PROGRAMME FOR THE ESTABLISHMENT OF A NATIONAL SYSTEM FOR THE CO-ORDINATION OF BIOLOGICAL RECORDING

Prepared by the
Co-ordinating Commission for Biological Recording

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PROGRAMME FOR THE ESTABLISHMENT OF A NATIONAL SYSTEM FOR THE CO-ORDINATION OF BIOLOGICAL RECORDING

Summary

1 A 12-month programme is proposed for the detailed investigation and assessment of resources presently devoted to biological recording including recommendations for the establishment and operation of an integrated, computerised national system. The system should be capable of being integrated with other national, non-biological datasets such as those for soils and climate, and the possibility of being associated, in the future, with similar European datasets or those of other international agencies should be borne in mind.

2 The programme will be the responsibility of a consultant, to be appointed following open tender, who will be responsible to the commission and the funding agency/agencies. The consultant will appraise the information acquired and will formulate costed recommendations on courses of action, policies and standards.

3 The topics to be assessed include:-

a Principal applications of Biological Recording

b The present situation and future needs

c Technical aspects of appropriate hardware and software

d The establishment of operational standards

e Operating policies

f Legal aspects of holding and making available data.

4 The estimated cost of the basic programme is not expected to exceed £80,000. That for the Directory of Biological Datasets (which may be funded through commercial sponsorship) is an additional £33,500.

Preamble

The Commission has prepared its Statement of Intent (Annex 1) based on the views of its membership and on the meetings and reports which preceded the formation of the Commission in 1990. Central to the Statement, and to earlier documents (e.g. Berry 1988 and those reviewed by Harding 1990), is the concept of bringing together effort and resources in biological recording, through a national system, to ensure the most efficient use of resources for the common good. The availability of data from biological recording is fundamental to numerous activities in environmental management, including the assessment and understanding of biodiversity both on a national and on an international scale.

A single, adequately funded, national organisation for overseeing the maintenance of biological records is needed urgently to establish, promote, co-ordinate, maintain, monitor and, as necessary, to revise standards of accuracy, format, accessibility and compatibility of records. The proposed national system should also promote the development and creation of databases which would comply with these standards, and holders of information which achieved a satisfactory standard would be registered and accredited by the national organisation.

There is no intention, at this time, to establish a single national Biological Data Archive, but rather to facilitate existing specialist sources and to promote new sources, all operating to a common, high standard, by establishing an effective system of inter-communicating, but autonomous databases. Whether the proposed system can be developed based on any existing agency or agencies, or whether it will need a *de novo* approach is not yet clear. That data are in a computerised form is central to the proposed system, but the Commission recognises that, at present, some valuable potential sources contain data which are not, or are only partially, computerised.

The Commission considers that the establishment of such an integrated system of organisations should be based on up-to-date information on its probable components, the standards to which each currently works and the types of data each holds. Consideration should also be given to foreseeable developments in data collection, storage and manipulation, and to the integration of biological data with other types of environmental data. The Commission requires a detailed assessment of the resources devoted to biological recording, in order to formulate firm recommendations for the operation of the integrated national system. The programme is set out below.

Objectives

The programme will cover 5 key areas which are described in detail below. It will identify the applications of data and user requirements, and review and, where appropriate, evaluate present resources in biological recording in the UK. It will also examine technical and legal issues associated with the proposed national system. Based on this information, costed proposals for the establishment of the system will be made.

1. Applications

Principal applications for the use of data will be identified based on broad, but possibly overlapping themes (e.g. planning, land management, environmental monitoring, wildlife conservation, scientific research) (Annex 2). Important members of the user communities will be identified and their requirements for information assessed by direct contact. This form of market research will not be wholly passive, but suggestions will be made, to the organisations being researched, of the types of information potentially available.

An assessment will be made of the existing and probable demands for data (in terms of the type, volume and frequency) and of the relative value to users of the different forms of data (e.g. raw data or interpreted data), and the extent to which they would be prepared to pay for data.

2. Facts about the present situation

2.1 Directory of Biological Datasets

A directory will be compiled as a database covering information on all established and potential sources of datasets derived from biological recording and surveys. This directory will augment work already commissioned by DOE on datasets for monitoring species as indicators of British wildlife (Crawford, Toy & Usher 1989). It will, however, have a wider remit to cover site, habitat and species surveys and projects to map distributions of species or habitats. Funding for this aspect of the programme may be available from a commercial sponsor.

