

## WHY HAVE ECOLOGISTS?

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In the 25 years since the Society was founded, the general public and therefore governments, have become far more conscious of the environment in which they live, the effects which their own activities are having upon it, and of the need to do something to maintain its quality. Twenty-five years ago both "environment" and "ecology" were words which were hardly ever seen in the popular press and only vaguely understood, if at all, by the man in the street. One had to preface any popular statement about ecology with an explanation of what the word meant.

This is certainly no longer the case and indeed the magic words "environmental impact statement" have become a sort of modern "open sesame" which must be uttered before we can hope to get anywhere with a whole variety of activities.

Governments, at least in the more developed countries, have responded to this popular interest in the environment by enacting protective legislation and by setting up departments or other agencies charged with the responsibility for looking after environmental affairs. As one might expect, there is a great diversity between countries in the matters which are considered to fall within an environmental portfolio. At one extreme, the Department of Environment in Canada has responsibility, at the federal level, not only for maintaining environmental quality in such matters as the control of atmospheric and aquatic pollution, but also for management of the naturally based living resources, parks, wildlife, fisheries and forests. The British Department of the Environment, on the other hand, seems to be primarily concerned with government construction programmes and fills much of the role of Department of Public Works elsewhere. In Australia at present Commonwealth environmental matters are also amalgamated with works functions in a Department of Environment, Housing and Community Development. These departments all have directly executive functions in their own fields. On the other hand, in New Zealand, the watchdog aspects of environmental protection appear to be separated from the executive functions and are exercised through a Commission.

There is also much diversity between governments

in the way in which research on environmental problems is organized. In Canada the Department of Environment is both a research and an administrative body although in some areas such as forestry, the manner in which responsibilities are allocated under the federal system of government largely limits the responsibility of the Department to research. In Britain on the other hand research is the responsibility of an entirely separate body, the Natural Environment Research Council, which operates mainly through grants to other research bodies either inside or outside the Public Service. In Australia, the research function at the national level lies mainly outside the Department, chiefly in CSIRO. The Department does fund some environmental research, but on a relatively small scale.

The development of environmental activities on the part of governments has been a response to public pressures. These pressures spring basically from the feelings of a very large number of individuals but they have been most vocally expressed through numerous voluntary associations. Some of these associations are existing bodies which were established for other purposes but which have natural interests in environmental matters. Others are bodies which have been established especially for the purpose of rallying and expressing public opinion. The pre-existing bodies include scientific societies at the professional level, local natural history societies and similar amateur associations, and groups concerned with some form of outdoor recreation. They are however sometimes joined by unexpected bedfellows as when, as has happened in Australia, trade unions in the name of conservation prevent the construction of power stations in locations which have already been accepted by all the official environmental agencies concerned. It is indicative of the widespread nature of the environmental interests that a significant number of the national bodies have formed international groupings to co-ordinate

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their activities and to enable them to speak with a single voice at international conferences and at councils at the inter-governmental level. For example, at the meetings of the U.N. Environment Programme, the N.G.O.s (non-government organizations) have a recognized and influential place, though the formal decisions of the Council itself are only voted on by the member governments.

It is interesting to examine further the reasons for the remarkably rapid increase in public interest in environmental matters over the last 25 years, and to try to identify some of the principal considerations which make the environment appear important to us. Although these two questions are closely inter-related, they are essentially quite distinct. Most of the reasons which have contributed to the public feeling that there is a need to do something to protect the environment, spring, I believe, directly or indirectly from the recent rapid rate of technological advance. Directly, the technological advance itself has greatly accelerated the speed at which environmental threats are building up. Two obvious examples of this are the proliferation of the automobile with the resulting build-up of atmospheric pollution, and the discovery and widespread use of chlorinated hydrocarbons, PCBs and other deadly, but previously non-existing, substances. Indirectly, the developing technology has both increased the leisure time of the average man and increased his mobility, particularly for recreational purposes, and these effects have jointly given him more contacts with the non-urban environment and made him more aware of, and more responsive to any threats to its well-being. The increased ease of communication and development of the mass media have also probably contributed to the rapid growth of environmental awareness. It is then perhaps not altogether to be wondered at that the sudden development of interest in the environment and its protection has taken place at the present stage in man's social evolution.

