Conference Report

BIOREC 75

Biological Recording in Scotland

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CONFERENCE ON BIOLOGICAL RECORDING IN SCOTLAND

11 – 13 April 1975

Papers presented at a conference organised jointly by Dundee Museum, Glasgow Museum, the Nature Conservancy Council, the Royal Scottish Museum and the Scottish Wildlife Trust in collaboration with the Biological Records Centre of the Institute of Terrestrial Ecology.

General Editor of the Report – Adam Ritchie

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PREFACE

With the growing environmental pressures in Scotland resulting from the rapid development of its tourist assets together with that of oil and related industries, the demand for reliable biological information is escalating. It is, therefore, essential that a unified system for biological data accumulation, storage and retrieval facilities, is adopted.

By comparison with the rest of the UK, there are many gaps in our knowledge of the biological wealth of Scotland due to there being fewer active field naturalists here and to the remoteness of some of the Scottish countryside.

This conference was stimulated by similar successful conferences held at Cardiff in 1971 and at Leicester in 1973. Like them, it owed its origin to the realisation by a few individuals concerned about biological recording, with encouragement from the Biological Records Centre at Monks Wood, that it would be a valuable opportunity for an exchange of information about the many different kinds of recording schemes now in operation. It would also act as a medium through which it is hoped that there will be a spread of interest in the recording of biological information throughout Scotland.

Since it is the amateur naturalist group that forms the majority of the important work force behind field-recording, the conference was given wide ranging publicity to attract as many amateurs as possible through the press, the radio, the television and circulars to all natural history societies and conservation bodies, as well as to universities, colleges, scientific research institutions and museums in Scotland.

The choice of speakers from a wide range of organisations concerned with recording reflects the conference objective to present the complete picture of biological recording:

An introduction dealing with the significance of biological records is given by Andrew Currie (NCC); a review of the different types of recording schemes is given by Alastair Sommerville (SWT); accounts of the organisations of three types of record centres are given a) on a national basis for the UK by Frank Perring (BRC), b) on a regional basis for Wales by Jim Bateman (Welsh National Museum) and c) on a local basis for Dundee and Angus by Adam Ritchie (Dundee Museum); brief accounts of recording schemes in progress are given a) for mammals by Gordon Corbet (British Museum (Nat Hist))

b) for plants by George Ballantyne (BSBI), c) for insects by John Heath (BRC), d) for marine molluscs by Shelagh Smith (RSM), e) for waders by Tony Prater (BTO) and f) for geology by Matthew Armstrong (IGS); David Daymond (Clackmannan CC Planning Department), Elizabeth Farquharson (Edinburgh Natural History Society) and Frank Hamilton (RSPB Scottish Office) present the consumer's point of view at a discussion forum; a final summary of the situation in Scotland with recommendations for future action is given by Frank Perring.

General discussions took place after the presentation of each paper and a summary of these appear in this report.

Resolutions put forward by the Nature Conservancy Council, and agreed by the delegates, recommended that a working party should be set up to encourage biological recording and to investigate the feasibility of setting up local record centres.

The conference was attended by over 100 delegates.

Adam Ritchie

INTRODUCTION TO BIOLOGICAL RECORDING

Andrew Currie - Nature Conservancy Council

Biological recording is a very new science. Indeed, the science of ecology, by which I mean the study of plants and animals in relation to their habitat, is comparatively recent in origin, though there were undoubtedly what we would now call 'ecologists' working before the conception of that name. The British Ecological Society was founded as recently as 1913. It was preceded by the British Vegetation Committee, founded in 1904. But in very broad terms, the period around the end of last century and the beginning of the present one was the period during which naturalists began to look seriously at the habitat. Prior to this, it is probably fair to say that most of the work carried out and written up was within the following broad categories:-

First: taxonomic work, that is to say, concerned with the classification of species.

Second: anatomical and to a lesser extent physiological studies, that is to say, descriptions of the various animal and plant organs and their functions.

Third: descriptions and philosophical dissertations, particularly in relation to exploration of new territories of the world and speculation as to the origins of species and the reasons for their geographical distribution, and

Fourth: listing of the species in relation to regions, counties and small geographical areas such as islands, river valleys or mountains.

From this background ecology emerged, and has continued to develop until today, when it is considered to be almost a dirty word by one section of our materialistic society. But it is the development of the fourth category which I shall discuss here. From the simple listing of the species from defined areas naturalists have proceeded to the preparation of various forms of maps of the distribution of species, andultimately to the consideration of this distribution in relation to habitats rather than geographical locations. What we are moving on to nowadays is yet another progression involving the use of information on distribution and population densities as a means of monitoring the excessive changes which modern technology can bring about in our landscape.

There are lessons to be learned by examining earlier methods of presenting scientific data, and having summarised the evolution of biological recording as we now know it, it is opportune to look back at some of the records of the past in order to learn from them. We start with William Harvey, the famous physiologist who discovered the circulation of the blood, and who in 1651 gave this account of the Bass Rock ... 'The surface of this island in the months of May and June is almost completely covered with nests, eggs and young birds, so that you can scarce find free footing

anywhere; and then such is the density of the flight of the old birds above, that like a cloud they darken the sun and the sky... If you turn your eyes below, and from your lofty stance and precipice regard the sea, there you will perceive on all sides around an infinite variety of different kinds of sea-fowl swimming about in pursuit of their prey: the face of the ocean is very like that of a pool in the spring season, when it appears swarming with frogs; or to those sunny hills and cliffy mountains looked at from below, that are covered with numerous flocks of sheep and goats. If you sail round the island and look up, you see on every ledge and shelf, and recess, innumerable flocks of birds of almost every size and order; more numerous than the stars that appear in the unclouded moonless sky; and if you regard the flights that incessantly come and go you may imagine that it is a mighty swarm of bees you have before you.' What a descriptive outburst, but try to imagine the result of presenting that as evidence to a public inquiry into the proposals of any of the steely-eyed, grasping developers of what are nowadays rather euphemistically known as 'greenfield sites'. The evidence would be laughed out of court.

Another old paper may be quoted as an example of early ornithological recording. I refer to a paper entitled 'Ornithology of the Firth of Cromarty', by W Vincent Legge, published in the Zoologist in April, 1867. This paper is characteristic of many of that period, full of interest, but also full of generalities. For example, Great Black-backed Gulls are 'plentiful in the Firth', whereas Lesser Black-backed Gulls are 'not so plentiful'. Herring Gulls are 'very plentiful' whereas Common Gulls are 'very common in the Firth'. To crown this, the Black-headed Gull is described as 'more numerous than any other species (of gull)'. Where does this take us in terms of an assessment of numbers? Regarding Brent Geese, Legge is more specific - but still lacking in clarity. 'These birds' he says 'are in the proportion of a hundred to one of any other wild fowl in the Firth. Their numbers are extraordinary - no matter in what part of the Firth your boat might be, you were sure to come upon Brent Geese...' Colourful description is not adequate in the modern context to convince our planners to vary their policies.

I have referred to birds so far, but some reference must be made to older botanical work. Perhaps because plants are static in comparison to birds or mammals, attempts were made to map plant distribution quite early during last century. The work was pioneered by H C Watson, culminating in the publication of his 'Topographical Botany' in 1873. This work established the 112 vice-counties, which were to be used as a basic unit in mapping for a century and are still used.

Now we must turn from the past to the immediate present. Whereas past recording of species distribution may be said to have been academic in purpose, biological recording as we now know it has essentially practical as well as academic aims. Man has the technical power to make massive changes to the landscape and to the seas, changes which were undreamt of until recently. Literally, Man can move mountains. He can also pollute on a massive scale and in a variety of ways; and all of this is a part of what we regard as progress. It is not my purpose here to argue the pro's and cons of the technical revolution. Let us accept that at least in part, the changes are necessary, and that they are, on the whole for the benefit of the people, their well-being and their financial security. But what as naturalists we have to ask is whether it is always necessary to destroy what is good and beautiful in order to facilitate progress; and also at what point must we, from an environmental point of view, decide that enough is enough. There has to be proper control of technical development; in some cases development has to be opposed on environmental grounds; and I suggest that sooner than we all think, society may have to call a halt to the pollution and destruction of the earth's limited natural resources. Careful monitoring is essential in order that we may have the information necessary to allow us to make enlightened decisions, and this is in my view, one of the ultimate functions of biological recording. The purely academic aims are important, but they must give way to those which are geared to provide us with the raw data for the major environmental decision-making which is so imminent in Scotland.

Let us now discuss in some detail the value of biological recording to naturalists in general, and to the Nature Conservancy in particular; for in practical terms, it is they who will most often be able to use the data in a constructive way, because of their statutory position. In so doing, however, let us not forget that the independent bodies such as the Scottish Wildlife Trust, the Royal Society for the Protection of Birds and others will also be using the information, either independently, or else in the backing up of the official body.

Habitat assessment is one of the primary tasks of the Nature Conservancy, and indeed the Scottish Wildlife Trust. This is particularly so in Scotland, and perhaps even more so in the wilder expanses of the north of Scotland, where the sheer mass of natural and semi-natural habitat are available, makes the task of ascribing any sort of conservation rating much more difficult than it would be in more built-up areas where sites of any natural interest tend to stand out much more prominently. Site assessment is a time-consuming exercise, involving literature search, site visits,

consultation with other naturalists and possibly also some degree of actual research. It is a task which with experience may be carried out quickly, but rather superficially; alternatively it may be done very thoroughly, but comparatively slowly. The purpose may be to provide an immediate response to some particular planning proposals, or more usually, the study may be part of a wider assessment in order to provide a regional conservation evaluation.

Whatever the purpose, biological records are indispensible. An example of this was the work which has recently been carried out in the Moray Firth, where wide exploration took place, sites were selected and ultimately a 'Prospectus for Nature Conservation within the Moray Firth' was produced and published as a planning document. In this, proposals for National Nature Reserves, Local Nature Reserves, Scottish Wildlife Trust Reserves and so on were made, and we are now working on the fulfilment of these proposals by the establishment of the reserves. In an excercise like this carried out in a part of Scotland which is being developed rapidly - some would say much too rapidly - and with only one Nature Conservancy officer actually involved in the detailed field work, it would have been quite impossible to proceed without the help of voluntary bodies and the recording schemes which were already operating and the biological records already available.

The first problem was to obtain bird numbers. Fortunately, Wildfowl Counts had been carried out under the auspices of the Wild Fowl Trust, and these records were immediately and freely available to us. The Birds of Estuaries Inquiry, jointly sponsored by the British Trust for Ornithology, the Royal Society for the Protection of Birds and the Wildfowl Trust, commenced in 1969, and we were able to use the facilities of this scheme in order to obtain further data. Since 1965, very nearly forty local naturalists have co-operated with the Nature Conservancy and the organisers of these two schemes to provide a bank of bird data on the Moray Firth which was not available ten years ago. This data has formed the basis for National Nature Reserve proposals in such important areas as Nigg and Udale Bays, Loch Eye, the Dornoch Firth and elsewhere. From the botanical point of view, the Atlas of the British Flora and the Critical Supplement have been constant companions to the study. Of particular value have been the maps which showed the distribution of rare species or of those which reach the limits of their distribution around the Moray Firth.

A newer scheme which I believe will be of immense value to conservationists will be the British Trust for Ornithology's Habitat Register. I have already obtained and

made good use of the site descriptions for certain sites, and it is my view that whereas it is almost impossible for professional ecologists to find the time required to carry out detailed survey work on all of the potential sites, volunteer naturalists can augment the work of the professionals by engaging in these studies on a spare time basis. One of themost important aspects of national schemes such as this one is that the information can be stored centrally, and assessments of any particular site can be made within the national context. The work of the Nature Conservancy in the Nature Conservation Review, can be extended to cover a much wider range of sites at all levels of conservation interest from the national and the international down to those which have only local interest. Thus projects such as the Habitat Register can be used to enable us to place sites accurately in their proper conservation context with reference to the whole country.

We may now consider nature reserves which we have in a variety of forms. Nature Reserves are key areas in the planned conservation of our Scottish flora and fauna. National Nature Reserves will normally have a warden, who is a full-time professional, and his work will be augmented by commissioned research. Both time and funds are limited, and the work of the professionals will always remain incomplete. Those dedicated amateurs working through the various recording schemes have a real contribution to make on the reserves and their work will be indispensible. A nature reserve has to be monitored in order both to obtain information on the changes which may take place on that reserve, and to provide comparisons with the area surrounding the reserve, and with similar areas elsewhere. The changes over a period of time which have to be measured involve schemes which operate over perhaps ten or twenty years. The task becomes almost impossible for wardens or regional staff of the Nature Conservancy to tackle on their own, and the same stricture applies to the managers of other types of reserves. Not only that, but the particular professional skills of each warden or representative will have to be augmented by visiting experts, whether they be specialists in bats or other mammals, entomologists, bryologists, conchologists or those of any other discipline, each operating within the appropriate mapping or habitat recording scheme. It is clear however that the proper use of the variety of cards made available by the Biological Records Centre is essential on all nature reserves.

Another type of scheme which is in its infancy, but which ought really to be in operation on every type of reserve, is Event Recording. Where there is a warden or representative, this is one of his tasks; where there is not, the task falls to

the management committee. An example of the usefulness of this type of recording was when it became necessary recently to obtain some information regarding fires on nature reserves. By checking through Event Record Cards, it was possible quickly to obtain a great deal of data, and to draw upon the experience of others nationwide. Similarly, experience on matters such as the establishment of trees or scrub, or the effects of visitor pressure may be shared, provided that the appropriate information is stored centrally and is easily acquired.

Obviously, it is not possible to discuss every scheme which has been used: however there is one other which is proving of great value. I refer to the work of the Seabird Group. The Nature Conservancy are in the process of preparation of a 'Prospectus for Conservation in the County of Caithness'. This county has a long coastline with a number of important seabird colonies. The records of 'Operation Seafarer' have provided very detailed counts of these birds, and enabled us to assess three sections of coastal cliff as being of national importance. The results of the operation have been published, and the volume will be a valuable guide to naturalists for many years to come.

I now wish to discuss questions of nature conservation in relation to development proposals. I have stressed earlier that biological recording is no longer a purely academic exercise. Urban and industrial development proposals arrive so suddenly that little time tends to be available for field studies before decisions must be made. Readily available information assumes a value out of all proportion to the time previously taken in collecting it. The discovery of North Sea oil greatly accelerated the process, providing the whole of Scotland with a rash of planning applications for oil-related industry. Unfortunately, when the cry of 'Jobs' goes up, society becomes polarised. A for or against situation exists, communities are divided. Five hundred jobs and a one hundred million pound investment once promised, achieve banner headlines, and against this, protestations about birds or plants are taken to be ridiculous. I have already referred to the materialistic society in which we live. I do not suggest that businessmen and planners are dishonest, but it would be naive to pretend any other than that political and financial interests, employing the best available public relations and technical advice, line up against any who seek to stem the tide, or even to ameliorate effects of development proposals. In seeking to frustrate any of the plans of developers, we must recognise that we are up against highly professional and well organised forces. It is no use opposing these with the sort of general and descriptive statements which I quoted earlier from old papers. On the contrary

we must employ ourselves the same means as are used by those whom we have to oppose. This is why, particularly in the presentation of the scientific case we must use the most professional methods. Biological recording, if properly organised can be one such method.

Dunnet Bay was the subject of a proposal for the construction of oil-rigs, which went to a lengthy Public Inquiry. Botanical Records were invaluable in assessing the significance of Primula scotica, the most significant of a number of species on the fringes of their distribution. Also in this area a number of rare mosses occur and it was expedient to refer to relevant surveys. Not all such research results in objection. This point is emphasised in relation to the Drumbuie Inquiry, and the Lochcarron area. Here, the Nature Conservancy carried out a special rapid survey for the Scottish Development Department, which involved field survey and literature search. Detailed examination of existing biological records failed to identify any species which was rare or threatened. We do not as a matter of course object to development unless the grounds for such objection are secure.