2.2 Existing agencies actively involved with biological recording

An up-to-date inventory of the principal agencies, such as local records centres, wildlife trusts, national data centres/schemes (e.g. BRC, BTO, BLS) and collative projects (e.g. NCC/ISR), will be compiled. This inventory will update and enlarge the survey by BRC and BCG in 1980 (Harding & Greenwood 1981, Greenwood & Harding 1982).

The inventory will contain elements in common with the Directory (2.1), but will cover only the main collative agencies as potential components of the national system.

The inventory will document the following for each agency:

- the extent of geographic and taxonomic coverage,
- financial and manpower resources,
- objectives,
- data holdings (including data on habitats and land use, nomenclatural practices),
- data storage and handling methods and facilities.

The relationship between present resources and workload will be assessed for each agency, but will differentiate between the requirements for handling new data from a future starting date and those for handling any existing or perceived backlog of data.

2.3 Potential of existing agencies

The programme will identify the procedures by which each agency aims to achieve its present, stated objectives. It will also assess the extent to which it achieves these objectives.

Each agency will be assessed for the additional resources (e.g. of funding, manpower or facilities) it may need to expand and develop to meet the draft standards to be developed as part of the programme (3.1).

The programme will note and assess any novel practices or methods of operation at agencies which could be considered for incorporation into the draft standards.

2.4 Assessing future needs

Methods for making good the shortfalls in coverage will be proposed, with costings where appropriate. These shortfalls may be in geographical or taxonomic coverage, habitat or land-use surveys or may concern biological information currently outside the accepted limits of biological recording (e.g. commercial and amenity tree planting), but which should be recorded.

Areas of the UK will be identified which lack formal local data centres and those which are only partially covered (e.g. incomplete taxonomic coverage, part-time staffing).

The programme will identify the extent to which each taxonomic group is covered by effective national or integrated regional species recording projects, and the extent to which each group is covered by local agencies. The viability of existing projects will be assessed.

3. Technical aspects

It is essential that the programme makes firm, reasoned recommendations on the following technical aspects, having first reviewed and evaluated the present situation. Tasks of particular importance include the preparation of draft technical and operational standards, and the design of a computerised system which will enable the individual systems in current use at the different participating agencies to be linked and for data both to be exchanged and merged.

3.1 Technical and operational standards

Individual agencies play differing roles in the existing national system of biological recording, but each will necessarily have to agree to and conform to a

set of minimum standards. Standards will need to be applied to a variety of the technical and operational aspects of agencies, such as the verification of records, confidentiality of data and minimum staffing levels. The programme will identify situations where national standards should be applied and will recommend appropriate standards based, wherever possible, on a consensus of current good practices. The Accreditation scheme devised by the Biological Recording in Scotland Campaign (BRISC Recorder No.10, 1989) should be used as a basis for formulating standards.

The development and acceptance of recommendations on standards will be as a result of close and regular interaction between the consultant, the Commission and prospective members of the national system.

3.2 Computer hardware

The programme will examine the computer hardware in current use at participating agencies with respect to its suitability to service the operational needs of the biological recording network and will recommend desirable minimum standards (e.g. for processing power and storage capacity).

The following aspects will be documented for each agency, and evaluated against these minimum standards:

3.2.1 The hardware currently in use.

3.2.2 The prospects for technological advances in hardware and their potential impact on achieving minimum standards.

3.2.3 The prospects for the application of existing and projected technologies which are not currently used and the extent to which these might become standard practices in biological recording.

3.2.4 The probable constraints on each agency which might affect changes and replacement of hardware.

3.3 Computer software

The programme will examine the computer software in current use at participating agencies. It will recommend the desirable minimum standards for software which will enable the agencies to service the operational needs of the national biological recording system, to generate data which conform to agreed specifications and to transfer or merge data between agencies. It will also assess the probable constraints on each agency which might affect any proposed changes and replacement of software recommended by the programme.

The programme will document other existing software available in the UK and overseas, and assess each in relation to the draft standards and specifications, and for its compatibility with other software.

It will cover the broad areas of data management, data analysis and GIS for each agency.

It will define functional requirements for the verification of data, for handling information at different geographical scales and for outputting data using geographical referencing systems other than the Ordnance Survey grids (British & Irish), such as latitude and longitude and Universal Transverse Mercator. It will assess how agencies use GIS for spatial analysis and data overlay. All software in current use will be assessed for suitability and compatibility.