Few people except in the most primitive societies spend much, if any, time in environments which are not already significantly modified by man. In spite of this, many of the modified environments would be regarded by most people as reasonably or entirely satisfactory. Thus, the primary objective of environmental protection and management is not in general to maintain or restore the surface of the globe to its pristine condition. The real objects of our efforts to look after our environment are therefore complex and well worthy of some examination. This is made more difficult by the fact that some of the objectives are quite clearly in conflict with each other.

The considerations which are taken into account in

man's efforts to maintain a suitable environment include:

- (1) it should be safe for him to live in;
- (2) it should contribute to the economic prosperity of his society;
- (3) it should be aesthetically satisfactory;
- (4) it should contribute to the satisfactions he obtains from outdoor recreation;
- (5) it should be biologically productive, particularly of species which he wishes to exploit either commercially or for recreation;
- (6) all species and biological communities which naturally occur in it should be maintained in being.

Human safety would probably be accepted by all people and governments as being an over-riding consideration for which support can most easily be obtained. It arises most often in connection with water and atmospheric pollutions. It underlies, for example, the current tendencies to compel motor manufacturers, at considerable inconvenience to themselves and cost to their customers, to make major modifications in order to reduce automobile-derived pollution of the atmosphere. In the water, the safety aspect has been one of the principal factors contributing to the great progress which has been made in the control of pollution. Over the years emphasis has moved from sewage-borne pathogens to heavy metals of industrial origin.

Use of the environment in the pursuit of economic prosperity is generally industrial use; and it is this which most commonly conflicts with the other objectives for which the environment may be managed. The conflict is probably least in the case of tourist or other recreation-based industry, and most intense for those industries which involve the complete modification of the environment from its original form. However even those uses which cause major modifications may vary considerably in the severity with which they conflict with other uses. Conflict with aesthetic, recreational and some biological objectives would, for instance, be much less severe in the case of modification by intensive farming than in that of surface mining of minerals. The conflicts which arise between different uses of the environment are difficult to resolve, not only because they require value judgements which may differ between individuals, but also because they may involve the balancing of human benefits of unlike kinds. The considerations involved in assessing, for example, whether a piece of land supporting an indigenous but economically non-productive plant community should be replanted with an exotic but economically productive forest, are less diverse in

their nature than those involved in deciding whether an existing fishing industry should be abolished in order to ensure that even a very small number of individuals who live very largely on its products should be protected from any possibility of ingesting dangerously large quantities of mercury.

I had hesitated whether to include the aesthetic aspects as a separate factor in the considerations which may influence the management of the environment, since the associated values are so largely subjective. Nonetheless, aesthetic considerations are probably often of considerable importance in determining public reaction to proposals which would involve a major change in the appearance of a landscape. They would influence, for example, reactions not only to proposals for the construction of large buildings in rural landscapes, but also to the planting of uniform dark-coloured, coniferous forests in previously more diversified areas.

The satisfactions derived from outdoor recreation are many and diverse in their nature. One survey which I recently read identified 11 experiences sought by outdoor recreationists. These were: experience of nature, general escape, mental change, exploration, avoiding others' expectations, family togetherness, tension release, achievement, exercise and physical fitness, dominance and control, and thrill-seeking. While this list may read rather strangely to some of us, it does provide a good example of the variety of factors which cause a large proportion of the public to be interested in maintaining what they regard as a satisfactory environment. Not all of these satisfactions can be realised only in a rural environment and still fewer of them only in an unmodified one.

The concept of a high level of biological productivity as an objective of environmental management is one which needs to be approached with considerable caution. It is true that environmental modifications which led to a serious reduction in the level of productivity would be generally regarded as unacceptable. Examples of such developments would be the effects on a river or lake of toxic industrial wastes or, on land, the effects of extensive surface mining or the destruction of vegetation by toxic materials discharged into the atmosphere. On the other hand, increases in productivity may also bring about environmental modifications which would be unacceptable to many people. An obvious example is the eutrophication of a lake by sewage effluents which may bring about profound biological changes, but actually increase the level of productivity. A terrestrial parallel would be the conversion of an area of pristine vegetation to agricultural land with the attendant application of artificial fertilizers.

