

Ecologists at work in the Cairngorms

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Mountain plant ecology is a subject which cannot escape the attention of members of the Cairngorm Club. After all, they walk on plants, sit on them at lunch time, look them in the eye when ascending the steeper slopes, even – perhaps – grab them in emergencies. That mountain plants are different from those of the lowland is an elementary fact to most members, who are – or ought to be – better acquainted than the average man with the environment in which these plants have to live. Indeed, walkers and climbers in the hills have all shared with the arctic-alpine flora the conditions of low temperature, rain, mist, ice and snow, which characterise the habitat. They have rejoiced in the sun and warmth of the growing season but have had occasion to be painfully aware of its shortness. Only when it comes to the many days of hibernation under a protective blanket of snow, do we encounter an aspect of the environment of which – it is hoped – Club members have little personal experience.

To suggest, then, that not enough is known about the plant ecology of our mountains could almost be taken as an insult, and if it seems insulting to the mountaineer, how much more so to the amateur or professional botanist! For years, mountain plants seem to have had a place of honour amongst botanists – so much so that the unfortunate flowers have sometimes been hard put to it to survive their attentions. Their very rarity placed a kind of scarcity value upon them, so that devotees expended vast energy in efforts to locate them. Fortunately for their continued existence, however, records and photographs are nowadays regarded as sufficient reward, and the collector's specimens of rare plants are happily largely a thing of the past.

None the less, a valuable outcome of all this activity over the years is that the distribution of some of these plants has become so well known that every locality in which they occur can be charted with accuracy and confidence. Indeed, the painstaking searches of generations of naturalists have provided the foundation of facts upon which is based part of the case for establishing the largest of Britain's National Nature Reserves in the Cairngorms. There is ample evidence that the area contains a remarkable variety of those plants, birds and other animals which are most characteristic of British uplands, and which – because of their specialised requirements – occur often in small numbers and few localities. Who can doubt that one of the functions of a

Nature Reserve is to recognise a situation of this kind and to provide for the protection and preservation of this special flora and fauna?

All this is as it should be, and yet at the same time it is by no means the whole story. In addition to harbouring a number of rather unusual plants and animals, the Cairngorms as a whole constitutes an area of the highest scientific importance; and this provides another and equally important justification for retaining as much as possible as a Nature Reserve. Admittedly, as propaganda on behalf of conservation this may seem less promising, to many people, than the simpler idea of a wild-life sanctuary. So it is perhaps relevant to make an attempt to dispel the notion that the scientific interest of an area like the Cairngorms concerns only a minority of specialists.

Walking over the high plateaux, it may not be too easy to see at a glance why scientists should be moved to expend the considerable effort necessary to undertake research at these altitudes. Inspiration derived from the grandeur of the scenery is hardly a sufficient motive. Nor is there a great deal of easily visible evidence of research programmes in progress: the mountains could scarcely be described as cluttered with busy scientists, or even with marker posts or little enclosures labelled 'keep out'. None the less, these things can be seen if one knows where to look, though they are not the only manifestations of active research. Investigations are indeed in progress in the Cairngorms, although there is still much to be done.

The point is that while the distribution of mountain plants has received much attention, there is all too little understanding of the reasons why they occupy these inhospitable environments. Most of what we know about the processes of plant growth has been discovered from studies in temperate or tropical conditions. Adaptations which enable plants to survive in mountain or polar environments are virtually unexplored. Apart from filling gaps in our understanding of the natural world, the solution of this kind of problem may have far-reaching implications in terms of extending the range of crop plants in severe climates, increasing frost-resistance, and other useful developments.

Some examples of ecological research programmes, either recently or currently in progress in the Cairngorms, may serve to illustrate a few of the wide range of problems available for investigation. In one recent project the aim has been to measure the amount of plant material produced each year by the natural vegetation at high altitudes, in a selected study area on Beinn a'Bhuird. This has contributed a link in a grand chain of similar measurements being made on all kinds of

vegetation in localities ranging from the equator to sub-polar regions and from sea-level to high altitudes, under the auspices of the International Biological Programme. It was of course, no surprise to find that, because of low temperatures, a short growing season, and other unfavourable factors, the rate of production by vegetation growing at 3,000 feet in the Cairngorms is not as great as in nearby lowlands. The surprise was that the difference proved to be very much less than expected. This was particularly evident when the performance of one species in particular – heather – was compared at low and high altitudes, showing that this plant does quite remarkably well when growing close to the upper limits of its range. It is evident that, under natural selection, certain compensatory mechanisms have come into play both in the form and physiology of the plants of high altitudes, and here is a wide field for future research.