3.4 Exchange and merging of computerised data

The programme will document the means for transferring and merging computerised data, including the existing networking systems available in the UK, and evaluate each one in relation to its accessibility to participating agencies and its ability to support the computer systems in use at those agencies. It will also document and evaluate other relevant transfer systems, with particular regard to present and future needs for international data exchange.

3.5 Data transfer standards

Existing standards for the transfer of computerised biological data, both in the UK and overseas, will be documented and evaluated (e.g. those used by or proposed by IUCN, CORINE, NCC/Recorder, BSBI). Evaluation will be in relation to the methods currently used at each agency and to the systems used by national agencies. The programme will recommend standards for the transfer of data, based wherever possible on existing practices.

3.6 Technical problems with data

3.6.1 Data input methods

The methods for data input already in use at each agency, will be documented and evaluated for effectiveness, efficiency and accuracy. The relationship between the workload of each agency and the resources allocated to data input will be assessed. Recommendations on preferred practices will be made and particular attention will be given to existing methods in relation to the data standards and the need to conform with those standards.

Other relevant methods, currently or potentially available, but not in general use in the UK, will also be documented and evaluated, and recommendations made on their use.

3.6.2 Data validation procedures

The Study will document the procedures currently operated by existing agencies, paying particular attention to taxonomic and geographical (spatially

referenced) information. These procedures will be assessed for coverage and efficiency, and recommendations made on the most effective procedures to be adopted as standards.

3.6.3 Taxonomic nomenclature and coding
Procedures for handling nomenclatural information and for dealing with nomenclatural problems and the coding of taxa (including changes in nomenclature) will be documented. These procedures will be assessed for their adaptability, for example to be expanded to include wider European taxa or to include ancillary information on species status, ecological requirements and habitat/site management requirements, and recommendations made for procedures to be adopted as standards.

3.6.4 Habitat definition and coding
Procedures and systems for handling 'habitat' information and for coding such information will be documented and assessed. The advantages of each system, and the compatibility of the different systems will be assessed, and recommendations made for the systems to be adapted as standards.

3.7 Integration of biological data with other datasets

3.7.1 Some biological data lie outside the currently accepted limits of what is regarded as 'biological recording'. Collated data on, for example, aspects of intensively managed biotopes or systems, such as forestry and amenity tree planting, should be reviewed. Datasets may be held by local authorities, government agencies and departments and some international agencies. Recommendations will be required on which types of data and which particular datasets should be covered by the national system.

3.7.2 The availability of relevant non-biological computerised datasets, at a national or regional scale, such as gazetteers, topographic boundaries, land use, climate, evapo-transpiration, soils and geology will be documented. The compatibility of each such dataset with the available and potential software packages, and with European datasets, will be assessed. Non-biological datasets may exist and be available at a variety of levels - international, national, regional and local - so that the coverage of each dataset must be clearly defined. Recommendations will be made on the most appropriate datasets to be used both nationally and regionally, having regard to their possible association with similar European or international datasets in the future.

4. Operating policies

The programme will formulate and recommend a standard set of policies for the operation of agencies within the national system. These standard policies will be

developed after a thorough review of the present policies of existing agencies and the benefits and difficulties of their individual policies.

4.1 Funding

The funding mechanisms for each agency will be documented and additional opportunities for funding for the different types of agencies (but not for individual agencies) will be investigated.

4.2 Charging policies

The existing charging policies of each agency will be documented and appraised. For each user group being supplied with data, the types of data and amount of interpretation provided will be differentiated.

Charging policies in related areas of data supply will be documented and assessed, to cover the UK and overseas, especially other EC countries.

4.3 Ownership of data

The policy of each agency regarding the ownership of the data it obtains from its sources will be documented.

4.4 Confidentiality of data

The existing procedures and safeguards employed by each agency will be documented and assessed. The reasoning behind classifying data as confidential, and any degrees of confidentiality, will be clearly described.

5. Legal aspects

5.1 Legal requirements for data

A review of EC and UK legislation on requirements for information, for example in planning, will be made. An assessment will be made of the existing and proposed legislation in terms of the demand for data and of the obligation of local authority funded agencies to supply data to users such as statutory bodies and developers.

5.2 Freedom of information and access to data

A review of EC and UK legislation on freedom of information, particularly that relating to computerised data, will be made.