Nigg Bay is quite another case. I have already described the process of survey and research which led to the proposal that Nigg Bay ought to become a National Nature Reserve. That decision was based upon an assessment of available biological records. When subsequently there was a proposal to build an oil refinery with associated oil storage and marine terminal, conservation bodies found themselves involved in a Public Inquiry. In this type of situation, the data collected can come under the most critical examination by lawyers and business-men and planners. As happened in the Dunnet Bay Inquiry, so in the Nigg Bay Inquiry - a professional biologist was retained by the Company. This implies that the data may also be examined in these cases by qualified professional biologists and I cannot emphasise strongly enough that the facts which are recorded within the many recording schemes may be placed under close scrutiny in a Public Inquiry, and that we must always work with this in mind.

In this context, bird counts obtained under the auspices of the Wildfowl Trust and the Birds of Estuaries Inquiry were used to establish the local, national and international importance of particular species within the Cromarty Firth. This data has been severely questioned by a County Councillor and this criticism has been pressed home at the Public Inquiry. Botanical Society of the British Isles Maps of the distribution of Zostera over the British Isles, supplemented by detailed local studies, provided invaluable information on the significance of the

distribution of that species. This was relevant in that wildfowl eat Zostera - but even this known fact was challenged. I wish to re-emphasise the new scrutiny to which the records are being subjected. Ambitious gentlemen with financial and economic interests at stake are not willingly going to turn aside in the interests of birds or Zostera. Where it can be done these gentlemen will go to great lengths to discredit the data presented by conservation bodies. We must never again be so naive as to assume that our information will always be welcomed and accepted. Often it is not the truth which is being sought - but the right to develop and despoil without let or hindrance.

In the light of this, we must harden our attitudes, and apply to our studies the high degree of professional expertise without which we shall repeatedly be left standing naked in the council chamber.

There is yet another very important use for biological recording, in view of the calamatous changes which are taking place in our environment, and in particular those in previously unspoiled areas such as Lochcarron, Stornoway, Shetland and Cromarty Firth, ceaseless vigilance is essential if we are to prevent the worst excesses of pollution. We must monitor our environment. Now the monitoring of gaseous and liquid emissions from works, and sewerage from the expanding communities are all the subjects of statutory controls which ensure that certain levels are not exceeded. But most ecologists agree that these controls are not enough to protect the environment from progressive pollution. We must go a great deal further, and here biological recording can play a part. Species and habitats can be measured carefully and base-lines established. Having established a base-line, this can be used as a means of assessing change on a continuing basis. This is particularly important in sensitive habitats. It is also well-known that certain species are more sensitive than others. Lichens, for example, are particularly sensitive to air-pollution, and can be used as an indicator of change. The schemes which we design can be an early warning system. If the air we breathe or the water we drink will no longer support certain species or groups then we would do well to ask what effect it will have on Man himself. Perhaps this is the most significant and important field in which those involved in biological recording can engage themselves.

In looking to the future, I feel that I must make some mild criticism of the existing situation. There are so many organisations now involved in gathering information for their various schemes that there is a considerable possibility of

overlap. For example, both the Wildfowl Trust and Birds of the Estuaries Inquiry count duck and geese. This is not necessarily productive, and can indeed be counter-productive especially when the figures from the two schemes do not quite coincide. I do not suggest that these different figures mean anything in biological terms but they provide ammunition for our critics.

One of the problems of the multiplicity of schemes is the strain which it puts on workers. As with all practical projects, the burden of work falls upon the broad shoulders of the few, willing helpers. More especially think of nature reserve wardens, or regional staff and the representatives of the voluntary organisations. Requests for data for mapping schemes in relation to birds, plants, lichens, bumble-bees, snails and fish to name but a few: and on top of that, Habitat Registers, Nest Record Schemes, Symphytum Surveys, Great Crested Grebe and Rook Inquiries, and I could go on. I choose these quite at random. All seem necessary - and yet were a professional conservationist to respond to half of them, he would be inundated with paper work, to the detriment of other tasks. Can there not be rather more planned control, and particularly careful timing, of the schemes? Views have been expressed that it is not so much the species, but the organisations which reap the benefits or even individuals. This may seem a cynical view, but reserve wardens are perhaps the most exposed to the pressures upon their time. There is no doubt that certain well-meaning people 'get their kicks' to use a modern idiom, from their intense involvement in the schemes. Wardens and regional conservation staff have jobs to do - and many of these recording projects impinge upon their spare time. Voluntary workers willingly spend their evenings and weekends engaged in these activities. This is the time when the professional may prefer and deserve to put their feet up, rather than become involved in yet further field work. I speak from experience and may point out that all of the work on bird counts in the Moray Firth was carried out so far as I was concerned, in my spare time. It seems inevitable that these schemes depend as much upon the professional as upon the voluntary support, and this ought to be taken very much into account in the design of the schemes.

Another matter of concern to many, including those within the voluntary and statutory bodies, is the question of rare species . Not everyone agrees on the wisdom of passing on such information. Who benefits? The species or the organisation? Local naturalists are extremely sensitive about local rarities and ; question the wisdom of passing on any of the records to those whom I may call 'strangers'. Plant and egg collectors still exist, but they do not wear uniforms.

We must all be on the alert against these individuals. How can we check the credentials of those who claim to have the right to restricted information? After all, anyone can join natural history societies by simply paying a subscription. Membership of societies does not necessarily imply a right to obtain rare species data. Local naturalists may quite rightly refuse to pass on certain information on rare species or sensitive areas, because they fear that it may get into the wrong hands.

Some naturalists have been upset when visiting botanists or ornithologists from the south came north to tramp all over special sites, searching for rarities. A few years ago, botanists came north armed with map references for rare species, failed to contact any local recorders, and also apparently failed to find many of the species. These sites are well-known to County Recorders, and safe-guarded, and it is exasperating to come across visiting plant hunters who have forgotten their manners. Incidents such as these do not further co-operation within the field of botanical recording. Ornithologists suffer the same problem in relation to birds such as eagles and peregrines.

I propose to conclude with some rather tentative proposals for consideration. In as much as we hope in Scotland to evolve an even better system of biological recording than exists elsewhere, there are well-defined areas within which improvements may take place.

Much greater use must be made of local people to co-ordinate data collection and storage. It may be that local schemes are more valuable than national schemes. Certainly it is my view that data collected locally should be available locally as well as at the national centres. Only in this way will local naturalists have ready access to the material. There may also be a case for a Scottish Records Centre, and in proclaiming myself a 'separatist' in this respect, I am not in any way suggesting that there is no need for a United Kingdom Centre. The matter is really one of emphasis.

A related point is that the kilometre square is not necessarily the best unit for recording distribution. On the national scale it is valuable, but at local level, its usefulness is quite limited. We must consider the use of different types and various levels of recording. The KM^2 is a most unnatural division, and I personally cannot become as worked up about boundaries and overlap as some recorders do. The lines, as we all know well, are hard to define on the ground. The other point which I made referring to the need for varying levels of

recording is a particularly valid one when dealing with species on the edges of their distribution, or of those species which are actively spreading or retreating. Similarly, species likely to become affected by pollution undoubtedly are to be included among those requiring a much more definitive recording method.

While we have so far been able to make meaningful use of records, it is nevertheless too soon to have experienced the real benefits. So far, particularly from the point of view of those wardens and field staff who have carried out the greater part of the recording, it has been all work, and few benefits. But I am absolutely clear in my own mind that the benefits will come in the future, as with time and greater experience, we build up a greater bank of information, with better techniques developed at the collecting end and at the storage and distribution end of the spectrum of effort. If we can create a highly professional system of recording, which may be used with the utmost confidence in defence of our native Scottish flora and fauna, our landscape and our wilderness, then I will be well satisfied.

ACHIEVEMENTS TO DATE

Dr Alastair Sommerville — Scottish Wildlife Trust

In a review of what recording has achieved so far, I want to take care when talking about other peoples projects and schemes. As most of the schemes have a representative at the conference please consult them for the detailed facts. I see it my job only to pull out from the 60 or more schemes current in Scotland, some generalisations which I hope will help to broaden the concept of biological recording in peoples minds and allow them to consider the problems of groups other than their own particular interests.

I have spent some time trying to familiarise myself with the recording schemes in Scotland and to this end I have contacted all the organisers for their views of the Scottish contribution to the flow of information. The results of this rather superficial survey have been collected into the booklet you have been given and I hope this will prove some kind of reference work to consult about the schemes you might consider helping with. There are bound to be mistakes and omissions but I hope that it could be a prototype of a document which could be available to anyone interested in biological recording. I would be pleased to receive any amendments to the guide.

The sheer volume of different societies and individuals concerned with recording has meant that it is almost impossible to consider all of them at once and quite difficult to grasp why each scheme has its own approach, its own type of organisation of the recorders and its own ways of encouraging people to go out 'fact finding'. I think that if all the methods and results are looked at side by side one can see an evolution of ideas which is partly historical, partly inherent in the groups of animals and plants being studied and partly to do with the individuals motivation for helping. With so many dedicated field workers present here I hope a lot of this information will 'rub off' during the conference, informally as well as in the formal business.

Perhaps I could go back to simpler days when biological recording was a gentleman's pursuit, especially that of the country vicars. Many of the oldest original records by that type of naturalist concentrated on the unusual — unusual species or large numbers, early or late arrivals or departures — with an imprecise location often using a local place name not known to outsiders and untraceable to researchers today.

There was great difficulty in being precise — the authors liable to anecdotes, quotations and other 'red herrings'. Obviously not all of them were like that but old reliable records are quite scarce as problems of identification, nomenclature and reference specimens, as well as locality, have all given rise to confusion.

The explanation of this state is obvious — the records were collected by individuals and were individualistic. The collection of some notable fact was the essential feature with the commonplace species being overlooked — a state which still exists in part today. However, as records began to be recorded not only in their separate form but as part of a greater bank of data, from which extra facts could be extracted, the ideas of an uniformity of the methods of observing and recording grew more attractive. Today for any one scheme there is a clearly stated basic quantity and quality of records which are required, often much more demanding on the observations of the field naturalist. This 'form filling' attitude has a number of attractions especially the way in which the observer has to consider details at the time of observation which he could well forget 24 hours later — assuming he had in fact mentally noted it at the time. An example of how easily essential parts of a record are lost by negligence can be found in almost any naturalist's notebook. A visit tothe estuary to count birds — straight forward enough but an inaccurate location (knownwell of course to the naturalist himself and his colleagues but no-one else) means that a later use of the records might be unable to say how much of the estuary these records would represent or if they included the important feeding or roosting areas. Absence of details of the state of tide, visability and even the type of binoculars used all add to the possible error in the counts. Are the figures total figures of all species or were one or two species selected out as they are the 'favourites' of the observer? All these short comings have been recognised today and a great deal of thought has been put into the instructions to observers to ensure a maximum reliability and consistency.

This evolution in methodology of collecting records, the use of records on a greater scale and the more detailed analysis of records has come about by the evolution of the specialist societies and their increasing interest in the distribution and population fluctuations of the particular group of plants or animals they are interested in. BRC was the catalyst behind a great deal of the development of recording ideas and with the essential role of familiarising the field worker with the latest methods — more of this, of course, from Dr Perring. Today when the quality of records is more scientifically controlled with entries to be completed for: species, map reference, habitat details, and other species associated with the primary one. It is clear that the level of recording is reached by considering the group of organisms involved (as regards the numbers of species and difficulty of identification) the potential number of recorders and their quality and the resources of the organisers. On top of these basic units the aim behind the

collecting of records is paramount and this has often been brought about by the necessity to establish the status of the species concerned or the effect of pollutants or changes in land use for them. I hope this point will come out in this afternoon's discussions when representatives of a few of the current recording schemes will describe their project and the basic rationale behind their collecting of data.

The move towards larger collections of records through the specialist societies has usefully increased the local naturalists awareness of how representative the animals and plants he knows wellare of the country as a whole either Scotland or Britain. All of the British species are now being considered in an even wider field either in western Europe or — especially in the case of migrating birds — the whole of their range often Europe but even including other continents. This must be a developing trend with the general awareness of the susceptibility of species in different parts of the world (this is reflected already in different laws, eg in Germany the Stag Beetle is protected), the netting of migrating species, the importance of overwintering as well as breeding areas for migratory species (Cromarty Firth), the different geogrphical races involved (Large Copper), the relative importance of species throughout their range (eg plants and insects in Britain existing only on the edge of the range whereas others also are turly indigenous). We will have to consider our records more and more in their local, regional, national and international context.

The large scale of record collection has given rise to problems of handling — again Dr Perring will expand on this — but it has made fairly elaborate analysis possible of what were straight forward records. The amount of information which can be extracted, will obviously depend on the 'units' of information at the time of recording but the introduction of counts of species and repeated observation have given an extra dimension to several of the schemes. The Botanical Survey could be taken as the basic format for recording and as an example of the evolution of methods and needs. Plants of all sorts were in the past recorded from counties or vice-counties and compiled into Floras — a number of which remain the main reference to that area even today. However, the Botanical Society of the British Isles, by concentrating on 10km squares accumulated records for the whole of Britain and this eventually produced a record of the occurrence of each species of vascular plant over the whole country. It became apparent that several species were difficult to find, difficult to identify or were basically scarce and the plants in these categories required more detailed coverage. This has lead

to the whole Atlas being re-done group by group with special efforts being made to cover the important but hard to get at areas (for example in Scotland by the Committee for the Study of the Scottish Flora). Rare plants are to be mapped in detail with population figures and a whole series of new county floras are being produced on 5 x 5km or even 2 x 2km square grids.

The basic BRC distribution map of 10 x 10km squares, as in the Atlas of the British Flora, gives an approximation of the spread of the species concerned, and if historical records are included, a picture of the recent increase or decrease of the species. The actual pattern of distribution can often by linked to a habitat type, geological strata or a climatic zone, which is essential information for an understanding of the species' ecology and status in Britain. The Rothamsted Insect survey have taken this one step further by including a quantative element into their maps and have produced density maps which allow one to identify centres of populations and the adjoining fringe areas. For many of the lesser-known groups the maps provide a false distribution pattern — namely one of the recorders — not of the species. This will always occur chiefly in the small, obscure animal groups and least in the larger non-moving plant groups.

The birds, despite their great mobility have been covered by a huge army of observers and some remarkable results have been achieved. The chief advances have been in keeping an accurate estimate of whole populations either as a total figure, as in the monthly wildfowl counts (which covers the whole of Europe) or as a sample as in the Common Bird Census and the Waterways Bird Survey. The value of this type of survey is that a standard procedure carried out repeatedly over a period of years given a very valid reflection of the fluctuations of the populations of these species which is available almost immediately after the counts have been done — Tony Prater of the British Trust for Ornithology can elaborate on their workin this field. While on birds it is worth mentioning that the Oiled Birds Survey also monitors long term effects of oil and chemical pollutants on sea birds as well as information on individual 'wrecks' from an individual oil slick — Frank Hamilton of the RSPB will be mentioning this tomorrow.

For the majority of animal and plant groups the observers in the field are too few to deal with the type of coverage achieved by the BTO and the Wildfowl Trust. For many it must be basically trying to establish where each species in the group concerned is to be found. Some organisers — for example the woodlouse mapping scheme — have chosen to concentrate on very detailed habitat entries

with the species records so as to obtain as much information as possible with the relatively few records which came in — Dr Collis is here to explain more about this project. Another approach is to try and involve as many people as possible — a device which is only really suitable for easily identified species. Considerable success has been achieved by the Bumble Bee survey, the Wasp scheme and the Ladybird scheme by involving 'collectors' who have to merely identify the basic group and send any specimens for species identification. Mr Stubbs can explain how successful this has been for Craneflies.

