

# THE PROBLEMS OF RECONCILING GEOLOGICAL COLLECTING AND CONSERVATION

*by* K. L. DUFF

**ABSTRACT.** The existing and projected threats to the continued conservation of important geological localities are shown to come from both industrial development and from geologists themselves, with the great increase in field-work activities, and commercial exploitation of scientifically valuable specimens being the main factors involved. The history and practice of geological conservation in Britain are reviewed briefly, and the various methods available to combat the threats are described. These include the production of a nation-wide inventory of geological localities, which is then used to identify alternative sites which can relieve the pressure on existing over-used ones; the production and publication of guides to these alternative sites; and an increase in physical management of geological localities by the conservation agencies.

CONSERVATION has been defined as the wisest use of natural resources, and this must be as true for scientifically valuable fossils, minerals, and rocks as it is for commercially valuable ores or fuels. Defined in this way, it is clear that conservation is not synonymous with preservation, since it clearly implies management of resources to obtain maximum benefit, and so conservation of a geological locality should not necessarily involve the imposition of restrictions on entry, but rather is concerned with finding ways to use the site in the best interests of science. At all times conservation must be realistic, and must avoid impractical policies which cannot be adequately enforced.

## THE SCOPE OF THE PROBLEM

The management problems encountered in geological conservation are manifold, and include not only those generated by geologists themselves, such as the threats posed by over-collection from, or misuse of, a locality, but also a wide range of problems over which geologists have no direct control, such as the erection of coastal defence schemes, the 'landscaping' of disused quarry workings, and the siting of industrial development. Although not strictly relevant to the matters under consideration here, brief consideration should be given to these externally generated threats, for if they are not adequately controlled, the problems of reconciling collection and conservation will become more difficult.

Development threats are, in many ways, more easily controlled than are over-use or misuse problems, since they can be dealt with through planning procedures, under which the Nature Conservancy Council in Britain has statutory powers to influence developments within Sites of Special Scientific Interest (SSSI); here, local planning authorities are legally required to consult with the Nature Conservancy Council before any planning decision is made. Since the Conservancy does not, as a matter of policy, designate a geological locality as an SSSI unless its national importance

has been clearly demonstrated, a long record of successful defences of classic geological sites has been built up, many of the cases reaching public inquiry level, such as Chesil Beach (public inquiry held in 1973), Wolston Gravel Pit (1974), Barton Cliffs (1974), Achnasheen Kame Terraces (1977), and St. Erth Pits (1978).

In comparison with the successes in combating development within important geological localities, the problems caused by geologists themselves have proved much more difficult to resolve, largely due to the lack of enforceable statutory powers relevant to problems of this kind. General interest in geology has increased greatly over the past thirty years, with a steady rise in the number of candidates for Ordinary and Advanced Level geology (Schools Council 1977), in the number of undergraduates, in the number and scope of extramural geology courses, and in the membership of geological societies, at both a national and a local level. The effects of this great increase in field-work on geological sites has been realized for many years, and the Geologists' Association *Code of Conduct for Geologists* (Stubbs 1973), based on previous field-work codes to cover the protection of plants, insects, and the countryside in general, seeks to provide detailed advice on how the field geologist can minimize the cumulative effect of over-use of localities. The problem of enforcement is, however, largely insurmountable, and in any case, the Code cannot do more than prolong the life of specific sites; it does not have any provisions for spreading the geological usage over a wider area. In addition, within the last ten years amateur lapidarists and gemmologists have become much more numerous, and although the governing body of their national society discourages bad or inconsiderate collecting practices, the same problems of enforcement apply. Finally, the greatly increased number of popular books on geology, often linked with television programmes designed to interest the layman in the subject (e.g. Muir-Wood 1978), have led to a steady increase in the numbers of collectors using classic geological localities all over the country. It is, however, necessary to bear in mind that this vast body of amateurs, at all academic levels, is as entitled to an involvement in the subject as the professional; instead of trying to prevent the amateur from pursuing his hobby, which is only likely to lead to hostility, we must try to foster an increasing awareness of the finite nature of fossils as a resource, and should seek to spread the philosophy and practice of responsible collecting.