Associated with the concept of high productivity is that of a "healthy" environment. This however raises real problems of definition and therefore of measurement. Probably many of us would feel that we "knew" intuitively whether a given environment was "healthy", although we would have difficulty in defining the reasons for our belief. Perhaps one of the principal criteria involved is the existence of a fairly high level of species diversity in the associated biological community. On this criterion, both the above examples of environments with increased productivity would probably fail to be classified as "healthy". Conversely, we must recognize that there are many pristine communities which, on account of physical features of the environment, have naturally a low level of species diversity.

Another aspect of the productivity of the environment is the maintenance of the populations of exploited species at levels which will give the maximum benefits to man. This requires almost automatically that the population should be kept at a fairly high level, either by maintaining an adequate number of breeding animals or by some form of artificial augmentation. Where the objective is yield measured by weight, and not by number of animals, its maximization also requires the appropriate balance between the rate of exploitation and the minimum age at capture. This approach has been most highly developed in the field of fisheries. Over the last 40 years, considerable emphasis has been given to developing both the biological and mathematical approaches to management for maximum sustainable yield by weight. In the last few years, however, we have seen a number of advances on this relatively simple approach. In the first place, it was realized that other measures of yield may be more appropriate than simply the weight. In particular, economic and social factors such as maximization of financial return and maintenance of employment may have to be considered. Still more recently, it has come to be realized that at least some resource species should ideally be managed not individually but as part of an assemblage. Some fisheries, for example, inevitably take more than one species at a time, so that there is a relation between the catches. In addition, changes, due to exploitation, in the size or structure of the populations of one species, may have effects upon other resource species or indeed with other components of the living environment. In addition we must recognize that there are still major deficiencies in the conceptual understanding and the quantitative knowledge which is required for the proper management of living natural resources.

and that we should allow for this in our management procedures.

A useful summary of some of the important guiding principles can be found in a recent resolution of the General Assembly of IUCN. This enunciated the following principles:—

- “(1) the ecosystem should be maintained in such a state that both consumptive and non-consumptive values can be realized on a continuing basis, ensuring present and future options, and minimizing the risk of irreversible change or long term adverse effects,
- (2) management decisions should include a safety factor to allow for limitations of knowledge and imperfections of management,
- (3) measures to conserve one resource should not be wasteful of another, and
- (4) survey or monitoring, analysis and assessment, should precede planned use, and accompany actual use, of a resource, and the results should be available promptly for critical public review.”

The final objective, the maintenance in being of naturally occurring species and communities, raises still more acutely the question of conflicting interests and highly subjective values. Preservation of plants and of the smaller animals must generally be accomplished through preservation of representative areas of the communities of which they form part. As a general principle, this has probably wide acceptance. The associated problems are mainly of two kinds, in addition to those arising from alternative possible uses for the same areas. The first of these is the practical problem of identifying significant community types which merit preservation and locating representative and available areas for protection. The second arises from the inherent conflict between preservation and public use and enjoyment. The initial step of identification of significant environmental types and representative areas, must be undertaken in the first place by ecologists having the appropriate knowledge. However, the vital second step, acceptance by the public and administrative authorities of the need for preservation, may be seriously influenced by aesthetic and other considerations. It is, for example, much easier to obtain support for the preservation of a stretch of beautiful coastline or a forest of magnificent trees than for an uninteresting-looking patch of swamp or scrubland. Some of you may remember the Ball's Clearing incident of some 20 years ago, when an area of botanically important low-growing scrub in a recognised reserve was almost bulldozed out of existence by a well-meaning

authority with the object of reducing the fire risk to the surrounding trees, whose main botanical value was to provide shelter for the smaller community.

It is when we come to the protection of individual species that subjective values become overwhelmingly important, and the amount of interest and therefore possibility of administrative action depends greatly on the nature of the animals and plants concerned. There is no question that birds have received much the widest and most effective protection on a species by species basis. Britain, for instance, has had an effective Wild Birds' Protection Act since 1880 and New Zealand and Australia have long provided legislative protection for their native, as distinct from introduced, species. Even among birds, however, inconsistencies appear and in many countries including those mentioned above, the shooting of certain species in the name of sport is permitted, although generally closely regulated. It is not entirely clear why the Anglo-Saxon regards it as perfectly respectable to shoot anatine and gallinaceous birds but looks with contempt on the southern European who regards the shooting of passerines as a legitimate sport.