To take another topic, work has just been started on the stabilising effects of mountain vegetation. In the past, the large-scale geomorphology of the Cairngorms has been described and interpreted in relation to processes of glaciation. Also the main types of plant community have been classified. The geographer's interests are now turning to the smaller-scale processes which are continually at work at high altitudes: rock weathering, movement of gravel and sand by wind and water, scree and terrace formation, and the development of small scale stripes and patterns by cycles of freezing and thawing. At the same time there is increasing realisation of the role of vegetation in landscape-development, and of its effects on the small scale geographical processes. So another line of research is concerned with correlating plant community-type with terrain, and measuring surface movement in sites occupied by different kinds of vegetation cover as well as those where cover is incomplete or lacking. This is one of the studies involving small forests of markers, apparatus to trap moving gravel and sand, and other equipment: but most hill walkers are unlikely to encounter them for they are deliberately inconspicuous! Among the objectives here is to assess the firmness of anchorage of the vegetation and the coherence of its cover, and to relate these to its surface-stabilising properties.

This type of study leads naturally to the investigation of erosion. Erosion is a natural process occurring all the time at high altitudes, but it is greatly intensified by the passage of many feet. Hence it has become a serious problem in the neighbourhood of the Coire Cas chair-lift, where the use of heavy machinery and building operations have added to the difficulties. Perhaps the more alarmist prophecies

are exaggerations, but the fact remains that there are ugly scars on the slopes, while the deterioration of vegetation in the more frequented areas up to and beyond the summit of Cairn Gorm is all too obvious. This has been the subject of research by members of the Nature Conservancy staff, who have also been called on for advice in connection with experiments on reseeding denuded slopes. These have met with considerable success.

Another extensive field of research concerns the major type of land use in the Cairngorm area – deer management. The sport of deer stalking provides an important source of revenue on the large estates, but until recently little has been known of the relationships between the deer population and their food resource – the vegetation. This subject – for which the American title ‘range ecology’ has been borrowed – is now a major concern of the Nature Conservancy’s research staff. On a selected estate, the size of the deer population is being measured and levels of control suggested, while at the same time detailed analysis of changes in the vegetation is being carried out.

This study offers an opportunity for ecologists to assess the impact of a system of land use which operates over much of the Western Highlands of Scotland. The signs are that certain aspects of management have in the course of many years contributed to deterioration of the habitat. Experiments have been designed to investigate means of upgrading the quality of the grazings, and of approaching a balance between the numbers of deer and the carrying capacity of the ground. The objective is a sustained improvement in the standard of animals in the herd, combined with conservation of the environmental resources.

Another aspect of this problem is that it has become increasingly evident that deer are in many instances responsible for the failure of regeneration in the surviving fragments of native pine forest, and even for progressive reduction in the amount of juniper scrub. These types of vegetation, formerly widespread in the Cairngorm area, contribute greatly to the scenic and wild-life interest of the region. Furthermore, it may be held that among the functions of a Nature Reserve is the maintenance – or even re-establishment – of examples of native vegetation types. Hence, research on the means of achieving a degree of expansion of natural pine and juniper woodland, in some sort of balance with a controlled deer population, is clearly important.

All these, and more, are topics in which there is opportunity for research in the Cairngorms. Research carried out mainly in other upland areas is also relevant to problems of land management in the

Cairngorms. For example, the management of upland grazings for hill sheep has been intensively studied in other parts of Scotland by the Hill Farming Research Organisation, and in Wales; while there has been a long series of investigations on the ecological implications of heather burning on grouse moors. There is scope for new work on the role of hill cattle in the mountain ecosystem, and their balance with the vegetation. The effects of commercial afforestation also require more detailed study.

These studies will find their applications not only in Scotland, but very generally in the upland districts. Management policy in the upland areas of Britain is bound to undergo change in the coming years, and it is of the utmost importance that new developments should rest on sound ecological principles.

Ecological research requires not only study areas for intensive research where the scientist is in full control of management, but also larger territories where, in co-operation with owner or manager, the long-term changes can be followed. This is one facet of the importance of the Cairngorm National Nature Reserve which can accommodate the interests of mountaineers, walkers, and skiers, as well as scientists. A Nature Reserve does not, except in rare cases and small areas, demand the exclusion of the public. What it does demand is the sympathy of the public, and this is perhaps best achieved by showing that a Reserve offers scope for scientific studies which can be of interest and significance, not only to a minority of specialists, but to everyone.