Many groups will remain obscure and in the hands of a few specialists but even here (for example with pseudoscorpions or fleas) specimens may come the way of people working in other fields, eg with nests (mammals or birds) and valuable material could be supplied to the expert just known where to sent it. The manual may provide some insight into groups of animals and plants which might be unheard of by most people in this room yet they could perhaps contribute usefully to the sciomyzid fly mapping scheme or the marine dinoflagellate survey.

We must be careful about being devisive — the specialist is an essential part of the system but the all-rounder is equally useful. We must not concentrate on species if we neglect their habitats. Once we get into this realm things become much more complex. The Nature Conservancy (as described by Andrew Currie) has lead the way with habitat assessment and devised methods of describing and ranking areas on their biological, geological and physiographic importance. The Conservation Review (already mentioned) gives alist of the most important of habitat sites in Britain. Further down the scale the SSSI's (Sites of Special Scientific Interest) occur — we have several members of NCC here to fill in the details of how they are created (Dr Rosalind Smith, Andrew Currie, John Mitchell, John Young etc). The Scottish Wildlife Trust has attempted local assessment of the lesser sites and the Angus Habitat survey conducted jointly with Dundee Museum will be described by Adam Ritchie. The problems of quantifying discussions about habitats are great although certain habitats can be dealt with, with some logical precision (eg freshwater habitat where there are relatively few larger plants and animals). What is required is a community assessment and community record keeping, both difficult. For plants considerable advances have been made and for animals, work is being done on insects eg plant bugs and weevils, to establish indicator species for habitat types, age of site, stability of site etc. Garth Foster could fill in on his work with water beetles which has proved very interesting in the Borders. The BTO have realised the essential relationship between the habitat

and birds and have started a Habitat Register to record the important sites for birds throughout Britain. Other schemes have concentrated on woodlands (coniferous or deciduous), meadowland, wetlands or even ponds — a rapidly decreasing habitat of considerable local interest and importance — (Elspeth Hamilton has been involved with such a survey for several years). Roadside verges are in the same category, and a great deal of effort has been put into this problem by BRC, SWT and others.

So what have we got? Where have we got? A great number of schemes run in different ways at different speeds and with different successes. We know a good deal about the distribution of plants with many maps of the vascular plants. The animals lag behind but the mammals, reptiles and amphibians, freshwater fish, and several groups of insects already have distribution maps and many others are due out soon. These maps stimulate people to fill in missing squares but, far more important, the problems and shortcomings are being appreciated and more help is forthcoming. The extraordinary range of bodies involved from the Nature Conservancy Council to the local Natural History Society and the differing approaches they are using must be generally beneficial to stimulate new ideas on how new groups and new areas can be tackled. Overlying it all must be the educational effect getting involved with a recording scheme must have. One is establishing new basic facts which future generations can rely on while realising that the conservation of plants and animals depends on establishing each species status now.

It is interesting to look at the records from Monks Wood (just published in book form) or examine those at Wytham Wood (Oxford University) which must be the two most recorded areas of Britain, to realise that even they have huge gaps in the state of knowledge of these areas. The problem for Britain as a whole is enormous and for Scotland, with its 95% countryside — immense.

I must end with a caution. With more and more involvement in the field the organisms we are so carefully studying could suffer from our well meant observations. Already bird ringing is sensibly regulated as is disturbance of nesting birds and there are codes for insect collecting and plant collecting. Even geological sites are not safe as Dr Armstrong will demonstrate and a code for geological field work has been issued.

There is a lot to be done but a lot has been done and a lot of ideas have created a sound basis for recording. We need more awareness of what is going on and how people can help.

The back of the form carries a map of the reserves which shows features readily recognised on the ground, including the boundary, well used tracks, and streams, ditches or fences, or obvious vegetation boundaries. These are used to divide the reserve into compartments. The map is used to locate the Event and the number of the compartment is noted on the form.

Of the three copies the top copy is sent to the Regional Trust Office, a second copy to BRC and the third (a thicker card) is retained by the warden, who files them in Event Number order. At BRC each completed Event Record Card is processed to produce:

1 A list of all the Events of the preceding year in compartment order, and by class of event within each compartment

2 As above, but in class of event order and by compartment in each class

In succeeding years these can be added to thus providing a growing index of what has happened and where it has happened on the reserve referring the enquirer to particular Event Record forms in the file where they are stored in Event Number order. We would like to see this system extended to at least all important reserves: certainly to those where continuous and active management and research is underway and coding of Events is being expanded.

BRC Objectives: a) Sites

It would be appropriate here to say what our objectives are for site records at the national level.

1 NNRs and sites of equivalent status
Event Record System, Species record cards

2 Other Grade 1 or 2 sites in the Nature Conservation Review
1 Site Recording Scheme cards: Species Record cards

3 Other sites of SSSI status and other nature reserves
Site Recording Scheme cards

This is the information we are making a positive effort to collect, inevitably though, other information such as lists of species from SSSIs which are not Grade 1 or 2 sites is received and we have to be organised to deal with it.

To this end we have acquired a suspension filing system. There is a file for every Grade 1 and 2 site — and a file for each 10km square from which we have received site information.

Species records are kept separately on the appropriate species list cards.

Species Records for Grade 1 and 2 sites will be computer stored to provide analysis of the effectiveness of reserves in species conservation — and the Event Recording system with its new Event Classification will also be stored in the computer — to give a national bank of management information. And a sites recording scheme (Habitat) card for each site would make a national register of habitats in reserves possible.

BRC Objectives: b) Species

a) To complete national surveys of distribution of all plants and animals at 10km square level

b) To have exact information of all 1st county records (V-c), 2nd V-c records, first records for 50 years and of extinctions

c) To have exact information for critical material identified by an expert

d) To have exact information about all species which, nationally, occur in 15 or fewer 10km squares.

and to have a) - d) organised to be accessible by species or site (with adequate safeguards for confidential records).

The system would also supply cross reference between the Site Recording and 10km square systems

e) To repeat surveys at reasonable intervals

List of Nature Reserves — annually

Rare species — every 5 years

Well-known groups — every 25 years

Less well-known groups — every 50-100 years

THE TECHNICAL SIDE AT THE NATIONAL LEVEL — BIOLOGICAL RECORDS CENTRE, MONKS WOOD

Dr Franklyn Perring — Monks Wood Experimental Station,
Institute of Terrestrial Ecology

Species Recording

The primary function of BRC is the collection of distribution data based on the presence or absence in 10km squares of all plants and animals which occur in the British Isles. Although we started with terrestrial organisms the work has gradually extended to marine organisms, first to those of the littoral, but more recently to their distribution on the Continental shelf. The materials which are the basis of this work are described in Instructions for Recorders (1972) Biological Records Centre.

For each group with which we are concerned standard 8" x 5" species list cards have been printed carrying a list of several hundred scientific names with code numbers and space for grid reference, date and Vice-county number. Up-to-date lists of these coupled with an order form are available from BRC.

In ideal circumstances an observer is found for each of the 3650 10km squares who, after a limited period or search, up to say 5 years, sends in a complete list, with an additional species on an Other Species card. Additions are then sent at intervals of a year (or less frequently) on identical cards. Occasionally, but with increasing frequency as far as Birds and Flowering Plants are concerned, there are County recorders who undertake to co-ordinate recording for one or more Vice-counties. They may be making a survey based on a smaller unit than the 10km square, either the 5 x 5km or 2 x 2km, but, at the end of their survey all that is sent to BRC is a master card for each 10km square. The original data are retained by the organiser who may use them as the basis of a County Flora or Fauna.

In less ideal circumstances, especially in remote counties where there is no County organiser, cards are received from a number of sources for a square, some based on a short visit to the whole square, others on an intense study of one locality. From these we complete a master card at BRC and try to find someone with a knowledge of the area to vet the records. Thus our files consist of two sets of 8" x 5" cards — the species list cards and the master cards. The species list cards are a random collection, which may include lists from particular sites, but more often consisting of lists, more or less complete, compiled for the square as a whole. Currently we have just completed reorganisation of the species list cards so that all plant and animal records for one square are brought together in

one place. The Master Cards for each group are still kept separate because they are the responsibility of one member of staff and are in constant use for updating and revision.

These Master Cards are, at present, deficient in one important respect: they do not include all the species records only received by us on Individual Record Cards or One Species Cards. IRC's are used for recording one species from one locality, and make it possible to give more information about a specimen than is possible on species list cards. Ideally their use should be limited to records which need qualification; new or second County records; species refound at a site after a long time lapse or known extinctions; critical species when material has been seen by an expert. These criteria are already used by BSBI County Recorders, but this represents only a minimum input. There are many situations when a chance observation, a Brimstone in a garden in March, a Hedgehog dead on the road when an IRC makes more sense than a species list card. However when an IRC amplifies a record made by someone who is working a square it should go on the field card as well.

Besides IRCs from observers, though, there is an enormous input based on the abstracting work of the BRC staff. This is particularly true of the flowering plants and ferns. Almost all the records of the 400 species marked 'A' in the Atlas of the British Flora are based on IRCs, so too are nearly all the pre-1930 records for the 'B' species of which there are about 1000, and all the records in the Critical Supplement identified by experts. This makes a total of some 300,000 cards based mainly on Museum, Literature or expert determination, always with a place name, frequently with a detailed grid reference. They are stored by species, and have all been punched for Vice-county, but I regret to say that because of pressure of work they are no better organised than at the moment. However, we do have plans to improve this situation and have made a start. Firstly, for the last seven years, first Miss M N Hamilton and now Miss L Farrell has been co-ordinating a re-survey of the present and past distribution and exact locations and population size of the 300 rarest flowering plants and ferns. From over 800 species localities detailed population forms have been received, giving a sketch map of the site, an estimate of the populations, the threat to its conservation and a list of associated species. All these records are being transferred to 80-column IRCs, and , where a population form exists, this will be indicated. These are primary documents often carrying more information than we were able to code

for punching, it is therefore essential that as few as possible are lost through punching errors. These cards will therefore have only the species number and county number punched on them: the card has been designed so that the fields for these are not written on. Only eight columns have to be punched so that errors and rewriting should be negligible. The cards will only be sorted once, to file them by county within species.

All these data are confidential and are kept in a locked drawer in a locked room. Their value has been proved time and again during the passage of the Wild Creature and Wild Plants Protection Bill through Parliament: they will ultimately be the basis of a Red Data Book for British Plants.

For other IRCs where the problem of confidentiality does not arise the cards will be taken to our microfilm unit. Here they will be photographed and 3 copies of the film developed:

1 For Archives (to be stored in the British Museum (Natural History)
2 To be sorted and stored as microfiche by species and within species by county
3 To be sorted and stored as microfiche by 10km square

Questions will be answered by sending copies of the fiche to users. An institutional user will need to have a microfiche reader: but these are becoming less expensive and most libraries are now equipped. For individuals without access to readers it is possible to prepare hard copy from the microfiche.

There are two over-riding reasons for using microfiche:

1 Safety of data — copies of our unique collection must be stored elsewhere
2 Economy — microfiche is much cheaper to store and send through the post than conventional material

When filming of IRCs is complete we shall film field cards (particularly those for precise localities which are in demand for conservation purposes) and Master Cards which help volunteers to find out what is already known.

When the filming is complete a Records Centre or Centres in Scotland could have copies of all our Scottish records cheaply and compactly, and similar facilities could be available for individuals responsible for co-ordinating counties or other survey areas.

In addition to surveys based on national distribution schemes, the Centre is involved in a number of special surveys, especially in conjunction with the BSBI.

Over the last 5 years we have helped to conduct studies of Wild Service-tree, Black Poplar, Campion (Silene vulgaris), Comfrey, Holly, Mistletoe, and (with the Weed Research Organisation) an arable weed survey. Data on all these, collected on special cards, is stored at BRC after the information has been used to prepare reports. We expect similar schemes will be devised for other groups, some have already started. From the Herpetological Society we have received extremely precise data on the distribution of the rarest amphibians and reptiles and, in collaboration with the World Wildlife Youth Service launched a scheme amongst their youth groups to collect species and habitat data on the distribution of 5 small freshwater fish in streams, and through the British Association Young Scientists we are conducting a survey of the galls on oak.

There are two other schemes, both related to flowering plants and ferns, which have a conservation motive, but are species oriented so should perhaps be included here. First there is the Record of an Introduction or proposed Introduction to a nature reserve, details of which were given in Policy on Introduction to Nature Reserves (1970) SPNR Conservation Liaison Committee Technical Publication No 2, the principles of which we believe should be extended to all introductions of species into the wild when the origin would not otherwise be obvious (trees in hedges and plantations, sown motorway verges, etc). Very few completed forms have been received in the 5 years since the Policy was published: I can only hope this means that the pamphlet has been so successful that Introductions have stopped. We intend shortly to issue a list to stimulate a response. We believe than any introduction into 'Natural' habit ought to be recorded.

The second scheme is a survey to find out which rare British native species of known origin in the British Isles are in cultivation in Botanic Gardens. All records received go into IRCs and a duplicated list is available, indicating whether seed or live plants can be obtained from the garden holding the material. This survey has recently been extended to private gardens. This list should help those wishing to make re-introductions to sites from which a species has been recently lost, and reduce the need to collect rare species for experimental study.

Site Recording

Site recording is an aspect of the work of BRC which is likely to develop rapidly in the next few months: hopefully a member of staff will be appointed whose responsibility it will be to co-ordinate this activity.

His first task will be to complete the distribution of a national list of nature reserves — indicating their acreage, grid reference, administrative area — and the status of the reserve. His next task will be to promote the Biological Sites Recording Scheme which was proposed by the SPNR and issued as a booklet in 1969.

The Sites Recording Scheme was an attempt to produce a standard system for recording basic information about sites with a biological interest of importance for conservation. It was designed to meet the needs of the County Trusts who wanted guidance on site recording, and it was hoped to build up at BRC a central register of the total area of particular habitats in the country as a whole and their distribution.

Because the system was mainly for County Trusts it was designed so that surveying could be carried out by volunteers who were not necessarily trained field biologists: the terms used in the habitat classification should be familiar to the layman.

It was hoped that naturalists in each county would visit all sites of interest, complete an 'Available Habitats' card and, in addition, compile lists of species for the most important groups of plants or animals, using the specially designed 'Trust' versions of our record cards which include two ('Birds' and 'Vertebrates') not used for any national recording scheme.

A data flow scheme was devised by which means all completed cards would go first either to the County Trust or to BRC. After checking and completion BRC undertook to make copies for distribution as follows:

1 Nature Conservancy Regional Office
2 BRC
3 The originator (if other than Trust)
4 County Trust Secretariat (only 'Available Habitats' card)

The originals are returned to the Trust

So far BRC has played its part, but there has been a very slow response from the Trusts to a system which has been in existence for 6 years. I feel this has been mainly due to lack of manpower to organise the volunteers in each county: in the few cases where there has been organisation the system has worked very well and we have very complete information from Cheshire and Surrey. And two years ago a simplified system of presentation of the scheme was devised by the Hertfordshire and Middlesex Trust which has resulted in a better flow of data.

I hope that in the next year or so every county will have the time to organise a group which will set itself the limited target of completing an 'Available Habitats' card for every Trust Reserve and every SSSI in their area so that BRC can build up the national register we all want to see. There is often reluctance to volunteer because of the formidable character of the pamphlet. However, this can be overcome by arranging a one-day field course where the simplicity of the system is demonstrated. These BRC is willing to run.

His third task will be to co-ordinate and expand to all sites of NNR status the Event Recording System wherever feasible. Our booklet on Reserve Recording is a blueprint of what we would like to see - though we appreciate that it will only function where a Warden or a Reserve Management Committee exist.