An assessment will be made of how existing and planned legislation will affect a network of independent data centres, particularly in relation to access for the general public and to charging policies.

5.3 Legal opinion

The programme will seek expert advice on formulating statements and questions regarding each of the relevant aspects covered in sections 4 and 5 and will obtain expert legal opinion on the statements and questions.

Procedure

1. The programme, to be completed in 12 months, will be the responsibility of a consultant to be appointed following open tender. The consultant will be responsible for the following to the Commission and to the funding agency/agencies:

1.1 Obtaining expert advice from appropriate specialists, within a defined budget, in the areas of work specified in the objectives (1, 2.2-5.3);

1.2 Co-ordinating the work of specialists;

1.3 Reporting and appraising the information acquired and formulating recommendations on courses of action, policies and standards;

1.4 Liaising closely with the Commission at all times through agreed channels, including regular interim reporting on progress, after 3, 6 and 9 months.

The report should be presented as a draft to the Commission to enable its members to examine, assess and comment upon the draft and to revise the recommendations as necessary, for a final report.

Information acquired during the programme will be collated and stored using appropriate methods agreed in advance with the Commission and the funding agency/agencies. Results or data from the programme will remain the property of the Commission and the funding agency/agencies, but may be released for subsequent use, for example in research, databasing or publishing.

Note 1. Where a statement of costs is required, the Full Economic Cost should be used. These costs should be based on current Civil Service and/or Local Authority staff costs and recurrent expenditure rates with a uniform, but arbitrary, overhead of 100%. Staff costs should be based on grades of staff appropriate to the work required, without assumptions about the availability of volunteers or cheap labour through employment training schemes.

Note 2. The Directory of Biological Datasets (2.1), however financed, will be overseen directly by members of the Commission.

Duration and cost of the programme

1. The programme under the control of the Consultant should be completed within 12 calendar months of the date of the contract being signed.

2. The costs will include:

a)	Consultancy fee (to include staff, travel, and preparation of report) not to exceed	£35,000
b)	Budget for specialist advice not to exceed	£45,000
	Sub-total	£80,000
3.	Directory of Biological Datasets (if not funded separately)	£23,500
	Overall total	£103,500

References

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Greenwood, E.F. & Harding, P.T. 1982. Survey of local and regional biological records centres - analysis of results. *Biol. Curators' Gp. Newsletter*, 3: 108-114.

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Abbreviations and acronyms

BCG	-	Biology Curators Group
BLS	-	British Lichen Society
BRC	-	Biologial Records Centre (NERC)
BSBI	-	Botanical Society of the British Isles
BTO	-	British Trust for Ornithology
CORINE	-	Co-ordinated Information on the European Environment (EC)
EC	-	European Community
GIS	-	Geographical information system(s)
IUCN	-	International Union for the Conservation of Nature
NCC	-	Nature Conservancy Council
NCC/ISR	-	NCCs Invertebrate Site Register
NCC/Recorder	-	NCCs Recorder package for handling computerised biological records
NERC	-	Natural Environment Research Council
UK	-	United Kingdom

CO-ORDINATING COMMISSION FOR BIOLOGICAL RECORDING

STATEMENT OF INTENT

The Co-ordinating Commission for Biological Recording (CCBR) was established as the result of widespread discussions, over several years, involving all the principal existing agencies, organisations and societies engaged in biological recording. It became clear that there was a widespread and increased interest in biological records. This was especially the case for a variety of biogeographical purposes, not least their use, in conjunction with other physical and climatic data, for monitoring natural and man-made changes in the environment, as well as for their application to a variety of other purposes. For example, demand for biological records is likely to grow with the increasing introduction of environmental assessments of all kinds, whether for planning, development or land use. The Linnean Society played a leading role in these discussions and its report - *Biological Recording: Need and Network* (1988) - was presented to a fully representative meeting, organised by NERC in February 1989, of a range of agencies, scientific, voluntary, commercial, local authorities and government. This meeting recommended the establishment of the CCBR both to create, in the first instance, a nationally agreed, computerised system for biological recording and to propose an organisation to ensure its continued, effective maintenance. It was agreed that a Steering Committee representing the views of the various groups would prepare an initial plan. This committee has met and made recommendations to its constituents.

This paper sets out concisely the agreed intentions of the CCBR.