Some of the greatest conservation problems stem from the fact that the distribution of field-work is very unbalanced and most of the load is concentrated on a few hundred sites (Black 1971). Further, the large growth in numbers of people wishing to undertake field-work has not been matched by a corresponding increase in the number of localities available for such use; on the contrary, the number of localities has remained approximately static, and the rising level of demand has come to cause serious over-use, especially of classic sites. Finally, many localities are misused, a problem which may involve either the use of a particular site by a party of an inappropriate academic level, or the excessive or unnecessary use of hammers, or both. These types of problem can be resolved by identifying and publicizing alternative localities, thereby spreading the use more widely.

Perhaps the most provocative issue at present is the greatly increased trade in geological specimens, which is now causing international concern, and has recently led to a number of well-publicized cases, such as Lesmahagow (Gittins 1977). At its

lowest level, the greatly increased commercial value of many geological specimens has led to many people becoming involved in geological collecting for financial motives, often only to discover that they cannot sell the specimens which they have gathered. In a few cases, the unwanted specimens may eventually find their way into a reputable museum, but more commonly they are merely discarded so that an irreplaceable scientific asset is irretrievably lost. At the other end of the scale is the professional dealer in geological specimens, who often operates on an international level, and uses expensive powertools to collect his carefully selected material. It is indisputable that a great many of the impressive geological specimens collected during the nineteenth and early twentieth centuries were discovered and preserved because of the activities of commercial traders or wealthy amateurs, and it is therefore apparent that commercial exploitation may have some advantages. However, as palaeontologists, we must be concerned about the scale and implications of many of these activities, since they often result in the destruction of numbers of scientifically valuable, but perhaps incomplete, unsought after, or unrecognized specimens, in the search for complete and well-preserved examples. Also, commercial dealers are often secretive about their localities, and in this way may deprive professional researchers of information concerning particular sites or their biotas. The major difficulty involved with the commercialization of collecting is obviously that of its control, a problem which has not yet been resolved.

Virtually all British geological localities are in private ownership, and control of activities such as collection rests in the hands of the landowner or occupier, who usually cannot discriminate between the rival claims of commercial collectors and professional geologists. In a legal sense, the landowner could perhaps claim that the removal of geological specimens from his land without his consent constituted theft, especially if they were then sold for commercial gain, but there do not appear to be any precedents for actions such as these. If specimens collected in this way are exported from Britain the matter becomes even more involved, since there is a possibility that customs regulations are being infringed. Again, however, this has never been tested in the courts, and so the legal position remains unclear. Control of activities of this kind might be made easier if the '1970 UNESCO Convention on the means of prohibiting and preventing the illicit import, export and transfer of ownership of cultural property' had been ratified by Britain, but even if this were the case, very great problems of enforcement would still have to be overcome.

This *laissez-faire* attitude leads naturally to the attitude taken by many geologists towards field-work. There seems to be an assumption amongst some geologists that they have a 'right' to go anywhere and collect anything, without the need to obtain prior permission from landowners. This is especially true of disused quarries, upland areas, stream sections, and cliff sections, where most geological field-work is based on tacit trespass. In an increasing number of cases, alienation of the landowner results, and whilst this has not been an unfamiliar problem in farming areas (Dineley 1973), it is now appearing elsewhere, especially since the introduction of the Health and Safety at Work Act in 1974 (Schools Council 1977, p. 63). Many councils are now aware of the dangers to the public posed by lengths of sea cliff within their district, and some are considering means of controlling not only access to the beaches at their foot but also the activities of geologists on the cliffs themselves. For example, in

Dorset, a working party set up by the County Council has recommended to the District Councils that they should introduce by-laws to control large-scale *in situ* extraction of material from the cliffs, through some form of licensing procedure. However undesirable this may appear, it is considerably better than the introduction of restrictions completely prohibiting collecting from the cliffs, which appeared to be the other alternative.

