# Recording and the declines of the Nationally Scarce plants Ajuga pyramidalis L. and Melampyrum sylvaticum L.

# T. C. G. RICH

## 67 Heol Uchaf, Rhiwbina, Cardiff CF14 6SR

and

## C. SYDES

Scottish Natural Heritage, 2 Anderson Place, Edinburgh EH6 5NP

### ABSTRACT

An assessment of the reasons for decline of the Nationally Scarce plants *Ajuga pyramidalis* and *Melampyrum sylvaticum* was carried out by revisiting pre-1970 sites listed in the Scarce Plants Database. 17% of the records were erroneous. Inadequate original information probably accounted for failure to refind another 25% of the records. Excluding these records, 25% of *Ajuga* and 33% of *Melampyrum* pre-1970 sites were refound. Loss of habitat has probably accounted for declines in 25% of *Ajuga* sites and 66% of *Melampyrum* sites. In 50% of the *Ajuga* sites suitable habitat was still present but plants were not refound. Real decline has occurred in both species, but the degree of change was masked by the problems of recording.

Keywords: conservation, botanical records, habitat loss, Lamiaceae, Scrophulariaceae.

## INTRODUCTION

Nationally Scarce species are those which occur in 16–100 hectads (10-km  $\times$  10-km squares) in Britain, and are of concern to conservationists as the second rarest group of species in the British flora after the Red List species. Despite protection measures, local populations of rare and scarce species are still liable to extinction, but the greatest loss of biodiversity has occurred, and appears still to be occurring, amongst common but evidently vulnerable taxa (Sydes 1997). Between 1990 and 1993 a review of the Nationally Scarce vascular plant species was carried out (the Scarce Plants Project), with a main aim of creating a computer database (Stewart *et al.* 1994). The resulting Scarce Plants Database records were used to revise the list of Nationally Scarce species, update distribution maps and assess changes in the frequency of species, and the results were presented in *Scarce Plants in Britain* (Stewart *et al.* 1994).

The Scarce Plants review indicated that a number of species are declining rapidly, as judged either from the high proportion of pre-1970 records shown on some maps, or the high percentage of the post-1970 records compared to the records on the maps in the *Atlas of the British flora* (Perring & Walters 1962). For instance, species such as *Ajuga pyramidalis* L., *Betula nana* L., *Carex maritima* Gunnerus, *Melampyrum sylvaticum* L., *Mertensia maritima* (L.) Gray, *Meum athamanticum* Jacq. and *Saxifraga nivalis* L. are species which are fairly widespread in Scotland but have significant numbers of pre-1970 records in Stewart *et al.* (1994). The causes of these declines are not always clear, especially where they occur in the remoter parts of Scotland, and might be attributable to natural metapopulation dynamics, under-recording, habitat change, or combinations of the three. It is valuable to have some estimate of the relative importance of these factors when assessing priorities for conservation, so as to concentrate on species whose habitats are declining and not waste resources on species simply under-recorded.

To investigate the reasons for the large apparent declines in these seven species, in 1995 Scottish Natural Heritage (S.N.H.) commissioned field work to revisit pre-1970 sites and assess possible reasons for loss of sites. Of these species, the changes in *Ajuga pyramidalis* and *Melampyrum* 

## T. C. G. RICH AND C. SYDES

*sylvaticum* were quantified in the most detail, including searches for historical herbarium and literature records to provide additional background information. They provide good examples of the balance between decline and under-recording of species which occur in remote areas (e.g. *Ajuga*) or are difficult to identify (e.g. *Melampyrum*). The aim of this paper is to summarise the results of the work; full details are given in Rich *et al.* (1996).

#### METHODS

For both species, ten pre-1970 sites with known 1-km square or 6-figure grid references were selected from the Scarce Plants Database to give a wide geographical spread in Scotland. Sites with known 1-km squares or 6-figure grid references were selected to maximise the chances of refinding the original site as many old records are vague and may not even be localised to a hectad. *Ajuga pyramidalis* is widespread on the Inner and Outer Hebrides from which recent data are particularly lacking, but these islands had to be excluded on the grounds of cost. Remote upland sites for *M. sylvaticum* were also excluded for safety reasons. As there are few detailed pre-1970 records for *Melampyrum*, a number of sites had to be taken as 'best guess' 1-km squares (e.g. 'Falls of Clyde' was taken to be NS/88.41). In addition, recorders visited three known post-1970 sites to familiarise themselves with the species and their habitats, selected from personal knowledge or where there were 6-figure references in the Scarce Plants Database. A few additional sites were also investigated for both species.