USES OF BIOLOGICAL RECORDS

Biological recording is defined as the collection, collation, storage, dissemination and interpretation of records, both in space and time, of kinds and numbers of wildlife, assemblages of organisms, and their habitats, especially when the records are related to specific, localised sites. They are of use, or of potential use, for a variety of purposes. These include:

1 *BIOLOGICAL RESEARCH AND ENVIRONMENTAL ASSESSMENT.* Biological records, especially when considered with other environmental data, are the raw material of ecological and biogeographical studies of all kinds. Because many plants and animals are sensitive to small changes in the environment, changes in their abundance or distribution can be used to detect or monitor both intrinsic and extrinsic environmental changes such as climatic change, or changes in land management such as the effects of high nitrogen, pollutants, falling watertables, amongst many others. Biological records linked with remote sensing could

provide a particularly valuable tool for survey and monitoring work, over large or small areas of the globe.

2 *PLANNING.* It is becoming of increasing importance to take statutory planning decisions with a clear knowledge of their likely or potential effects on all aspects of the environment, direct and indirect, including the effects on wildlife. These decisions require prior knowledge of which organisms are present, their abundance, ecological requirements, distribution and vulnerability. Such information is required at all stages of the planning process in order to ensure enlightened decisions by local or central government, private industry, developers, citizens or voluntary bodies.

3 *LAND MANAGEMENT.* Land owners and land managers in both the private and public sectors, whether concerned with commercial gain, amenity, habitat re-instatement, or conservation, need to know what habitats and species are present at a given site. The presence, absence and abundance of particular organisms frequently provides clear indications of soil conditions and hence of the likely outcome on the land of the management proposed. Alternatively, the effects of a particular management regime on the organisms present needs to be known, or predictable, e.g. on SSSI sites. This may require knowledge of historical records of the presence and abundance of the contemporary flora and fauna, or of how they compare with those of an adjacent region, or even in a national, or international context.

THE CO-ORDINATION AND PROMOTION OF BIOLOGICAL RECORDING

A new approach is needed since, at present, no effective organisation exists to co-ordinate records. Biological records are, at present, kept by a diversity of agencies and individuals to different standards and with differing degrees of accuracy. Moreover, these records are frequently not co-ordinated with those of other agencies concerned with collecting physical, chemical, climatic, or social data, with which the biological data could most usefully be correlated. Indeed, they are only rarely made available to such agencies. No complete Index exists of UK record holders, nor of their standards, or the availability of their records.

A single, adequately funded, national organisation for the maintenance of biological records is needed urgently to establish, promote, co-ordinate, maintain and monitor standards of accuracy, format, accessibility and compatibility of records. It should also promote the development and creation of databases which would comply with satisfactory standards, to be established, and such record holders would be registered and accredited by the national organisation. Users could then be assured of the value of any records they obtained either directly from the accredited databases, or, indirectly, through the national organisation. There is no intention, at this time, to establish a single national Biological Data Archive but rather to promote and facilitate a diversity of specialist sources brought to a common, high standard. This will require the establishment of an effective network of recognised databases. Whether the

proposed new national organisations can be developed from any existing centre or centres, or whether it will need a *de novo* approach is not yet clear.

The proposed national organisation should play a leading role in Europe, and indeed, globally, both in the promotion and the establishment of networks of other biological record centres and in conjunction with those of other environmental agencies. In this way, the value of biological records for detecting environmental change, for instance, would be immensely enhanced.

Procedure

The proposed national system should form a computerised network of local/regional recording agencies, perhaps on a county basis, together with a smaller number of national/thematic centres possessing major holdings of biological records, e.g. Biological Records Centre, British Trust for Ornithology, the Nature Conservancy Councils, certain learned societies.

In order to promote the establishment of the proposed national organisation for the maintenance of biological records as soon as possible, the CCBR will:

1 Instigate the compilation and publication of a complete Index of Biological Records Agencies currently holding records in the United Kingdom.

2 Make detailed recommendations for the establishment of an agreed computerised network of databases, including an assessment of the potential of existing centres for development, and ensure, after adequate and appropriate consultation:

   i. minimum standards for verifying the accuracy of biological records;

   ii. a common recording format;

   iii. standard procedures and common protocols to ensure the compatibility of all records;

   iv. registration procedures for accredited recording agencies;

   v. arrangements for access to the databases through prescribed procedures (N.B. The vast majority of records should, in principle, be generally available, but some records, e.g. of threatened species, may need to be restricted);

   vi. the maintenance and publication of a Register of accredited databases together with details of how, where and under what conditions records may be obtained.