Second to the birds come the mammals, followed by the other terrestrial vertebrates with the fish and most invertebrates lagging far behind. In the last seven or eight years we have seen a remarkable growth of public interest in the marine mammals which, in the United States, has led to the enactment of a Marine Mammals Act which is probably one of the most rigorous pieces of protective legislation now in being. Under this Act it is necessary, for example, for a State government to obtain a permit from the Federal government before it can “discipline by harrassment” some sea lions to drive them away from fishermen's nets. The reasons why certain groups or species are selected by the public and governments for protection have often no basis in scientific terms, although a variety of factors may be involved. In North America recently, for example, there has been a major public outcry directed towards the cessation of the Atlantic fur seal industry, while almost no attention was paid to the Pacific fur seals. The difference in this reaction was almost certainly due to the fact that the Atlantic seals are taken as helpless blue-eyed pups, whereas the target of the Pacific industry is the large and vigorous three-year old bulls.

The title of this talk related to the role of ecologists, but I have made little direct reference to this so far. I hope, however that this analysis of some of the salient features of the recent development of popular interest in the environment, and of the problems underlying its administration will

in itself have thrown some light on the new and expanding roles of the ecologist.

The opportunities for professional employment as an ecologist have of course enormously increased in recent years. Many more ecologists are now required to form an essential part of the staff of new or expanded governmental agencies for environmental administration or research. In addition, private consulting organizations working in the environmental field have shown a marked growth in many countries. Further, many large companies engaged in mining and other activities which impinge on the environment find it wise to employ their own ecologists. To supply the recruits for this expanded market, many universities have also expanded their environmentally-oriented departments.

In simple terms a major function of the ecologist—and I am using the word in its widest sense—is to ensure that the public views and administrative actions are based on the best possible information. This should apply as a guiding principle whatever the role of the ecologist may be in the particular circumstances. Among the possible roles are:

- (a) as an investigator whose concern is to ascertain facts and develop understanding either at the basic background level or as regards a particular proposition;
- (b) as an assessor whose task is to advise an authority on the accuracy and significance of information put before it as a basis for a decision affecting the environment;
- (c) as a manager who not only has to weigh up the available information but also has the ultimate responsibility of reaching a decision based upon it;
- (d) as an advocate who draws attention to the need for a particular action relating to the environment and puts forward the information supporting that point of view.

Probably many of us find ourselves at one time or another filling one or more of these roles. When, in relation to a particular issue, our role is a single one, it is commonly not too difficult to decide what we should do, but when, as sometimes happens, we have to play more than one role on the same issue, then the internal conflicts may become more severe.

It is however probably the role of advocate which causes the greatest problems. Most ecologists would believe strongly that there are certain actions which ought to be taken in environmental matters, and that

they should play their part in bringing them about. Sometimes this desire for action is based simply on appropriate ecological knowledge as, for example, in the identification of unique and disappearing plant communities, which would have little appeal as such to the general public. Often, however, the wish for action is based to a large degree on a subjective assessment of the case. In this respect ecologists are of course no different from their brothers in other occupations. On account of their professional knowledge, however, they do have two particular problems to face which give them special responsibilities. I am not sure that all ecologists who ally themselves with support of particular environmental causes fully realize the responsibilities which lie particularly upon them on account of their professional knowledge. The first of these responsibilities is to ensure that the information upon which their case is based is fairly and accurately presented and in particular that however good their case may be it does not misrepresent any contrary arguments. The second difficulty facing a professional ecologist in advocating environmental action is a more insidious one. As I have tried to show earlier in this address, many of the problems which face us in deciding on actions affecting the environment arise from the need to balance the values to human society of a range of entirely different considerations, some of which do not directly involve ecological or biological considerations. The ecologist is for example no better equipped than the lawyer, the carpenter or the farmer, to determine whether it is better to close down a segment of the fishing industry or to run the risk that a very occasional person will suffer injury to health through excessive ingestion of mercury, or, to take another example, whether it is more objectionable to kill, in order to make fur coats, baby Atlantic fur seals than it is to kill three year-old Pacific fur seals.

To sum up, therefore, the ecologist has through his professional training and knowledge a vital role to play in contributing to the maintenance of an acceptable environment for mankind on this earth. These qualifications carry with them the responsibilities to ensure both that he uses this special knowledge in an honest and professional manner and that he distinguishes between those actions in which he is employing his special qualifications and those in which he is acting as a human being making subjective judgements on an array of considerations of which ecological knowledge may be only a small component.