The pamphlet makes suggestions about the type of information a Warden or Reserve Management Committee should be keeping about the reserve under their care, and explains standard ways of keeping those records so that they will be of maximum benefit to successive generations who will inherit the data in years to come.

Andrew Currie has referred elsewhere to the short term value of the method but the recent discoveries by historical ecologists of the long lasting effect of past events on the patterns of vegetation makes the recording of events which we originate or observe of increasing urgency. All events which occur on a reserve, either those like fencing or coppicing which we carry out ourselves, or natural events like flood, fire or a falling tree, ought to be recorded in such a way that even when we are dead and gone our successors will have no difficulty in finding out exactly what happened where and when.

The Event Record System was originally designed for the Nature Conservancy and is now being used in all regions, though not yet in all reserves. The system has been adopted by RSPB for its reserves, by the National Trust at Holy Island, by the Cumberland County Council in an LNR, and by several County Trusts, notably Lincolnshire and Cambridgeshire.

The scheme is very simple: the warden records each event and the part of the reserve in which it occurred on a separate form in triplicate giving each a separate Event number. They are then filed in such a way that the information can be retrieved efficiently, even when the number of events on record has become large and the recorder has long since moved on.

THE TECHNICAL SIDE AT THE REGIONAL LEVEL — NATIONAL MUSEUM OF WALES

James Bateman — National Museum of Wales

The Geographical Problem

The success of attempting to record the distribution of wildlife in any region, can be estimated from a measure of the surface area of the region and the size of its human population.

The task of recording the wildlife of Wales is reflected by a land area of just over 8,000 square miles, or about 2 million hectares, and a human population of $2\frac{3}{4}$ million. It is generally considered a phenomenal proposition, even when reduced to the recording of a single species, for each recording scheme, per 10 kilometre square in a total of 230 squares for Wales.

The scel of comparison in Scotland is vast and probably even more daunting. Here the land area measures nearly 30,000 square miles, or $6\frac{3}{4}$ million hectares, and the population is just over $5\frac{1}{4}$million. Generally speaking, one can assess the scale of the problem as being inversely proportional to the average density of the population. The figure of population density for England is 900?/square mile; for Wales 337/square mile and for Scotland 175/square mile. If, therefore, it is proving to be a vast undertaking to cover Wales, it would appear to offer an even greater challenge to recorders proposing to cover Scotland.

When investigating the problem of carrying out biological recording throughout Wales, an immediate observation was that seats of learning and likely sources of recorders were distributed around the periphery of the Principality, leaving a large void of residential professionals in the centre of the country. In Scotland, the reverse situation is more probably ture, except for establishments at Dundee and Aberdeen.

I am not sure how the offices of natural history societies and trusts are located geographically in Scotland, but in Wales, they tend to follow the same pattern as the universities, museums and regional offices of the Nature Conservancy Council. It is obvious, therefore, that an immediate responsibility is to provide recorders for those areas where it is unlikely that any are resident. In Wales this is being achieved in two ways, on the one hand by organising field meetings of recorders in the unrecorded areas, and on the other hand by training interested lay-people in order that they can ultimately fulfil the role of recorders.

The Physical Problems

The organisation of field meetings and training of amateur naturalists present their own physical problems.

In Wales, and certainly in Scotland, there is the difficulty of travelling comparatively large distances from centres of human population to the more unrecorded parts of the region. Invariably there is a need to find residential accommodation a) because the distances are greater than those which would allow for one-day field meetings and b) because it is uneconomical in time and money to spend a short time in an area which can only be reached after lengthy travel.

While it is not difficult to select areas which are under-recorded biologically, it is less easy to establish a base from which the work of a field meeting can be operated. Experience of organising such meetings in Wales has shown the desirability of providing reasonable residential accommodation within a ten-mile radius of sites to be recorded. There is also a need for facilities to examine, identify and preserve voucher material collected, although such facilities need not be very sophisticated.

The Purpose and Organisation of a Regional Records Centre

It is necessary to have a centre within a demarcated region which will provide an archive of biological records for the region. There are two main sources of records from which such an archive can be established: a) records sent direct to Monks Wood Biological Records Centre, b) records from local sources. Once a centre has been established it is possible to have records sent from Monks Wood, when duplicates of these have not already been received by the centre. In time, of course, there should be a rapport between the centre and local regional recorders which ensures that all records are lodged with the centre, whether or not they are independently sent on to the BRC as well.

The centre must have an index of local recorders, including persons resident outside the region who regularly record within it. Such a register serves a double purpose of referring new recorders to specialists in their own discipline, and also for circulation of information concerning proposals for field meetings and other events organised from the centre.

The centre should be responsible for the organisation of field meetings and compilation of published reports of these.

Publication is a most important aspect of the work of the Regional Centre. There are two main functions of publishing the results of a field meeting: a) recorders involved gain satisfaction and confidence from seeing the results of

their labours in print, b) there is an encouragement to supply new records to fill gaps in the published lists.

Field Meetings

In 1971 a conference was organised jointly by the Biological Records Centre and the National Museum of Wales, in order to explore ways and means of carrying out more effective biological recording in the Principality. It was attended by over 40 delegates from universities, museums, government departments and amateur societies.

The main achievement of the meeting was to establish the Biological Recording Work Group for Wales. The Conference laid down a set of guidelines for the Group to follow and these were:

1 Discover all persons/groups carrying out recording in Wales, and all local experts, and prepare lists of these for circulation

2 Investigate areas where recording was not taking place and devise methods for future coverage

3 Organise one day/weekend meetings of local and national societies in Wales to co-ordinate individual efforts and organise field meetings in the areas mentioned in (2)

4 Ensure that records are channelled to nominated centres and arrange for central publication of meetings and results

Later meetings of the Group expanded these directives by organising recording on a multi-disciplinary basis and by including an educational and training element in field meetings. The final development has been to extend the training by a programme of biennial field recording training courses, in conjunction with the Field Studies Council.

The multi-disciplinary approach to field meetings requires further elaboration. The advantages seem to be many and include a greater coverage of an area receiving intensive study; the provision of an ecological balance to the records of an area; an opportunity for scientists from a different disciplines to compare notes on the ecology of the area; and to enable amateur and trainee-recorders to see the techniques associated with more than one discipline.

With each successive meeting the number of disciplines represented has steadily increased. Furthermore, knowing of a visit to an area by the Group, an interested body has sometimes sought, and been eventually supplied with, a survey of animal and plant distribution of the area. This has occurred where a nature reserve had recently been established with an area visited by the Group.

The Organisation of Field Meetings

Once an area has been selected as the venue for a field meeting (based on personal knowledge), recommendation from members of local societies, officers of the Nature Conservancy Council and other knowledgeable) a centre must be chosen as a working base. Ideally this should be within a ten mile radius of all the sites to be visited; it should provide accommodation for visiting members of the Group; there should be at least primitive laboratory facilities and the overall cost to members must be kept as low as possible.

The last point is significant because the scheme operating in Wales has been largely self-financing, with the exception of staff time, stationery and postage which has been generously provided by the Council of the National Museum ofWales. In return, of course, the Museum benefits from the archive of records deposited there, as also from the voucher specimens held as a Regional Records Centre. Members of the Group, who are not covered by expenses allowances, have to be considered, so it has been essential to control accommodation and travel costs and thereby encourage the participation by these people.

The combination of accommodation and laboratory facilities has been achieved in a variety of ways. Occasionally it has been possible to use an established field centre belonging to a University, Collegeof Education, or School. There are also some youth hostels which provide fieldwork facilities. A third alternative has been to use private accommodation — hotels, guest-houses, or self-catering cottages — combined with the use of a school laboratory hired through the local education authority.

We have also found it useful to hire some passenger transport, usually one or two self-drive minibuses, in order to reduce the number of vehicles for which parking would be necessary at sites with limited facilities. We also use a Landrover for carrying heavy equipment such as boats, electric fishing machine and nets and getting these into areas where access would be denied to ordinary cars.

The equipment necessary for field meetings on the scale outlined, should ideally be available from a central pool based on one institution, such as a university, museum or college. Of course most recorders have a certain amount of personal equipment, including lenses, notebooks, identification guides and keys, vascula and sometimes nets. However, there is a need for laboratory equipment which is not always available at the centres used, for example low-power binocular microscopes, dishes, slides, specimen tubes, polythene bags, chemical

preservatives and various hand instruments. A supply of appropriate reference works of the kinds not always possessed privately, as well as additional keys and large-scale maps, has been most useful and appreciated by members attending meetings. Incidentally, the building up of a reference collection of large scale OS maps can be accomplished steadily as a result of a series of field meetings.

Perhaps the most important part of the planning of a field meeting has been the advance survey we carry out at each area we choose. The sequence of events has been to contact the landowners, usually through the regional offices of the Nature Conservancy Council, local Agricultural Advisory Officers and sometimes local officers of the NFU. Arrangements are then made to visit the area and obtain permission for access to the sites which appear to offer the greatest recording potential. The landowners and their staff are often able to suggest useful spots to look at and provide information about particular species. In return they appreciate copies of the survey reports, as an indication of the wildlife resource of their property. Occasionally we have found it profitable to co-ordinate our meetings with the membership of a local naturalist society or trust.

Once the groundwork has been carried out at the site, the potential membership of a Group field meeting is circulated with advance publicity. It needs to be done about three months in advance of a meeting. Later, a firm programme, and booking forms, are sent out to people who have requested these and if grants are available it is important to advertise this fact.

After a meeting, the most essential operation is to send letters of thanks to all those people who have extended facilities. This must be followed by letters to members reminding them to send in records of species not determined or listed during the weekend meeting.

Educational and Training Aspects

1 Field Meetings

Amateurs or 'novices' work with experienced recorders to acquire field techniques and the principles of identification and recording. Sometimes individual persons have concentrated on a single discipline or group, but often they have sought help and information on a broader basis. The work in the field is always followed by work in a laboratory, but the self-help aspect is emphasised, not only in benchwork, but also in provision of personal equipment which will allow them eventually to operate on an independent basis.

2 Field Courses

In order to accelerate the programme of training recorders, it was decided to provide concentrated tuition at a field centre. The first course was held in the early summer of 1974 at Rhyd-y-Creuau, North Wales. Here we assembled tutors from the National Museum of Wales, the University of Wales, Nature Conservancy Council and Institute of Terrestrial Ecology, together with members of the field centre staff, by courtesy of the Field Studies Council.

The Course was multidisciplinary, covering cryptogamic botany; flowering plants; insects; spiders; molluscs; fish; birds and mammals.

The success of this course resulted in a programme to repeat it in alternate years.

The administration of the course was shared between the staffs at the field centre and from the National Museum of Wales. Generally, tutors were resident only while they provided their own particular information and they waived the usual fees, so avoiding undue pressure on the domestic staff and financial resources of the centre.

As a result of these methods the numbers of competent recorders is increasing in Wales; also, some recorders who previously restricted their efforts to a single group of animals and plants, are now providing records for other groups.

Security

A most important aspect of all the organisation is:

1 a respect in the field for rare species

2 observation of the various environmental protection codes

3 restriction of the accessibility to records of rare species and scientifically important sites.

THE TECHNICAL SIDE AT THE LOCAL LEVEL — DUNDEE MUSEUM

Adam Ritchie — Dundee Museum

My contribution to the Conference is based on experience gained from working firstly at Leicester Museum, which has an established local records centre and from piloting a records centre project here in Dundee at the City Museum.

To justify the involvement of museums in biological records, I wish to begin by considering what I think is one of the most important aspects of museum natural history, namely, that of its contribution to wildlife conservation.

The growth of museum collections historically derives from the undisputed human desire to accumulate objects with some sort of intrinsic interest, whether they be objects of man's creation, for example coins, stamps, paintings etc or natural objects like birds eggs, butterflies, fossils etc. This collecting passion, very much in vogue during Victorian times, has clearly diminished with the evolution of our modern materialistic society.

Museums have a public responsibility to care for and maintain these collections with clear objectives in mind, which vary according to the discipline in which these collections belong. Whatever the discipline, the specimen or object is a three-dimensional record. An antiquarian object represents a stage in man's historic development. A biological specimen represents tangible evidence for the existence of that species from a particular locality at a particular time.

Traditional presentation of museum specimens reflects the emphasis on the range within the collections. Hence these displays show a systematic approach, ie cases containing serial rows of specimens comprehensively representing the species or type of a particular group or category.

Modern museum display thinking is directed, not so much at the systematic representation of the collections, but at a more meaningful selection of specimens representing a concept or theme. In the case of biological and geological specimens, they may be selected to illustrate academic principles like evolution, life histories etc. Most important, I think, is the unique opportunity to utilise the specimens in a display to promote environmental awareness. By this I mean that the specimens are presented in the context of their environment and interpreted using carefully chosen written and illustrative material. This highlights one of the most important roles of a museum, namely the significant contribution to environmental education.

At this stage I must turn to the question of museums and environmental records. The importance of environmental records has been made very clear by previous speakers and you have heard how records of national importance have been collated for the United Kingdom and for Wales. I will now consider the case for certain provincial museums concerning themselves with the recording and possible storage of written data on local natural history.

Firstly, in principle, a museum with well-documented local collections under the charge of trained natural history personnel, has a strong basis on which to build up a bank of local biological information. The acquisition of this local biological data is a logical extension of the traditional role of specimen acquisition, and in my view, is more compatible with current conservation thinking.

Secondly, it is usual for there to be a close liaison between museum naturalists and individuals and organisations concerned with local natural history and conservation.

Thirdly such a museum can provide the continuity of staff and, justifiably, storage and administrative facilities which are fundamental requirements for information collection, storage and dissemination.

As far as I am aware, neither the Nature Conservancy Council nor the Institute of Terrestrial Ecology are in a position to develop this kind of service for records of local significance within their own organisations but the former may perhaps be able to allocate grants in the future to assist in the establishment of local environmental record centres.

University Biology Departments are often keenly interested in local ecology, but their bias of work is subject to changes. Although the local Scottish Wildlife Trust Branches are one of the prime users of local environmental information for assessing sites for conservation purposes, they are voluntary bodies, without permanent premises and with only slender administrative resources.

I now turn to the current and projected situation at Dundee Museum. Despite the devotion of a large proportion of recent time to major display and specimen storage programmes, we have put a lot of effort into the potential development of the museum as a local environmental records centre. To this end, though with the uncertainty of the Museum's responsibility after Local Government Reorganisation in terms of being designated a District or a Regional function, we chose to adopt, as a pilot recording area, the City of Dundee and the present County of Angus.

Our initial action has been to gather all existing local biological information. Firstly, the most accessible records are being gathered by searching through our natural history collections, abstracting and listing the relevant local data. Secondly, the same procedure is being adopted for local natural history literature. Thirdly, we have obtained species lists and site information relevant to this area, from the Nature Conservancy Council and Scottish Wildlife Trust. Fourthly, we are in the process of obtaining copies of all the Angus Master Species List Cards from the Biological Records Centre at Monks Wood. A final source of existing records has still to be tapped, namely that of specimen collections containing local material in other museums, universities, colleges, schools, scientific research institutions and in private hands, and unpublished natural history field notes and research projects relevant to Angus County. This latter source of information greatly depends upon an established liaison with and co-operation from the individuals and organisations concerned.

Running concurrently, with this data abstracting, we have initiated three local survey schemes, all of which are almost wholly dependent on a volunteer force of local naturalists.