3 Seek funding from appropriate sponsors and establish the embryo national organisation. Since it will be essential to establish the organisation on a

permanent basis there will be a need for ongoing discussion about how best it can be maintained and by whom.

FUNDING

The proposed network will build, to a greater or lesser extent, on existing local and national resources. It will, in any event, have to be built up in stages. Assured finance will be needed eventually to sustain the network, but some front-loaded funds will be necessary to carry out an appropriate feasibility study and to establish it in the first instance.

Initially, funding will be needed to co-ordinate and plan with other record holders the details of the proposals, to develop protocols and existing software, and to establish a basic network of databases to an approved standard. Some databases will require to be set up from scratch, although in other cases, appreciable progress will have been made towards the approved basic standard. Progress is likely to be uneven. Funds will also be needed to compile the Index of agencies holding biological records.

Since the proposed organization will be in the domain of 'public good', funding will be sought, in the first instance, from both central government and local authorities. Future funding will be determined in the light of discussions within the CCBR and with a range of potential sponsoring agencies, public and private. Although not entirely predictable, it seems most likely that diverse sources of funding will need to be involved, together with income generation in connection with access to the databases. It will, however, be essential to ensure continuity of operation both to maintain up-to-date records and to determine time trends.

APPLICATIONS FOR BIOLOGICAL RECORDS

The Co-ordinating Commission for Biological Recording's 'Statement of Intent' makes clear that there is a very wide range of individuals and organisations who currently use, or are likely to use, biological records. These users have overlapping needs and interests, but their requirements can be considered under the following headings.

1 Planning

Planning applications are formulated and presented by individuals, developers, industry, utilities and statutory undertakers. Applicants may be in the private or public sectors, small concerns or multinational organisations, and may act directly or through consultants. They need to take ecological considerations into account when preparing and presenting their applications.

Individuals and organisations comment on planning applications during the public consultation phase and require information about the wildlife and habitats which have been recorded within or, in some cases, adjacent to the boundaries of the sites covered by the applications, together with assessments of their significance.

Planners working in local authorities have to weigh the evidence on each application and need to compare the data on one site with that from other sites of a broadly similar type.

Planners at national, regional and local levels need to accumulate data to input into forward planning activities and for the development of strategic policies. They need to assess site quality and potential in the context of other similar sites.

2 Land Management/Conservation

Conservationists manage most of their land primarily for its ecological and wildlife interest. They first need to identify, assess and protect discrete sites, and therefore they need information which is site-based. They also require a context which allows them to compare individual sites with others and to assess sites objectively.

Recreation/amenity managers and commercial organisations are often required to take account of ecological considerations in managing parts of their land, within the constraints imposed by their different priorities. To manage these sites, both they and conservationists need to be able to identify, assess and protect examples of particular habitats, individual species or species associations. This management requires information which relates to particular parts of the sites and the managers need qualitative as well as quantitative data. In addition to site-based records such managers also need access to ecological information relating to habitat and species management.

Foresters and farmers manage parts of their land for production and on these areas they need information which allows them to assess the risks of pests and diseases. This is likely to be background rather than site-specific data, and must be up-to-date.

3 Science

Amateur and professional scientists are often concerned with synthesising data from individual sites. The data they need may relate to species and habitats, analyses of air, water or soil samples, results of monitoring or phenological records. Data may cover short or long periods of time and small or large geographic areas.

Ecologists and biogeographers, both professional and amateur, require raw or processed data on the distribution of species, species associations, habitats and land use for study and evaluation.

Medical scientists may require data on disease vectors.

Environmental assessors increasingly require data for a large number of purposes, including monitoring and surveillance to determine the cycling of pollutants and nutrients, and to develop indicators and models of linkages between physical and biological systems, including the effects of pollution, disturbance, land use changes and the effects on water tables and climate.

The results of this work are used by educationalists and interpreters operating at a wide variety of levels and requiring data for teaching and research purposes. The need of these workers is predominantly for processed data from which general conclusions can be drawn.

Conclusion

The needs of these various users cover a very wide range of types of data, not all of which will be covered by all record centres. Certain areas of knowledge, such as site-based records of species and habitats, are the 'core' responsibilities of such centres because there are no effective alternative sources of these data. Most users also require the records centres to be able to provide interpretation of their records and may need these services at short notice. These needs have implications for the resources needed by each centre if it is to meet the demands placed on it by the increasing number and variety of users.