#### PRACTICAL METHODS FOR IMPROVING THE SITUATION

The need for a national policy to conserve features of geological importance in Britain was first recognized in 1945, with the publication of the Report of the Geological Subcommittee of the Nature Reserves Investigation Committee, set up in 1944. The Subcommittee consisted of six eminent geologists, assisted by another fifty local geological advisers, and their report pointed out that 'the foundations of geological science were laid largely by investigators in this country, and that it was important that the evidence upon which their conclusions were based should be preserved for the benefit of students for all time'. The Report included a list of 390 Geological Reserves in England and Wales (Scotland was omitted from their considerations), and constituted the first attempt at systematic geological site conservation in Britain. Similar investigatory bodies had been established to look into the need to conserve features of biological importance in Britain, and as a result the Nature Conservancy was established by Royal Charter in 1949, as the government agency responsible for promoting a national policy for nature conservation, to include geology and geomorphology. For the first ten years of the Conservancy's existence, geological sites were added to the Geological Subcommittee's list largely on an *ad hoc* basis, although the scientific integrity of each site was assessed by consultation with acknowledged experts before it was accepted for conservation. In the early 1960s systematic revision of geological sites was begun, and continued as the principal means of improving the coverage until superseded in 1977 by the work now being undertaken as part of the *Geological Conservation Review*. This work (Black 1978*b, c*), which forms a companion volume to the biological *Nature Conservation Review* (Ratcliffe 1977) will identify those localities in Britain whose conservation is essential for the continued prosecution of geological education and research, the localities being of national or international significance to the earth sciences, and will form the basis for practical geological conservation in Britain in the future. As with the *Nature Conservation Review*, the *Geological Conservation Review* will define fully the criteria used in site selection, although these have previously been published on several occasions (Black 1976, 1977, 1978*a*). Once these key localities have been thus identified, it will be possible to channel considerable resources into their physical conservation.

Having identified the key localities for conservation, and isolated the main geologist-induced factors causing damage to them, it becomes apparent that the greatest problem involves the concentration of collecting activities on a small number of vulnerable sites. Since this state of affairs is due largely to the paucity of information on alternative localities, it is clear that one of the most effective ways of alleviating this difficulty is by undertaking survey work to identify alternatives to the heavily over-used key localities.



*Surveys to identify alternative localities*

Preliminary investigations carried out by the Nature Conservancy Council in 1975 suggested that there are likely to be approximately 100 000 geological sites in Britain which could be used for teaching and collecting, but that the bulk of the teaching load was falling on perhaps as few as one thousand of these. Since it was clear that the Conservancy lacked the resources to carry out a site recording project of this size 'in house', they worked in concert with the Geological Curators' Group to set up a national site recording scheme which later received grant-aid from the Nature Conservancy Council. The National Site Documentation Scheme was instituted in 1976 (Gittins 1977; Cooper 1978) and is seen as being of threefold benefit to the national conservation problems caused by site over-use. Firstly, it will identify existing geological localities in all parts of the country, many of which are not currently well known, and will thus represent an invaluable source of information on British geology. As a result of the vast store of information which is collected, it will become one of the most potent means of selecting the additional localities which will need to be made available for teaching and collecting, if the existing pressure on well-known localities is to be reduced. It will also provide local museums and societies with the information that they can use to fight for the continued existence of any sites of local or regional importance which may become threatened by development. Secondly, it provides the information which is essential if new geological guides are to be written and published. This is necessary as a means of giving maximum publicity to the 'new' sites identified by the various surveys being undertaken, as there is little likelihood that the field-work pattern can be radically changed unless leaders are given all the new information which they will need to help them plan new itineraries, in a readily accessible form. Thirdly, the scheme will provide all the information necessary to document the network of regionally and locally important localities which form an integral part of the field-work pattern, and are a very necessary corollary to the nationally and internationally important localities identified by the *Geological Conservation Review*.

Once the information on all the localities within a particular area has been collected, it must then be used, in the best ways possible, to open up new possibilities for field-work. A very effective method of operation would be for the local records centres, who are collating the information on geological localities in their areas, to act as regional co-ordinators functioning as 'clearing houses' for parties or individuals wishing to visit a particular area. Under this scheme, the intending visitors would first contact the records centre for that area, indicating how long they wished to stay, what they wished to see, and the academic level of the party; the records centre would then suggest specific localities, bearing in mind the vulnerability of each particular site and the amount of usage which it had been receiving.