The first of these, called the Angus Wildlife Survey, incidently promoted by a gallery display, is designed to obtain casual, though, accurate and significant sightings of local animal and plant species. The volunteer recorder is provided with a batch of record forms on which to note down the following observations — species name, locality (with a 6-figure grid reference) date, habitat descriptions etc. The advantage of this all-embracing survey over a system of individual species surveys is the achievement of a greater number of significant records. The latter single species survey might deter participation by some potential casual observers who would otherwise have happily taken on the umbrella type of wildlife survey. Approximately one hundred of these record forms are returned to us each year with a good proportion of significant information. The majority of returns are of bird sightings, ranging from records of rare breeding species and visitors, early migrant arrivals, to seasonally fluctuating numbers and garden bird lists. Mammals follow as the next most popular recorded group ranging from sightings of stoats and weasels on a gamekeeper's gibbet, a haul-out of seals to hedgehog road casualties A small proportion of returns are for amphibians, reptiles and Lepidoptera, and an even smaller number are for plants, the latter reflecting the rather more specialist expertise required. The almost total lack of marine life records from this survey again must reflect the identification difficulties of a non-specialist.

The second of these Surveys is designed to record the local amphibians and reptiles. These two groups have relatively few species represented locally and do not pose great identification problems for the non-specialist. For this Survey, with publicity through the two Local Educational Authorities, we are enlisting the help of school children. Interested school teachers are being sent our special recording forms and a prepared guide to identification. To extend the interest beyond the simple identification of species, the recorders are asked to describe the micro-habitat and the apparent activity at the time of observation, for example: for an Adder — on a boulder, sun-basking etc. So far, the response has been scanty but the Survey was only initiated last summer.

The information from the returned forms is to be transferred to single species record cards accompanied by tetrad gridded maps (2km x 2km) of Angus County for each species, on which their distribution can be built up combining field, museum and literature records.

The third Survey, called the Angus Habitat Survey has been ogranised in collaboration with the local branch of the Scottish Wildlife Trust. It is essentially a 'field by field' survey of the County; undertaken by local SWT members along the lines of the Land Utilisation Survey techniques, but using the habitat classification as laid down in the Society for the Promotion of Nature Reserve's Technical Publication No 1 — Biological Sites Recording Scheme. The field recording tool is an Ordnance Survey 6" map and recorders simply identify the habitat and annotate a field map copy. The completed field maps are passed back to us and the information is transferred to master maps using a colour code and symbols to indicate the proportional distribution of broad habitat categories. To highlight the biologically important sites like wet lands, areas of undisturbed scrub and grassland etc an acetate overlay on which these categories are marked, is produced. There are two main objectives of this Survey. Firstly we wish to obtain basic information on the proportional distribution of broad habitat categories, for example, arable and pastoral farmland, deciduous, conifer and mixed woodland, dwarf shrub heath and grassy heath etc with a view to carrying out additional surveys at perhaps 10 to 15 yearly intervals, to monitor changes in these proportions. The second objective is to discover hitherto unknown sites of biological importance in the local context, to add to the known existing site records. The potentially environmentally interesting sites which emerge from this Survey will be investigated by a team of specialists who will prepare species lists and will complete a Biological Records Centre Habitat Record Card.

The advantage of this type of survey is that the level of natural history expertise required is minimal and so, in theory, falls within the capacity of most conservation sympathetic people willing to participate. In practical terms there are about 35 recorders, each one having 'adopted' an area covered by one, and in some cases two, 6" Ordnance Survey maps (5km x 5km). There are approximately one hundred 6" maps covering the whole of Angus County of which forty or so have been allocated covering mainly the lowland areas as one might expect since about one-third of Angus is highland terrain making a 'field-by-field' survey of this nature difficult. Hence, about two-thirds of lowland Angus is being surveyed at present. With the exception of one or two highland glen areas w . tourist pressure exist, survey of the lowland area requires priority because of a wider range of pressures.

The master set of maps and supplementary overlays are to be stored in a vertical plan map cabinet and will be readily available for consultation. The site record details will be stored in two separate but correlated systems. A suspense filing system, with one file for each 10km square containing folders for each site, will hold correspondence, reports, notes, sketchmaps and photographs relating to the sites. There will be an 8" x 5" record card system. Species lists and habitat details will appear on BRC species and habitat record cards and stored in sections for each 10km square. Each 10km section will be accompanied by BRC 10km Master species cards so that as records of national importance accummulate, they can be selected and forwarded to Monks Wood at regular intervals. As far as is possible, the sites are to be attributed to tetrad units so that species records can be used for species mapping at tetrad level.

This, then, is an outline of the survey projects and data organisation with which we are involved at the present time. If the existing resources were to be increased it is proposed, in collaboration with local naturalist, ornithological and SWT groups, to launch further local species surveys.

For the birds, species known to have a limited local distribution due to human interference in the interests of game and fishing, loss of habitat, land and sea pollution, for example, certain diurnal birds of prey, the Barn Owl, the Great Crested Grebe, the Dipper and the Puffin, will be surveyed to monitor their fluctuations.

For the invertebrate groups, it is probably only realistic, bearing mind the availability of specialist expertise, to expect only the insects to have any attention paid to them, in particular, butterflies. In the case of the marine invertebrates, a significant recording coverage will probably be confined to molluscs.

For flowering plants, a comprehensive survey at tetrad level even with existing herbarium records would prove an unsurmountable proposition. As for birds, those plant species known to be subject to certain pressures, and the spread of aliens might be considered as subjects for surveys on a tetrad basis. The non-flowering plants, of course, demand highly specialist knowledge though it is conceivable, in the case of marine algae with their restricted habitat and the more conspicuous larger fungi, that a survey for these groups might be attempted. With more than our fair share of lichenologist expertise within the County, a lichen flora survey coverage could be efficient.

At this point, it should be stated quite clearly, as Angus has a number of national rarities in the plant line and Schedule I breeding birds, that records of these would be treated highly confidentially and be omitted from the general species lists. They would be stored on separate cards, relating to the general system, and locked in a card index cabinet. Access to these would be strictly vetted.

Another very important function of such a record centre is to promote the national species survey schemes within the local area, some of which you will be hearing about later in the Conference. It would act as a clearing house by co-ordinating the efficient channelling of information between the organisations and individuals concerned and Monks Wood.

Contact has recently been made with the new Tayside Region Planning Department informing them of the proposed local environmental records centre at the Museum. The plans were received extremely favourably with the knowledge that the system would operate in conjunction with the two agencies concerned with the interpretation of this information, namely the Nature Conservancy Council and the Scottish Wildlife Trust.

In addition to this biological information service meeting the requirements for conservation strategies, I forsee a demand from educational quarters for sites for teaching field biology, as more and more emphasis is placed on environmental studies. When a comprehensive record system and efficient information retrieval

service has been developed, we shall be in a position, not only to recommend suitable sites for elementary field studies and for advanced ecological projects, but also to keep clear of the fragile and sensitive areas.

To summarise then, Dundee Museum is working towards a scheme to develop a local environmental records system compatible with the national Biological Records Centre at Monks Wood, which will promote recording and keep a record of the biological wealth of the District of Dundee and Angus to be available to conservation agencies and for research and teaching purposes.

RECORDING IN SCOTLAND— MAMMALS

Dr Gordon Corbet — British Museum (Natural History)

The Mammal Society instigated a recording programme for all mammals throughout the British Isles in 1965 and a provisional set of maps was published as volume 1, parts 4/5 of the society's journal Mammal Review in 1971. (A reprint, with the addition of four maps updated to 1973, is available at 90p post-free from Mrs N Chapman, Larkmead, Barton Mills, Bury St Edmunds, Suffolk). Subsequently the Deer Society has published the results of their more intensive, five-year survey of deer (maps in their journal Deer, volume 3, part 5 for November, 1974 obtainable at £1 from John Hepper, 17a East Parade, Leeds 1). The Mammal Society is at present handing over its records to the Biological Records Centre at Monks Wood and they should be fully integrated with the BRC system by the end of 1975. We hope to encourage intensive recording through 1975 with a view to publishing a revised set of maps in 1976 covering the period 1960-1975. Beginning in 1976 new recording arrangements are being planned to give greater emphasis to particular problems raised during the first part of the programme.

Several limitations of the existing scheme are worth detailing since they are relevant to the part played by local or regional organisations. (1) In the absence of a full-time headquarters staff it is not practicable for a small national society like the Mammal Society to maintain adequate contact, and provide adequate feedback of results, to a large number of local recorders, eg one per old county. This situation would be eased if a small number of regional centres could be established to act as links between the national organisers and the recorders in the field. (2) Although the number of species is small the techniques required to record mammals vary enormously from group to group and few people are able and willing to deal with all groups such as bats, rodents, deer, carnivores, etc. Also many mammals are of economic significance and to be successful any recording programme must involve a wide range of organisations dealing with agriculture, forestry, fisheries, game preservation etc as well as the natural history and conservation organisations. (3) The absence of a formal regional organisation has led to poor coverage in some areas, eg in northern and south western Scotland. However we have always believed that there is considerable value in establishing a receptacle for those records that are available, even in the absence of an active recording programme.

Our future programme will deal in rather different ways with different groups of species and some of these are of especial relevance to Scotland.

1 Common and widespread species (eg hedgehog, common shrew, rabbit, field vole, stoat). We shall aim to continue filling gaps in the existing maps and will pay especial attention to organising information on presence or absence on small islands. The scope for different combinations of species on different islands is enormous and of great ecological interest.

2 Species with limited distributions within the Scottish mainland. Special efforts will be made to organise surveys of these in the areas of particular importance, especially species that are not being studied by other organisations. The following are some examples of special interest. Hares — areas of contact or overlap between the two species. Water vole — how widespread is it in the Highlands? Harvest mouse — does it still exist in Scotland? A current enquiry has shown that it still exists further north in England than hitherto thought but so far there has been no confirmation that it survives in Scotland from where there are several more or less reliable 19th century records. Nests are easily found and a leaflet is available from the Mammal Society. Wild cat and pine marten — these are species for which a survey organised within Scotland could provide valuable information.

In conclusion I feel that the smaller national societies have a role to play in co-ordinating recording throughout the country but the part that they can play in local conservation issues is limited. There is a great need for regional centres that can organise the information in a way more suited to local requirements. Such regional centres can not only receive data from the specialist organisation but can also channel requests for information to the national societies and prod them to assist in gathering the kind of data that is of most practical use.

RECORDING IN SCOTLAND — FLOWERING PLANTS AND FERNS

George Ballantyne — Botanical Society of the British Isles

Since 1836 botany in Scotland has been organised formally by the Botanical Society of the British Isles set up a joint committee, known as the Committee for the Study of the Scottish Flora, to co-ordinate and promote botanical activity north of the Border. This Committee has twelve members, four from the BSE, four from the BSBI, and four who are co-opted; amongst its briefs are the arrangement of field meetings and recommending the appointment of Vice County Recorders.

Each of the 41 Scottish vice counties has its Recorder (a few are responsible for more than one), whose task it is to answer queries connected with it, to co-ordinate any work taking place, to vet records before they are published, and to attempt to record the state of the flora, often by 'mapping'. Each Recorder has a card index which contains information relevant to his area — the extent of the completeness of this data depends much on his enthusiasm for, of course, all work is done voluntarily.

Most Recorders are recording on a grid basis. Approximately one third of the country is being covered on a 10 x 10km basis, mainly in the north and south east, while a further third, occupying much of the central highlands, the east central belt and the Borders, is being done on the 5 x 5km (quadrant) method. Of the remaining third, a few widely scattered districts are being mapped on a 1 x 1 or 2 x 2km basis, or on a non-grid system; with a sizeable portion of west central and south-west Scotland where little or no co-ordinated recording is being carried out. An appendix gives the current position (April 1975) in each of the vice-counties.

Although Scotland has had its share of local floras in the past, there has been nothing to compare with the number which have been issued relating to English counties. Nearly all of those which have been written have long been out of date, and it is only recently that an attempt has been made to rectify this situation. Since 1959 several checklists have been compiled, especially for some of the western and northern islands, notably Shetland (1969), Skye (1974) and Orkney (1975), plus Galloway and Wigtown (1972). Provided proposed printing schedules are adhered to, a number of further checklists will be issued by the end of 1977 while a considerable amount are projected for the early 1980's. Thus, within a decade, Scotland should be reasonably well covered although it should be stressed that few of these intended public actions will be proper floras as distinct from checklists.

There are two projects which demand particular mention. In 1969 the CSSF decided to undertake a survey of the Flora of Inverness-shire, which comprises the vice-counties of Easterness (96) and Westerness (97), on a 5 x 5km basis. A five year programme of field meetings from 1970-74 was initiated and individuals and groups (eg the Inverness Botany Group) were invited to visit areas and send in records. The response was good and although — inevitably — coverage was uneven, only 10% of the 320 quadrants were not searched to some degree; the work of processing the accumulated data, together with older records, is now going on and it is expected that distribution maps and text will be available in 1976/77.

The other project concerns the British Museum (Natural History) Department of Botany's survey of the Island of Mull. This is unique in modern botanical recording as it embraces all disciplines and is not confined to flowering plants. The fieldwork was carried out from 1966-70, and the results are due to be published in a comprehensive volume soon.

These two schemes have been organised by, and largely carried out, by teams of workers but much of the botanical activity in Scotland is effected by individuals, and herein lies one of the major problems in this country — there are just not enough people, literally, in the field. For example, although occasional records are received from others, in Fife and Kinross (VC85) work began on recording the vascular flora on a 5 x 3km basis in the 1960's; this was confined to the Kirkcaldy district, and resulted in an annotated checklist, giving past and present locations, being issued in 1970. Present work is concentrated on Kinross-shire and it is expected that a similar checklist will be published in 1976 for that county. In the decade after that it is hoped to complete field work in the rest of Fife and then the task of compiling a complete flora will begin — 20 years after work was begun. This is the scale of operations in Scotland, in contrast to England where there are many more interested and actively knowledgeable people.

This lack of personnel means that coverage is bound to be patchy, and therefore areas that are known or considered to be rich much be concentrated upon, especially in view of the threats occasioned by oil and related developments. That this can be a rewarding exercise is instanced in the case of Loch Leven NNR, where recent intensive recording has resulted in over 400 species being listed, and the discovery of three separate localities for both Holygrass

(Hierochloe odorata) and Slender rush (Juncus filiformis). The widespread occurrence of Mudwort (Limosella aquatica) was established, while the decline of that puzzling spearwort, Ranunculus reptans, has been brought to light. Three of these plants are British rarities, and Limosella has only one other Scottish station.

For the future, priority should be given to mapping these areas where little active work is being done, and to the production of at least annotated checklists. The compilation of a census or comital catalogue of Scottish vascular plants, including critical and micro-species, would help considerably in understanding the distribution of species throughout the country. The preparation of such a catalogue has been agreed in principle by the CSSF.

