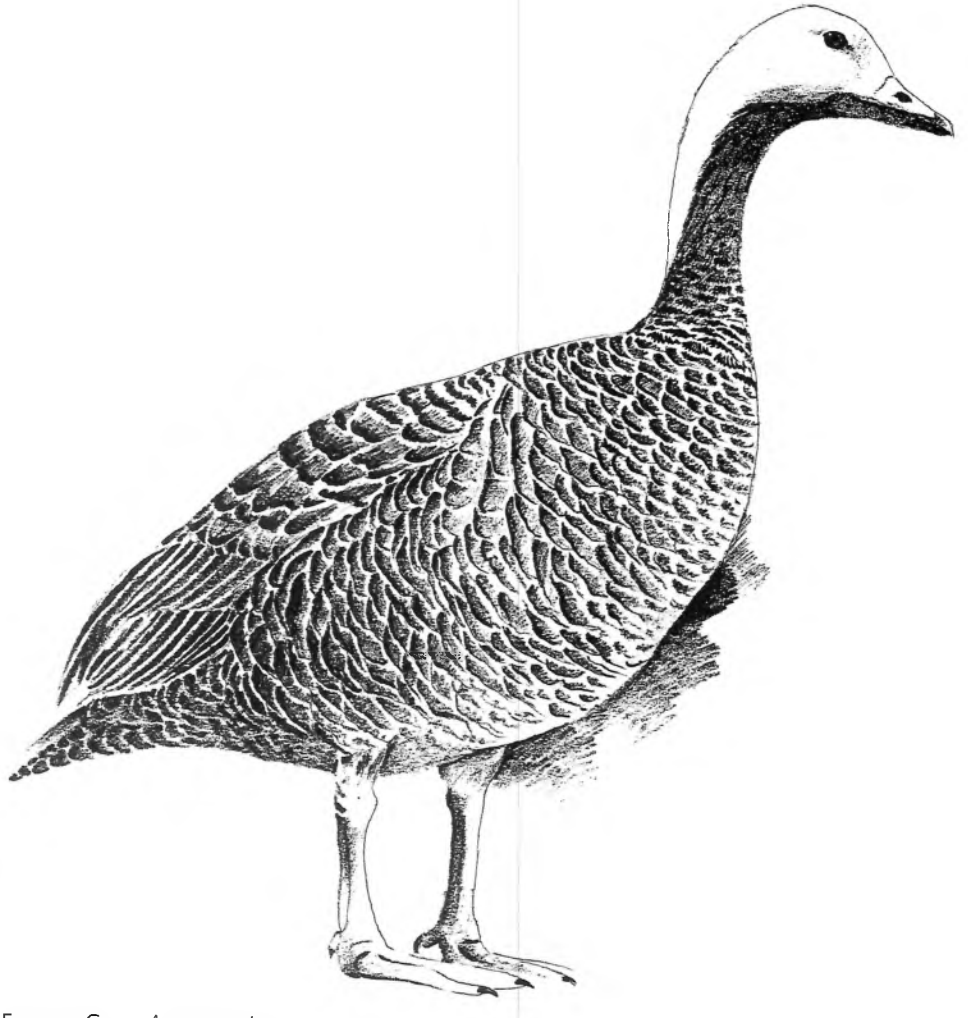

Emperor Goose *Anser canagicus*
drawn by Helen Shackleton, WWT