In addition to its support for the GCG scheme, the Conservancy is also conducting experimental recording projects, largely being undertaken by schools in various parts of the country, as an attempt to develop better methods of data collection, which will be most useful to the solution of conservation problems. One of the aims of this scheme is to assess how far schools can make better use of their local geological resources so that they undertake a greater amount of local fieldwork, and rather less

in classic, but more distant areas. Additionally, the identification of specific alternatives to particular over-used sites, especially those publicized in various geological guides, is now being promoted, both by schools and by extramural geology classes.

#### *Guides to publicize alternative localities*

As noted above, 'alternative guides' are essential if the pattern of field-work is to be substantially altered, and will depend entirely on suitable alternatives to vulnerable sites being identified by the various types of survey. Ideally, the guides should seek to provide a series of alternatives to a number of over-used sites, so that the newly inspired use is spread over a number of localities, rather than merely being transferred to another single site. In many cases possible alternative sites may require a certain amount of clearance work to be done on them before they are usable, but this should not be a major difficulty, since the Nature Conservancy Council can usually provide financial support for conservation schemes of this sort. Indeed, their own Mortimer Forest Geological Trail (Lawson 1977) is an example of a trail consisting completely of previously overgrown localities which were cleared to provide an alternative to many of the heavily over-used sites in the Ludlow area. Similar projects have been undertaken elsewhere, either by the Nature Conservancy Council itself, or by other conservation bodies, such as the Derbyshire Naturalists Trust (Duff 1978a). The provision of similar facilities in the future is likely to become one of the major growth areas in geological conservation.

#### *The control of collecting.*

In the present circumstances, where the great majority of geological localities are privately owned, there are few practical ways in which widespread restrictions on collecting can be either imposed or enforced, and the most effective widespread approach must be to promote a widespread awareness of the great damage which can be caused by over-collecting. Private collectors must be made aware of the help that museums can offer to them and if they can be convinced of the value of depositing specimens in museums, the current situation will be much improved. Further improvement can be achieved by collectors presenting unwanted specimens or collections to local museums or schools, thus ensuring that a finite resource is properly used. The actions of the London Brick Company, who ensure the productive use of many fossils collected by their staff from their pits by donating them to schools or museums, is an excellent example of such a practice.

The activity of the commercial dealer is virtually impossible to control at present, bearing in mind the lack of legal restrictions and the lack of localities under the control of the conservation agencies. Even the provision of alternative sites is not likely to alleviate this particular problem, since the dealer knows what he wants, and usually knows where to get it; he is not likely to be diverted elsewhere unless he can see in this a positive commercial advantage. One possible means of control would be to improve liaison with site owners in an attempt to get them to control access to particularly vulnerable localities. However, this would place a great responsibility on the site owner, who would have to decide who should be allowed to visit the site, thus amounting to the introduction of the licensing procedure, to which so many geologists

strongly object, in a piecemeal fashion. A far better system would be for the conservation agencies to negotiate management agreements with the owners of particularly vulnerable sites, so that the practical control of geological activities becomes their responsibility. If this were done, it would be possible to strengthen security arrangements, initiate and enforce a strict permit system of collecting, and undertake physical activities to protect the vulnerable parts of the site from illicit activities. This whole system would be based on the philosophy that certain specified sites are suitable only for the attention of accredited research workers, and not for the general public or interested amateur. In such cases, most conservationists feel that if the resource is strictly limited, and of great scientific value, it is their responsibility to ensure that that resource is properly used, and they must therefore be prepared to accept the criticism of those people wishing to make an inappropriate use of that resource.

The activities of the commercial dealers are often more difficult to control in view of their sophisticated equipment and great determination. Since it is unlikely that punitive sanctions would work effectively against the established commercial dealers, the need to undertake active management of the most vulnerable sites becomes more pressing, and is likely to be the most effective means of long-term control. In the meantime, geologists should consider the possibility of refusing to trade with such dealers (Duff 1978*b*), although this itself is problematical, if dealers offer material from classic localities for sale, and purchase is necessary to prevent export. As noted above, the current situation regarding customs regulations is currently under investigation by the Nature Conservancy Council, and it may well be that adequate control mechanisms can be shown to already exist. If this is the case, then the Conservancy will take appropriate action to ensure that the regulations are properly enforced.