List of Vice Counties with notes on current recording work

Vice County	Present Work	Published work (since 1940)	Remarks
72 Dumfries	5 x 5)		
73 Kirkcudbright	5 x 5)	Checklist 1972	Flora projected in future
74 Wigtown	None)		
75 Ayr	No co-ordinated work		
76 Renfrew	1 x 1		Checklist with maps envisaged
77 Lanark	None		
78 Peebles	5 x 5		Handlist in preparation
79 Selkirk	10 x 10		
80 Roxburgh	10 x 10		
81 Berwick	10 x 10		Concise flora projected
82 East Lothian	5 x 5		
83 Midlothian	5 x 5		Fieldwork almost completed
84 West Lothian	5 x 5		
85 Fife and Kinross	5 x 5		Flora with maps projected
86 Stirling	None		
87 West Perth and Clackmannan	5 x 5		
88 Mid Perth	5 x 5		Clackmannan on 2x2
89 East Perth	5 x 5		

Vice County	Present Work	Published Work (since 1940)	Remarks
90 Angus	10 x 10		Checklist in preparation
91 Kincardine	1 x 1 (in part)		
92 South Aberdeen	Non-grid		Data being collected
93 North Aberdeen			
94 Banff	5 x 5		
95 Moray	10 x 10		Flora with maps due in 1976
b) 96 Nairn	10 x 10		
96 Easterness	10 x 10		
96 "	5 x 5		Flora with maps due in 1976 — CSSF project
97 Westerness	5 x 5		
98 Main Argyll	little		
99 Dunbarton	5 x 5		Checklist envisaged
100 Clyde Isles	1 x 1 (Arran only)		
101 Kintyre	Non-grid		Checklist in preparation
102 South Ebudes	10 x 10	Flora of Islay and Jura, 1959	Flora of Colonsay and Oronsay in preparation
103 Mid Ebudes (Mull)	10 x 10		Detailed flora by BM (NH) due in 1976
103 Mid Ebudes (Coll & Tiree)	10 x 10	Flora 1941	
104 North Ebudes (Rhum)	10 x 10	List, 1965	
104 North Ebudes (Skye & Raasay)	10 x 10	Checklist, 1974	Flora projected
104 North Ebudes (Eigg, Muck etc)	10 x 10	List, 1939	Revised list in preparation
105 West Ross	little		
106 East Ross	10 x 10		Flora well advanced
107 East Sutherland	10 x 10		Flora due in 1976/77
108 West Surtherland	10 x 10		
109 Caithness	non-grid		Checklist in preparation
110 Outer Hebrides	little	numerous papers 1939-56	
111 Orkney	10 x 10	Checklist 1975	Ecological flora in preparation
112 Shetland	10 x 10	Checklist, 1969 (Fair Isle, 1973)	Flora projected

RECORDING IN SCOTLAND — INSECTS

John Heath — Monks Wood Experimental Station Institute of Terrestrial Ecology

Insect recording schemes are in operation for fourteen groups contained in eight orders. Provisional atlases have been published for the Rhopalocera (butterflies), Heterocera (Moths - Part I), Hymenoptera Apidae (Bumblebees) and Siphonaptera (Fleas).

Of these groups three are wholly organised by the Biological Records Centre. The Lepidoptera for which there are some 50 resident Scottish recorders; the Odonata (dragonflies) with only four Scottish recorders and the Orthoptera (grasshoppers and crickets) with two recorders. This pattern is reflected in all the other groups. As a consequence many areas of Scotland are still unrecorded and almost the whole of the country under-recorded in all the groups.

The unrecorded areas for the Lepidoptera are concentrated in the south-west, north, north-east, and western isles whereas for the Odonata and Orthoptera almost all Scotland is still unrecorded. The Hymenoptera are similarly unrecorded especially in the south-west, north, north-east and western isles, whereas for the Siphonaptera the unrecorded areas are concentrated in south-west and central Scotland.

It is now very important that a major effort should be made to complete the Atlas of the Butterflies. It is hoped to publish this in 1980. Therefore every effort should be made to survey all the unrecorded squares during the next four years.

The remaining parts of the Provisional Atlas of the Moths will be published during the next two to three years and records are still urgently needed from all parts of Scotland.

RECORDING IN SCOTLAND — MARINE MOLLUSCS

Dr Shelagh Smith — Royal Scottish Museum

Methods of Recording

The recording methods used in the marine mollusc census are described in the Information Sheets printed by the Conchological Society of Great Britain and Ireland.

I took over as Marine Recorder a little more than a year ago and find that thanks to Mrs Turk the previous Recorder, records are coming in very well. The bulk of my work is to get them into some order so that they may be used.

Originally the Census, as it was then called, was planned to operate at the level of the Census Area. At this level it operates very well indeed. The state of recording can be expressed by the number of species found per Census Area, and in this respect one can see that recording effort is spread fairly evenly round the whole of Britain and Ireland.

However, nowadays more detail is required and the volume of records coming in, plus that of literature and Museum records which need to be researched, are more than can be coped with by one person. Three years ago a system of Area Representatives was set up. The ideal is that each Census Area should have one or more people directly concerned for all aspects of its well being. It is all to the good if this person lives in the Area. The Area Representative is responsible for all records of his/her Area, both old and new, and is in an excellent position to drum up local support and to be involved in any public enquiry should it be necessary.

Most records are as yet littoral, and Area Representative write them up using the 10km square of the National Grid as a basis. I receive per year:- Master Field Cards per 10km square and/or numbers of species per square; Individual Record Cards, initially one for each species per Area, thereafter additional cards for imporved records and for preference a card accompanying each lot of specimens for the Voucher Collection; a Master Card for the Area and a short written report.

This apprently happy situation belies the fact that there is only a handful of regular contributors to Scottish marine mollusc recording, who, however, are extremely enthusiastic.

Taking distribution below Census Area level, it is now possible, thanks to the Area Representatives to produce mpas of numbers of species by 10km square. They do still tend to show distribution of recording effort, but for Scotland are starting to become meaningful. It is important, however, that the maps should be drawn with the northern islands in their proper place so that intervening sea stations can be added.

It is also possible to produce a handmade 'printout' of the distribution by 10km square of certain species such as of Gibbula, but this takes many hours of work and in any quantity is just not on, despite the fact that this is the sort of information most usually asked for.

Input of records

This is very satisfactory despite the fewness of people involved. Recording used to be almost entirely amateur, but professional bodies are now interested, sending in information often as a sideline to their own activity. Records are being gathered as part of survey and monitoring programmes, as last year in Shetland, and now in Orkney.

Processing of Records

Records entered on Field Cards and Individual Record Cards provide concise information, though a little lacking in detail, especially of repetitive data, the big advantage is that the information is set out uniformly.

Recording by 10km square works very well for the littoral zone, maps are easy to come by and people are used to the National Grid. However, the National Grid is not suitable for offshore records. Most offshore records so far received have Lat Long co-ordinates, some have Decca. Oceanographers form a strong body of opinion opposed to the use of UTM, put forward as suitable by the Biological Records Centre. Offshore work is expensive and haphazard in i distribution and full coverage will not come about, therefore extra care must be taken to ensure maximum use of the data available, which in effect means that the oceanographers' point of view must be respected.

Retrieval of Records

Retrieval of records is the real knub of biological recording, and so far as molluscs are concerned there are very few results for much effort. The sooner records can be retrieved quickly and easily the better. At present this is restricted to locality lists via copies of Field Cards. Marine mollusc recording was designed on its present basis to be computer linked, but for various reasons this has not yet happened, once it does, so far as littoral recording is concerned most problems will be solved, and Scotland will be in the forefront of any new advance. One looks forward to a start being made on a provisional atlas within the next few years.

Molluscs cover a wide range of environments which are not easily encompassed within a single recording programme. The non-marine species lend themselves

to being split off, but from high water mark downwards there is considerable overlap of range, much of which is not yet known! Littoral recording fits in well with other schemes, and forms an obvious focus for environmental studies. In the next few years we will be looking out to sea more and more and offshore and deep water records must not be the poor relations out on a limb because they are awkward From the Conchologists' point of view they are extremely valuable, and because there is so much offshore exploration around Scotland of more relevance to Scotland than to some other places, and I put forward a special plea that they should have a full place in biological recording.

Future Developments in Marine Mollusc Recording

1 It is essential that all first time round Individual Record Cards are written up as soon as possible so that I can fill in the gaps and have everything ready to send to the Biological Records Centre when required.
Likewise 10km master cards for coastal squares should be completed and kept up to date. Dr Perring would like this to be expedited.

2 An improvement in communication between myself (the Marine Recorder), the Area Representatives and other recorders is needed, particularly as regards informing Area Representatives about what is happening in other Areas.
It is suggested that Area Representatives should write up very full reports about every two years (not everybody in the same year). These reports should include details of special investigations, field meetings, descriptions of important sites showing why they are important, notes of any site at risk even if not from the conchological aspect. Marine mollusc recording does not as yet have the same security problems as, for instance, birds or botany, but Area Representatives must consider if any information contained in their reports (or indeed in any of their records) should be safeguarded and the degree of security required indicated.
The reports should include a progress map. This is in addition to a brief annual n note of new and upgraded records etc, which I can use in compiling the Annual Report published in J Conch.
Area Representatives should prepare full bibliographies to their Areas (I can help here) and addend them to their first report. Additional and new data should be added as appropriate to later reports.

3 The Marine Recorder should produce an annual newsletter which comprise:-

List of Area Representatives
Biennial reports from Area Representatives as available
Additional bibliography such as that pertaining to descriptions of species new to Britain
Full details (subject to security safeguards) of all new and upgraded records.

This would be a fairly hefty document and should be circulated separately from the other Conchological Society publications to omit members not interested in British marine mollusc recording. The mailing list would include Area Representatives, anybody who had sent in records recently, interested bodies such as Biological Records Centre, local offices of the Nature Conservancy Council, local Natural History societies. Area Representatives would suggest people.

This report would slightly shorten the annual report in J Conch. Mr Negus, editor of the Conchologists' Newsletter, would be invited to choose items from it for his publication.

4 Obviously the Conchological Society could not fully finance this marine newsletter, which would have very valuable public relations assets both inside and outside the Society. Ideas are welcome as regards a source of money

5 There was certain criticism at Biorec 75 that not all the right people had been circularised. There appeared to be glaring omissions. No doubt in some cases the publicity had landed on the wrong desk but one does have to find a way to get at people who do not belong to any organised body or society and who may be willing to contribute valuable information. One way this could be done is by greater publicity of Conchological Society field meetings, possibly through the local press/radio, and with additional minutes to local natural history societies. (Is this already done in some places?)

6 I have been criticised, properly, for not holding a field meeting in Scotland. Could I have an idea of numbers/names of those interested if a meeting were arranged?

7 It is suggested that fairly informal local Conchological Society meetings, arranged locally, for those unable to get to London, should be held, say once ayear, possibly based on a field meeting. This more or less happens already in some places. In Scotland and probably also in Ireland long distances have to be covered causing financial problems more acute than elsewhere.

If there are comments that this smaks of an attempt to fragment the Conchological Society, the cause can be laid fairly at the feet of those unwilling to travel to meetings outside London and who do not wish to be left out by meetings being held elsewhere.

8 It would be helpful, if outside finance is available, for the Marine Recorder to visit Area Representatives and others on their own ground occasionally. It has already been discovered that brief meetings within the context of a Conchological Society meeting are inadequate. More and undistracted time should be allowed.

RECORDING IN SCOTLAND — WADER COUNTS

Tony Prater — British Trust for Ornithology

Introduction

Wader counts were started in Sctoland in 1969 as part of a national and international programme to document one of the major animal communities of a limited and threatened habitat. Estuaries are coming under increasing pressure from developments of many sorts and it is clearly necessary to provide precise facts on the numbers and distribution of birds, if there is to be an effective conservation argument against damaging developments. The aim therefore is to document for conservation, although as a major scientific bonus the counts provide details of migration patterns which can be linked to the life cycle of each species. The survey is supported by the Nature Conservancy Council, and forms part of the BTO/RSPB/WT, 'Birds of Estuaries Enquiry'.

Methods

The numbers and species of birds vary considerably with season and to provide a full picture counts in each month are necessary. Waders are very mobile within an estuary and their position will vary with the state of the tide. At low tide they are spread out on feeding grounds and very difficult to count but at high tide they concentrate on a few areas in each estuary and are relatively easy to locate, reach and census. To prevent duplication or omission of birds from counts on large estuaries a co-ordinated count by a team of observers is carried out during the high water period of a spring tide on a specific date throughout the country. As it is necessary to make co-ordinated monthly counts, it is vital that the counts are made by local observers. In many areas of the north and west of Scotland finding observers is a problem, particularly because the few active birdwatchers in such areas are already heavily committed to many recording schemes (organised by the BTO, SOC, SWT, and WT as well as by local associations).

Throughout much of eastern and southern Scotland however the position is much better with large and active local organisations and many good observers, quite a number of whom already know the estuaries and their bird life. Reasonably competent observers usually become proficient after 8-10 visits.

For each of the large estuaries there is a local count organiser. We have found that for long term regular surveys it is vital that there is someone who can maintain frequent contact with all counters. He is also able to arrange for standby counters to fill in should the regular observer not be available for a count.

Individuals responsible for counting small estuaries correspond directly with the national organiser.

The principal need, once counting has started, is to maintain enthusiasm. Regular feedback of information is necessary to achieve this. The Birds of Estuaries Enquiry produces a 30-40 page annual report covering the whole of Britain and this is given to all observers. Local monthly or annual summaries are produced for the members of the teams counting the Solway Firth, Inner Clyde, Firth of Forth and the Moray Firth.

Results

After a pilot survey in 1969/70, when a limited number of sites were counted, regular counts have been obtained for virtually all estuaries north to Golspie on the east coast and to Holy Loch on the west coast. The cover is not complete in every month, with a few exceptions, but as the counts extend over five years a full picture has been built up of the wader populations. Generally there are good total estimates for the period October to March in each year.

The emphasis is placed on counts at estuaries, where the concentrations of waders occur, but in order to assess the relative importance of estuaries a number of counts are made of rocky coasts (in Fife, Angus, Kincardine) as well as coastal bays and beaches (in Caithness, Sutherland). Counts on rocky shores and bays can be made on any day providing the state of the tide is correct. On major estuaries, however, the counting period is often confined to the ten days of each month when the spring tides are at their highest.

Under-recorded areas are the north and north-western coasts of mainland Scotland and all of the islands. Few observers live in these areas and to avoid overburdering them is an important consideration. Expeditions to these areas would help to fill many gaps in our knowledge, particularly involving the Hebrides. Some species, particularly Lapwing and Golden Plover, occur inland and are only partly sampled. Other species such as Curlew, Redshank and Oystercatcher make use of coastal fields and are not always adequately censused by coastal counts.

Future

From and including winter 1975/76 the monthly counts will be replaced by three winter counts (in December, January and February). These will enable us to monitor the winter population of waders as part of the International Waterfowl Research Bureau's programme and to check on changes in distribution of birds

in relation to possible loss of estuarine ..abitat due to planned massive developments.

It is hoped that during the next two years some of the gaps in our cover will also be filled. During this period the results obtained since 1969 will be analysed and a full documentation of Scottish estuarine habitat obtained.

RECORDING IN SCOTLAND — GEOLOGY

Dr Mathew Armstrong — Institute of Geological Sciences, Edinburgh

Geological records include varied and complex data relating to distribution of geological formations and rock-types, stratigraphy structural geology, palaeontology, petrology, geophysics and geochemistry. In Britain systematic recording of geological data may be said to have commenced in 1835 with the establishment of the Geological Survey which in recent years has become a component of the Institute of Geological Sciences, a body with a wider area of responsibility, including in particular the British continental shelf. A most important function of the Institute of Geological Sciences is the production of up to date geological maps and ideally these would summarise all information on record.

In Scotland outcrop information has been recorded since 1854 on field maps at the scale of six inches to one mile. Coverage of the country is virtually complete whereas in England and Wales considerable areas still lack six-inch geological maps. A vast quantity of geological information provided by commercial and other boreholes, particularly in the coalfields, is held by the Institute of Geological Sciences at Edinburgh. A high proportion of the available boreholes and also of temporary sections exposed during building operations, road construction and pipelaying are examined by staff of the Institute of Geological Sciences and records are related to the appropriate sheet of the six-inch Ordnance Survey map. A large number of fossils and rock and mineral specimens accurately located with regard to the stratigraphy in exposures or boreholes has been assembled over many years and provides an essential reference collection for specialised palaeontological and petrological studies.

Full coverage of boreholes and temporary sections is not practicable and the Institute of Geological Sciences would welcome any information concerning such occurrences, preferably with measured sections and specimens. Valuable geological information collected by individual workers has a tendency to be lost and it is suggested that the records of the Institute of Geological Sciences would be a suitable repository for such material.

THE NEED FOR RECORDING IN SCOTLAND — THE PLANNER'S NEED

David Daymond — Clackmannanshire County Council

Although planning departments are made up of professional land-use planners it is rare to have wildlife qualified people on the staff. Therefore the work of the amateur doing biological recording can be very important. In practice planners frequently do approach the local naturalists for information to supplement the details they already hold on SSSI's, LNRs and Listed Wildlife Sites. It is therefore very important to help the planners understand the significance of a site with wildlife interest. For this they need a) a clear map of the site with boundaries; b) the main reasons why there is a wildlife interest (especially where there is a possibility of conflict); c) a comparison with other better known areas. (Planners occasionally do their own field investigations along these lines, eg the Clackmannanshire Woodland Survey); d) how and why the interest of the site came to light.

In every case prior notification is most important to the planner and the Scottish Wildlife Trust's scheme of Listed Wildlife Sites is an ideal system although any list like this can only be provisional. The naturalist's role of watch dog is one which is also very useful by ensuring that the planners are kept in touch with actual progress in the field.

THE NEED FOR RECORDING IN SCOTLAND — THE NATURALISTS' NEED

Elizabeth Farquharson — Edinburgh Natural History Society

Dr Watling, Ladies and Gentleman, I am attempting to speak on behalf of the amateur naturalists, many of whom belong to Natural History Societies, while others belong to none. I had been given the impression that quite a number of amateurs would be present this weekend but, looking around, we seem to be pretty thin on the ground.

In sheer numbers we amateurs outweigh the rest of you, with nearly 7000 members of the Scottish Wildlife Trust, and 2500 of the Scottish Ornithologists Club, and if you add to that the many Natural History Societies one realises that here is a very large potential workforce, both using records, and one would like to see, supplying records. Geographically we cover every corner of the country, and in range of disciplines we don't do too badly. It is only in depth of knowledge that we cannot compete with the professional, nor do we wish to.

Our interests are mainly in the field, and as a group we must spend a prodigious amount of time in the countryside, observing, mentally gathering information but not often recording, yet by our numbers and geographical distribution we are well placed for producing up to date information either on species or on areas of country. So, while we are great users of records we should also be great suppliers, but in actual fact we are not, except ornithologically as Mr Prater has shown, and possibly botanically. I wonder why this is so? One reason could be that Amateur Societies suffer a severe handicap in that, in many parts of the country, the group is too small to be able to finance a publication, so that records tend to remain in the minds of the living only to die along with the naturalist. There are of course, more glossy journals, but information we gather is not normally suitable for publication in these. Besides, it is so very easy, on one hand to be combing through old records for information on one's particular interest, while at the same time feeling that no-one could possibly be interested either now or in the future with one's own information.

I am not sure that the fault lies entirely with us. In the Edinburgh area we are particularly fortunate with many experts in our Societies, as well as most friendly relations with the Museum, and the Botanic Gardens, but this state of affairs is not universal, and many naturalists are working on their own, far from cities with little encouragement or help. Amongst our numbers we have many

who left school early, whose field knowledge is first class yet who will evade putting anything on paper for fear of incorrectly spellt Latin or the inability to give a six-figure map reference. In other words, when there are professionals around, we amateurs tread warily, hence so few of us here this weekend.

Another problem is that the non-specialist is not prepared to jeopardise the enjoyment of his hobby which is his relaxation after work, by anything that savours of compulsion or form-filling. He has enough of that during his working hours. This may be why one gets so little response from appeals for help with surveys, other than ornithological. One only has to mention such work to an amateur society to find oneself passed on at speed to another group.

Like everything else, records are influenced by demand. We would probably keep more if we were asked for them more frequently, but planners and developers usually go to the professionals, looking upon us as a collection of 'fuddy duddies' wandering round the countryside, more interested in a nice spot for a picnic than in doing anything worthwhile. This image is slowly dying but we still meet it, though we seldom deserve it. Of course it is probably true that our work is too superficial to be used by other bodies. Mr Currie referred to the high degree of professionalism that is required. So, how does the amateur cope, or, as I would prefer to put it, how do you cope with the amateur? Well, Mr Currie mentioned how amateurs could augment the work of professionals, and both Mr Bateman and Mr Ritchie have shown how we can be used and trained to better standards.

There seem to be varying views on how records should be kept. An individual, or an amateur society must keep its own records by whatever methods it finds best, depending as it does on volunteers. To impose a form of record keeping which may not be understood, which cannot be afforded, or which absorbs too much voluntary time is doomed to failure, so a wide variation in how records are kept should be accepted otherwise much good work may be lost.

Wherever else records are kept is not for me to express an opinion, but there will always be a need for records held locally, for the average amateur will not approach a professional and unknown organisation for fear of being rebuffed. A local supply of records has so much to commend it, being usually the most up to date, and requests for information can be handled speedily. We have, for instance, on several occasions supplied useful information to Edinburgh Corporation within a week. The local keeping of records can also often

overcome the problem of confidentiality, which can dog other things besides rarities.

To finish, may I sum up what to me the Naturalists need most — a greater acceptance of the Amateur for what he is worth, by the Professional, so that greater use can be made of what the Amateur has to offer, in the hope that we may contribute more usefully in the future, particularly in the realm of recording.

THE NEED FOR RECORDING IN SCOTLAND — THE CONSERVATIONISTS' NEED

Frank Hamilton — Royal Society for the Protection of Birds

It is inevitable in a Conference of this type that being 'tail-end Charlie' results in everything you wanted to say having already been said. Certainly, Andrew Currie and Alastair Somerville made a wide range of points which I would agree with.

However, I would like to emphasise some of these points and perhaps introduce one or two controversial aspects. As Mr Currie has said, the pressure on the countryside in the last two years has increased enormously as a result of the introduction of oil-related developments. The problem is usually the simple one of time. Because of the speed of developments that are required one does not have the time to gather information, employ someone for a season, and then be able to assess the value of the information which he has gathered. One is faced with 21 days in which to prepare the case and no amount of pleading or what-have-you can get round this problem.

This speed when linked to the lack of information is the problem which is facing conservationists today.

The third problem is that the threats come to specific areas, such as Dunnet Bay or Scapa Flow, and that one often realises how little one knows about a place when you have to write down on a piece of paper why you don't want a particular development to go ahead. When one is involved in this situation, one often has to draw conclusions from comparatively little information and of course there is something which scientists never like doing. It is because of these threats to specific areas and the speed with which they are going to happen that the problems arise and that we begin to need up to date biological recording.

When a threat appears, three things have to happen quickly. First, there is the survey of the literature and in most cases, at least from the point of view of birds, this is usually sparse unless the area is very well known. Second, and this usually occurs at the same time as the first, is to contact local people such as the Natural History Society, the SWT or the RSPB on the question of birds. The third, and this depends on the scale of the development envisaged and the potential threat to a particular area then one can have a crash programme for several months. I am thinking specifically here of Scapa Flow in Orkney and the Firth of Forth. The problem is that these crash programmes often do not give the whole picture and they are generally carried out by professionals.

However, they do produce a baseline on which amateurs can then work. At all levels co-operation with the NCC is important.

The aim of any survey or collection of information about a particular area which is threatened is to assess the value of that site or area in relation to the rest of the region, the United Kingdom or throughout Europe, and the reasons for this assessment. For instance, to say that there are 500 birds of a certain species in an area will mean little to a planner, but if you relate this as being a percentage of the national or international population then it does. As Mr Daymond says, it is this importance which is attached to the area that gives strength to the conservationist's elbow.

But then - what is importance? We can look at this in three ways. The habitat the species and, for the want of a better term, the rest. Looking first at the habitat one has to assess how common this is and while many conservationists 'know' this is often difficult to quantify scientifically. Such habitats can be grouped loosely together as estuary, woods, moorland etc and can be broken down further if it is felt an advantage. Individual surveys have to be assessed on a habitat rather than on that particular area and if such a survey can be carried out for the whole of the UK for one particular habitat this becomes extremely valuable. An example of this has already been mentioned by Tony Prater's reference to the Estuary Survey which was organised by the British Trust for Ornithology and the RSPB and this enabled people to assess the value of each estuary in relation to the other. However, to do this requires — (i) a high degree of organisation by professional people, (ii) has plenty of manpower and (iii) that there is good co-ordination. Such surveys cannot be thought of in terms of one or two years, but generally in terms of five years. The BTO is now linking this directly with the Habitat Register which in years to come will be very valuable.

As has been mentioned by other people, again especially by Tony Prater, the feedback to people joining in is very important if the manpower is to be encouraged and increased. If one can identify key species, and these are not necessarily rare ones, this can speed up the assessment of a habitat. My own view is that in the grading of sites within a faunal area it is important not to talk about grades 1, 2, 3 etc but rather on local, regional, national or international importance.

The second aspect is the one of species and here one often means rarity. Dr Perring has already covered the definition of 'rare' and how it can be

linked to a particular habitat, be at the edge of its range, be a concentration of one area in a sizeable world population or even be an endangered species. Whether one likes it or not, rarity can be emotional and will often achieve, in planning terms, a great deal than with a commoner species. However, as again has been mentioned rarity often means secrecy but it is possible, as has been achieved with birds, to both publicise and keep secret. To give an example of this we have a thing called the Rare Breeding Birds Panel which publishes a report but does not pinpoint particular areas. This does enable us to find out how rare is rare in birds and also ensure that information doesn't go to the grave when people die. The classic example of the BSBI and the Atlas distribution maps goes under species and the proposed BTO one on birds, which will soon be published, adds to this. However, in these cases it is usually long-term prospects for the use of these rather than the direct tool for today's conservationists.

The third category which I have put under 'other' are such things as Beached Bird Survey in which people are asked to cover a stretch of beach during the winter over one weekend. This has been running for several years now and is now going international. This helps us to assess chronic pollution on a wide front and is now being decentralised from the RSPB headquarters for more efficient organisation. Again, feedback is important and we also must avoid asking observers to do too much. It has been suggested that people counting the shore could look out for beached cetaceans, but if one does this the reaction is that people may give up counting everything. I think it is also important to collect data nationally on such things as disturbance to either plants and especially birds and we are doing this with the Highland Officer of the RSPB on divers and grebes. Breeding success to other species such as terns is also being carried out with the larger colonies being covered by the RSPB and the small ones by the SWT.

Before going on to organisations, I think it is worth emphasising the need for recording on nature reserves. These pinpoints on a map are places which are protected and should be run as professionally as possible and all scientific data on them should be clearly documented so that changes can be assessed. On many reserves in Scotland the event record cards, which have already been covered by Dr Perring, are very valuable long-term, while annual reports should be as detailed as possible.

Lastly, in the need for good conservation it is important that there is co-operation between organisations. I think this is the desire of everyone, but in practice it is often difficult. Alastair Somerville has covered the

subject of who does what very well in his summary. Co-operation between bodies of like interests, for example birds, is on the whole very good, ie research as we have already mentioned between the BTO and the RSPB over the estuary survey, the beached bird survey is organised jointly between the RSPB and the Seabird Group, and over the habitat survey I think everybody is trying to co-operate with the BTO. Co-operation between bodies of dissimilar interests at national level is, I think, rare. Locally it happens, especially with Natural History Societies, though I believe that when one has joint field parties, as has been suggested, birdwatching and botanising does not mix easily. In the slides which were shown by the previous speaker it showed you somebody doing just that. I wonder what the situation would have been like half an hour later when I suspect that the birdwatcher would have been half a mile away and the person looking at plants or insects would still have been crouched near the ground studying. I find myself that when I go out I have to make up my mind to either look at plants or look at birds, because if you try to do both neither works well.

A few last points. I think communications with the Nature Conservancy Council are vital and that everybody should do their best to link in with them as fully as possible. Communications with planners are also very important and I think this has been shown clearly the way the SWT and the planners have got together over listed wildlife sites. The RSPB, and other bodies to a smaller extent, also do this with lists of places of particular interest and I know for a fact that planners are always anxious to obtain information. Over the collection of data, to some extent birds already have a centre at 21 Regent Terrace which is the Centre for Ornithology in Scotland and is the home of the Scottish Ornithologists' Club. This could be expanded and could be linked with other collections of data for other disciplines if it is decided to have these on either a national or regional level.

Several speakers of the more specialised branches of natural history have mentioned the lack of manpower but I wonder if, by having a more popular approach, they may get a bigger following. I suspect there may be some deep-rooted objection to this and of course many disciplines require a good deal more mental effort than birds, but I believe that there is scope here that would give more manpower in the future.

Lastly, may I end up with a plea that amateurs do the work because they enjoy it Give them work to do which they do not enjoy then either the quality of the work will suffer or you will get nothing. It is for this reason that I believe feedback to people is vital and that they can see the results of their work. This enjoyment factor is one which has been exploited by the 'bird people' and is one of the reasons why the movement as a whole has expanded rapidly in the last two years and become a just force in nature conservation.

BIOLOGICAL RECORDING — THE WAY AHEAD

Dr Franklyn Perring — Monks Wood Experimental Station
Institute of Terrestrial Ecology

Priorities

The need to extend and improve biological recording in Scotland has been clearly established by this Conference. We are all aware that, when the development of North Sea Oil came on the east and north coasts we were almost totally unprepared to produce the biological information which was essential as a basis for sound advice to planners. If oil is also discovered off the west coast we must surely not find ourselves similarly so ill-prepared. Yet, at the present time, except for birds and flowering plants for which the coverage is widespread and even, there is still a great deal of work to be done to prepare adequate Atlases as the 10km square level for such obvious and important groups as mammals, amphibians, reptiles, butterflies and moths, and marine molluscs.

However much emphasis is placed on the importance of site recording, the complete assessment of sites cannot be made without reference to their value in terms of species rarity or species limits — information which Atlases give in compact and easily consulted form.

So the first priority for Biological Recording in Scotland must be to find ways of improving coverage of the groups which are due to be completed before 1980. It is no coincidence that the two groups which are well covered, the birds and flowering plants, have strong regional or County organisations: the ornithologists through the BTO and RSPB, the botanists through the CSSF. There is perhaps a case for setting up another CSSF - a Committee for the Study of the Scottish Fauna.

The second priority must be to co-ordinate the mapping projects with the needs of NCC, SWT and the planning authorities so that, wherever possible, those engaged on species survey make separate lists for 'good' sites. Likewise site records from surveys initiated by the NCC and SWT should become part of the species survey data bank. Data about sites and species must be stored together in such a way that comparisons can be made between alternative sites.

The Problem

Despite justifiable cries that there are not enough recorders in Scotland a major part of the problem seems to be a lack of organisation, so that the many enthusiastic field naturalists there are in Scotland have not always been aware of the best contribution they could make to the national needs. The same situation existed in Ireland until a few years ago. But in an area of similar size and population to Scotland we have seen immense advances since the setting up of an Irish Biological Records Centre in Dublin and the development of the Ulster Museum as a centre for the Province. The collaboration of these two centres has resulted in a recent publication of an 'Atlas of Irish Mammals' and other Atalses will shortly follow. This is in the tradition already pioneered in Wales by the National Museum which publishes among others 'Welsh Trees', 'Welsh Ferns' and 'Welsh Flowering Plants'. The absence of similar works in Scotland reduces the incentive of naturalists here to record: and in any case where should the records be sent? Can we look to the leading museums in this country to take some initiative? As a biologist I note with pride that the Directors of both the Glasgow Museum and the Royal Scottish Museum are biologists.

Initiative in Scotland

In fact as we have already seen one museum in Scotland has taken the initiative — Dundee Museum under the guidance of Adam Ritchie — and his paper modestly describes the immense impact this has had on biological recording in Angus, simply by co-ordinating and directing the potential for recording which already existed. Whilst his activities are, as yet, unique in Scotland, they are but one example of a situation which is now widespread in the rest of Britain where biological records centres exist in museums or similar organisations in over 30 counties. In each a member of the natural history staff assumes the role of a Records Centre organiser and gives all or part of his time to running a centre, with two main objectives in view:

1 To assemble, or know the source of, all species and site information for the county

2 To co-ordinate the fieldwork of local naturalists in the county and by collaborating with NCC, the County Trusts, National Biological Societies and BRC ensure that the fieldwork is as far as possible relevant to local and national needs.