The question of the ratification of the 1970 UNESCO Convention is more involved. Since so many of the problems concerning the export of scientific objects involve the ethics of establishing and conserving museum collections, the museums have an obligation to raise the problem to national prominence, so as to ensure that the matter is receiving proper consideration at all levels. The recent publication of several articles in the national press concerning commercial exploitation of geological sites, has served to whet public interest in this matter, and the time would appear to be ripe for more concerted action from geologists themselves.

Notwithstanding the courses of action at present being undertaken, which will inevitably take time before they can become fully effective, the whole problem of over-collection and site misuse will only be solved when every person engaged in field-work has developed a full and sincere appreciation of the adverse affects of site over-use, and every collector realizes that he is ultimately answerable to his own conscience for his actions. This is likely to take a considerable time to achieve, and at present it is therefore all the more essential that no geologist shirks his responsibilities for passing these sentiments on to students, for only in this way can we hope to stem this serious threat to our geological heritage.

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## DISCUSSION

*C. T. Scrutton.* One of the things that worries me is the publication of new locality information as a result of research. When one discovers new localities that might be particularly rich, and eventually publishes the details, before too long the locality can be completely worked out. I have experienced a number of problems of this kind so what I do is not to publish detailed locality maps but lodge them in a museum or similar archive. It is normally sufficient to publish just the main essentials, although in some cases even that may be too much.

*K. L. Duff.* I think that perhaps one of the more effective courses of action at present would be to make better use of the British Library system for depositing data, and to deposit locality details there rather than publish them in the normal way. Admittedly the details may still be retrieved if a collector is sufficiently determined, but short of absolute secrecy, there would appear to be few alternatives. There are certainly precedents for not revealing vulnerable localities (e.g. Cope 1977), but if carried to extremes this would amount to scientific censorship and could lead to the possible suppression of research by 'opposing' workers.

However, most geological localities are privately owned, and are likely to remain so in the foreseeable



future, and there are thus no legally enforceable means of preventing exploitation of these sites. For this reason I believe that, at least in the short term, the answer must lie in a more circumspect method of publishing locality details, although a satisfactory means of achieving this does not yet appear to exist.

*D. L. Bruton.* I think that this raises a problem since under international rules one is obliged to give a type locality when establishing new taxa. A colleague of mine in Norway had a synopsis published recently in the *Mineralogical Magazine* to the effect that type localities should be given, and he has received abuse ever since. In this case a particularly valuable locality was made known and a party from Germany arrived in a helicopter to collect, with the result that the whole locality disappeared. The problem is thus of international proportions. I am worried that every list or record of localities that is published increases the threat to them.

*K. L. Duff.* This is already an international problem, and is well recognized as such by the conservation agencies in Britain and overseas. It is not the Nature Conservancy Council's intention to make the locality details in the *Geological Conservation Review* generally available, since we are well aware of the misuse that this would undoubtedly cause. I think it is also true to say that many of the sites to be included in the *Review* are already well known, and so what is needed in the long term is not restrictions on publication of information, but rather restrictions on collection, commercial sales, and export of important material. We are currently looking into means of improving the practical conservation management of localities, but in addition to this, there is a need for legislative provision to control the commercial exploitation of scientifically valuable specimens. I believe that the geological institutions in this country have a responsibility to bring the scope and implications of this problem to national prominence, and urge that appropriate means of control be introduced.

*M. F. Stanley.* Dr. Duff has mentioned the National Scheme for Geological Site Documentation, which aims to locate alternative sites in Britain by an extensive programme of documentation. The setting up of Geological Locality Record Centres is well under way but they are based at provincial museums. The national museums, although holding much locality information, have as yet done little. Perhaps they could redistribute some information.

*D. A. Bassett.* This point is very valid but I think it is premature at present to single out any one group such as national museums. A conservation group is currently looking into the feasibility of holding a conference on conservation in about a year's time, and after that we can try to decide what to do about the problems.