Such centres can attract voluntary helpers for both these objectives by offering a service, in the same way that nationally BRC has been able to attract the help of national biological societies. Adam Ritchie has outlined some of the services a museum can offer:

a) Archival facilities for safe storage of records and specimens

b) Space for naturalists to work on these.

c) Literature necessary for research.

d) Outlet for publications (Local museums often publish the work of local naturalists).

e) Recording materials for the area, such as cards printed with base maps, card index cards etc.

f) Loan of trapping equipment such as moth traps, Longworth small mammal traps, etc.

But the services provided directly by the museum need only be the beginning of the influence of the Records Centre organiser. The lack of opportunities to learn to identify plants and animals has been a common theme of this conference. The organiser, knowing the needs of his county, can use his influence within the Local Education Authority and the Extra Mural Department of the University to arrange suitable courses. In Shropshire Birmingham University Extra-Mural Department have adopted theFlora of Shropshire project and are providing recording materials in addition to lectures.

The Future

The present financial situation and the attitude of museums to biology in Scotland is not encouraging. However we must plan for a brighter future. Scotland will become richer and by the time it does we should already have made the case for a Records Centre organiser so strong that he is at the top of the list of appointments needed in every county. With new authority areas coming into being in 1975 this is a time of change — the very time to press a case and win it.

In England the reorganisation of Local Authorities has produced a new breed of Museum being — a Director of County Museum Services — at least 17 now exist and they have overall responsibility for the museums in their area. With bigger units there is greater flexibility with staff appointments and so far, the idea of a Records Centre organiser has been enthusiastically received and a joint paper from the Museum Directors and BRC is to be prepared for the Association of County Councils.

In the long term I am sure the appointment of County Record Officers is the surest way of improving the quantity and quality of biological recording in Scotland, and it should be appreciated that his appointment need not be hampered by the lack of a museum in the county. In many parts of the north and west there will be none — and precious few records of which to make a centre. Here the greatest need is to co-ordinate the forces which do exist — here in the very area where new finds of offshore oil could bring the demand for data any day.

In the short term, however, there are several things which could be done:

1 In view of the success of this conference and the previous feeling of isolation expressed by many speakers, BRC will consult w National Biological Societies to see whether a meeting for Scottish representatives should take place in Scotland from time to time, eg biennially.

2 Because of the apparent lack of co-ordination amongst field zoologists thought to be given to forming a Committee for the Study of the Scottish Fauna — to promote work on national mapping schemes and the preparation of vice-county check-lists, which are essential guides to recorders on which records should be supported by vouchers and published in the appropriate journal.

3 Because of the enthusiasm of this conference an ad hoc group might be appointed to investigate all ways in which biological recording in Scotland can be improved. Such a group could include representatives of the major museums and similar institutions with biology departments, in association with the main users the NCC and SWT with powers to coopt.

SUMMARY AND DISCUSSION

Saturday — Session I
Introduction and Achievements to Date — chaired by Dr Morton Boyd

The main theme of Mr Currie's paper was the value of possessing fundamental biological facts in the form of records of animal and plant species, for the ecological assessment of sites for conservation.

With the limited naturalist expertise and lack of money preventing comprehensive species recording coverage, it was thought that selected species groups should be chosen for monitoring schemes and that strategic research was required for definite parameters of investigation.

Dr Sommerville gave a comprehensive review of the types of recording schemes in operation and the organisations involved with recording both at a local and at a national level.

One of the main points of discussion was the problem of obtaining records from recorders, particularly from the professionals. In the case of researchers, due to the pressures of time, they were not able to submit records on a regular basis. It was pointed out that the efficiency of the schemes would be bettered if there was more feed-back of survey progress to the recorders.

Dr Boyd summarised by emphasising the following points:

1 that there is a clear requirement for selective recording

2 that the needs of the planners and the conservationists should be carefully analysed

3 that the currently diverse and unco-ordinated network of data banks should be improved to cope with the increasing amount of biological information

4 that there is a great need to co-ordinate the local schemes with the national ones

Saturday — Session II
The Technical Side of Biological Recording — chaired by John Heath

In this session, accounts were given of the organisation of biological recording and the running of record centres, a) at the national level for the UK by Dr Perring, b) at the regional level for Wales by Mr Bateman and c) at the local level for Dundee and Angus by Mr Ritchie.

At the national level, the problems of computer storage of data, of objectivity over rarity and of confidentiality of records, were discussed.

Since the Welsh organisation began its recording activities in 1971, there has been a great improvement in the submission of Lepidoptera records.

At the local level, concern was expressed at the danger of local centres becoming repositories for 'second-class' records without contact with appropriate experts. One of the important tasks of the local record centres could be their attention to the recording of commoner species liable to be missed at the expense of high level records.

Saturday — Session III
Recording in Scotland — chaired by Dr Frank Perring

A series of talks were given, presenting the current situation on recording in Scotland in the following schemes — mammals by Dr Corbet; plants by Mr Ballantyne; insects by Mr Heath; marine molluscs by Dr Smith; waders by Mr Prater; geology by Dr Armstrong.

It was clear that survey coverage was far from being comprehensive, partly due to the lack of recorders and partly due to the large areas of not easily accessible terrain.

Saturday — Conversazione

Opportunity was provided on an informal basis for organisers of recording schemes to explain more about them through displays and literature.

Sunday — Session I
The Need for Recording in Scotland — chaired by Dr Roy Watling

This session was devoted to the consumers' requirements for records. Mr Daymond spoke on the needs of the Planner, Mrs Farquharson on the needs of the Naturalist, and Mr Hamilton on the needs of the Conservationist.

Much of the discussion centred around the planner/developer, the sort of relationship which should be built up between him and the conservationist, and in what form this information should be supplied to him.

It was agreed that since the amateur contribution to the wealth of biological information was so important, everything possible should be done to break down any barriers which prevent the flow of information from them to the record centres.

Sunday — Session II
The Way Ahead - chaired by Dr Roy Watling

Dr Perring, in the final paper, stressed the need to extend and improve biological recording in Scotland, particularly in the coverage of species recording. A great deal is still to be done with regard to the organisation of recorders in Scotland and the way was pointed to the possibility of the leading Scottish museums co-ordinating the fieldwork of local naturalists in the region and collaborating with the NCC, the SWT, the National Biological Societies and BRC so that fieldwork is, as far as possible, relevant to local and national needs. For the future, he strongly advised pressing the case for the formation of a network of unified regional record centres for Scotland.

Although doubt was expressed about the feasibility of record centres in the new Island Authorities, it was generally agreed that the concept of regional record centres should be pursued.

Dr Goode and Mr Stubbs, on behalf of the NCC, expressed approval, in principle, of the formation of regional record centres provided they were compatible with the NCC systems. They put forward, to the conference, four resolutions:-

1 that a list of active fieldworkers in Scotland should be produced

2 that amateurs should be encouraged to become recorders by provision of training field courses and other specialist courses

3 that publication of results should be promoted to provide feed-back to the recorders

4 that an investigation should be started to examine the practicabilities of setting up a record centre(s) in Scotland

They also suggested that a working party should be set up to look into those points and that this group could be the organisers of this Conference and could co-opt people to assist them.

Dr Watling placed these resolutions before the delegates for voting and they were carried unanimously.

It was agreed that proceedings of the Conference, together with a delegate list should be produced and circulated to each delegate.

Dr Perring said that, in view of the success of this Conference, he would consult with the National Biological Societies to see whether a meeting for Scottish representatives should take place in Scotland, perhaps biennially.

Dr Watling ended the Conference by thanking the Biorec 75 organisers and the Dundee University Biological Sciences Department.

An optional excursion to Tentsmuir Point National Nature Reserve in Fife was led by Dr Hugh Ingram of Dundee University assisted by Mr John Young, NCC Warden.

Biological Recording in Scotland Committee (BRISC)

As recommended at the Biorec 75 Conference, a working group has since been formed called the Biological Recording in Scotland Committee (BRISC) whose remit is:-

1 to produce a list of active recorders in Scotland

2 to encourage amateurs to become recorders by providing advice to them and promoting field courses and other specialist training courses

3 to publicise survey results to provide feed-back to recorders

4 to investigate the practicabilities of setting up a record centre(s) in Scotland

The composition of BRISC, which has powers to co-opt, at present consists of:-

Mr Ian Bonner	Nature Conservancy Council
A representative	Glasgow Museum
Mr David Heppell	Royal Scottish Museum, Edinburgh
Mr Ted Pelham-Clinton	Royal Scottish Museum, Edinburgh
Mr Adam Ritchie	Dundee Museum
Dr Alastair Sommerville	Scottish Wildlife Trust

The Committee has met on two occasions since Biorec 75 and the following points of action have emerged:-

1 an index of field recorders is being prepared and will be published sometime in the future

2 encouragement is being given to survey scheme organisers to regularly publish results as a feed-back to recorders

3 the Biorec guide to recording booklet is to be published and followed by updated bulletins

4 two specialist courses on the techniques of field recording and species identification have been proposed in collaboration with the Scottish Field Studies Association (Kindrogan Field Centre) and the University of Dundee Department of Extra Mural Education, and other courses are being investigated

5 a circular, to be sent to Natural History Societies and SWT Branches, is being prepared, asking which specialist groups, what degree of interest and what type of training would be of interest to their members.

BRISC wishes to emphasise its important role as an advisory body to help and encourage amateur naturalists to pursue biological recording. The Committee will willingly answer enquiries about any aspect of biological recording. Also, any helpful suggestions related to the work of the Committee would be welcomed for consideration at meetings.

Copies of the minutes of the BRISC meetings will be sent to anyone interested. Please send a 50p Postal Order to cover postage on a year's meetings.

BRISC Address: Biological Recording in Scotland Committee
c/o 8 Dublin Street
Edinburgh
EH1 3PP

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and to Drs Greenwood and Ingram for organising the Department facilities during the Conference

all those who presented papers and contributed useful comments during the discussions

Miss Helen Strachan of Dundee Museum who typed and duplicated this report

David Heppell
Sandy Kerr
Ted Pelham-Clinton
Adam Ritchie
Alastair Sommerville

CONFERENCE DELEGATES

NAME	Society or Professional Institution Represented (where known)
ANDREW, Miss J	Perth Grammar School
ANDREWS, S M	Royal Scottish Museum
ANGUS, S	Conchological Society of Great Britain and Ireland
ANTHONY, G	Midlothian County Council Ranger Service
ARMSTRONG, Dr M	Institute of Geological Sciences
ATKINSON, N K	Tay Ringing Group
BABBS, P	Clackmannanshire County Council Ranger Service
BALHARRY, R	Nature Conservancy Council (Scotland)
BALLANTYNE, G	Botanical Society of the British Isles
BALLANTYNE, J H	
BARBOUR, D	
BATEMAN, J	National Museum of Wales
BENSTEAD, Miss M	University of Dundee
BOAG, Dr B	Scottish Horticultural Research Institute
BOWYER, P	Royal Society for the Protection of Birds
BOYD, Dr J M	Nature Conservancy Council (Scotland)
BREMNER, D	National Trust for Scotland
BRINKLOW, R.K	Dundee Museum
BROWN, D	Scottish Horticultural Research Institute
BRYANT, Dr D	University of Stirling
BULLARD, Miss E R	Orkney Field Club
CALDWELL, Dr Helen L	Fife County Council Education Department
CAMPBELL, K M	
CAMPBELL, Miss L	Scottish Wildlife Trust
COLLIS, G	British Isopoda Study Group
COLLIS, Mrs A	British Isopoda Study Group
COPPINS, B	British Lichen Society
CORBET, Dr G	Mammal Society of the British Isles
CURRIE, A	Nature Conservancy Council (Scotland)
CUTHBERT, J H	Department of Agriculture and Fisheries for Scotland
DAWSON, Dr D	

NAME	Society or Professional Institution Represented (where known)
DAYMOND, D	Clackmannanshire County Council Planning Department
DUNCAN, A	Powis Academy, Aberdeen
DUNCAN, Dr Ursula K	Botanical Society of the British Isles
FARQUHARSON, Miss E	Edinburgh Natural History Society
FLOOD, S W	St Albans Museum
FOSTER, Dr G	West of Scotland College of Agriculture
FINDLAY, J	Scottish Wildlife Trust, Clyde Branch
FINDLAY, Mrs J	Scottish Wildlife Trust, Clyde Branch
FULLERTON, Mrs A	
GOSLING, J G	Kirkcaldy Naturalists' Society
GRAY, T	Fife County Council Education Department
GREENHORN, Mrs D	Kirkcaldy Naturalists' Society
GREENWOOD, Dr J	Conchological Society of Great Britain and Ireland
HAMADANI, H M	University of Aberdeen
HAMILTON, Mrs E	Edinburgh Naturalists' Society
HAMILTON, F	Royal Society for the Protection of Birds
HARALD, P	Royal Botanic Gardens, Edinburgh
HEATH, J	Biological Records Centre, Monks Wood
HINDE, T	Forestry Commission
HETCH, C J B	University of London
HOSIE, G	Department of Agriculture and Fisheries for Scotland
HULL, Dr P	University of Strathclyde
HUTCHISON, Mrs M A	
INGRAM, Dr H A P	University of Dundee
INGRAM, Dr R I	University of Dundee
JONES, Dr A	University of Dundee
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KERR, Miss A	Kirkcaldy Museum
KNOX, A	University of Aberdeen
LARSEN, R F F	Forestry Commission
LYSTER, I H J	Royal Scottish Museum
MACDONALD, Miss M	National Trust for Scotland

NAME	Society or Professional Institution Represented (where known)
MARRIOTT, Dr R	University of Aberdeen
MARTIN, J D S	Botanical Society of the British Isles
MARTIN, Mrs M E R	
MATHEWSON, E R	
MESSER, D J	
McGINN, D B	
McKAY, D W	Conchological Society of Great Britain and Ireland
MITCHELL, J	Nature Conservancy Council
MOORE, Miss B H	Royal Society for the Protection of Birds
PALMER, R	University of Aberdeen
PERRING, Dr F H	Biological Records Centre, Monks Wood
PELHAM-CLINTON, E.C	Royal Scottish Museum
PILLANS, Jean	
PRATER, A H	British Trust for Ornithology
REID, D T	West of Scotland College of Agriculture
RITCHIE, A B	Dundee Museum
ROBERTSON, A	Dundee Parks Department
SAPWELL, J	Royal Society for the Protection of Birds
SCRIMGEOUR, Dr C	Scottish Wildlife Trust, Dundee and Angus Branch
SIME, I F	
SINCLAIR, M	
SMITH, Dr Rosalind A H	Nature Conservancy Council (Scotland)
SMITH, Rachel M	
SMITH, Dr Shelagh M	Conchological Society of Great Britain and Ireland
SOMMERVILLE, Dr A	Scottish Wildlife Trust
SPRAGGE, E F B	Scottish Wildlife Trust, Fife Kinross and Clackmannan Branch
STIRLING, A McG	Andersonian Naturalists of Glasgow
STUBBS, A E	Nature Conservancy Council
THIRDE, G	Forestry Commission
THOMPSON, J A C	

NAME	Society or Professional Institution Represented (where known)
TOPHAM, Dr Pauline B	Scottish Horticultural Research Unit
YOUNG, Dr M	University of Aberdeen
WALKER, J J	
WATLING, Dr R	Royal Botanic Gardens, Edinburgh
WOIWOD, I	Rothamsted Experimental Station
YOUNG, J	Nature Conservancy Council (Scotland)