The sites were visited during late June and July 1995, and the full 1-km square searched as far as was practicable, concentrating on the most appropriate habitats. A wider area was searched where the previous record was not clearly defined. Where the plants could not be refound, the field workers assessed whether the plant was likely to have gone or not from the presence or absence of suitable habitat. Most *Melampyrum* sites were surveyed by R. FitzGerald, often with the help of the B.S.B.I. v.c. Recorders; the Ben Hiel site was surveyed by P. A. Smith. G. M. Kay surveyed *Ajuga pyramidalis* sites. The areas searched and locations of extant populations were indicated on 1:25,000 maps. Where populations were not refound, notes were made on the likely causes for loss or lack of re-discovery, and further enquiries were made about the locality from the original recorder, if they could be traced.

Historical data from specimens in **BM**, **BRISTM**, **E**, **GL**, **GLAM**, **K**, **LIV**, **MANCH** and **OXF** (abbreviations follow Kent & Allen 1984) were abstracted. A literature search of records in the floras and journals held in the libraries at Kew and the Natural History Museum was carried out, with additional references traced in *BSBI Abstracts* and Simpson (1960).

## RESULTS

The results of the field survey are given in Tables 1 and 2, and are summarised in Table 3. Erroneous records in the Scarce Plants Database, where either the species or grid reference was wrong, are believed to be responsible for failure to find one *Ajuga* (9%) and three *Melampyrum* (23%) pre-1970 sites (17% overall). In addition, insufficiently detailed original information was thought to account for lack of discovery in another two of the *Ajuga* (18%) and four *Melampyrum* (30%) pre-1970 sites (25% overall).

Excluding these sites, plants were refound in two of the pre-1970 *Ajuga* sites (25%), and two of the pre-1970 *Melampyrum* (33%) sites (29% overall). Habitat change probably accounted for losses at two *Ajuga* (22%) and four *Melampyrum* (50%) pre-1970 sites (35% overall). One of the *Ajuga* sites appeared still suitable but plants could not be found after an extensive search indicating they may have disappeared perhaps by chance demographic events, but some were found in a new site nearby. Plants were not refound in the other pre-1970 sites either because they have disappeared or because they were over-looked. One post-1970 site with 6-figure grid reference was not refound for one of these same reasons.

166 (41%) historical records additional to the Scarce Plants Database were found for both species (Table 4), which provided valuable additional information about distribution and ecology, especially for *M. sylvaticum* where a number of specimens had been wrongly named (data not presented; see Rich 1997; Rich *et al.* 1998; 1999).

Site	Grid reference Last record Refound in 1995? Comments				
Loch Call an Uidhean	6-figure	1992	Yes	-	
Torr Achilty	6-figure	1992	Yes	-	
SW of Clais nan Cruineachd	6-figure	1991	Yes	-	
Traigh an T-Straithain	1 km	1988	Yes	Wrong grid reference in database	
Creag na Faollinn	1 km	1967	No	Not refound, possibly still present	
Aird a' Chuilinn	1 km	1964	No	Wrong grid reference in database	
Rhigolter/An Fhireach	1 km	1964	No	Not refound, possibly still present	
Sanna Bay	6-figure	1964	No	Not refound, possibly gone	
Creag Clais nan Cruineachd	6-figure	1961	No	Not refound	
Clais nan Cruineachd	1 km	1961	Yes	Possibly a different site	
Cnoc na Stri	6-figure	1961	No	Inadequate information, later found to be inaccessible site on cliff	
Deadh Choimhead	1 km	1961	No	Inadequate information, later found to be inaccessible site on cliff	
Clashnessie	1 km	1954	Yes	Two sites present	
Loch Buine Moire	1 km	1952	No	Possible gorse invasion caused loss	
Thurso	6-figure	1916	No	Not refound, possible gorse invasion or agricultural improvement	
Sanna Bay	-	New site	-	Near old record	

# TABLE 1. RESULTS OF 1995 FIELD SURVEY FOR AJUGA PYRAMIDALIS

# TABLE 2. RESULTS OF 1995 FIELD SURVEY FOR MELAMPYRUM SYLVATICUM

Site	Grid reference	Last record	Refound in 1995?	Comments
Birks of Aberfeldy	6-figure	1992	Yes	-
Allt Doe	6-figure	1984	Yes	-
Glen Buck	6-figure	1971	No	Confused information, actual site not visited
Loch Ossian	1 km	1958	Yes	Biggest population found
Linn of Corriemulzie	1 km	1957	No	Grazing damage
Ballater Bridge	6-figure	1955	Yes	Now densely shaded
Reekie Linn	1 km?	1950	No	Dense woodland and agricultural runoff may have caused loss
Struan, River Garry	6-figure	1949	No	Forestry caused habitat change
Roy Bridge	1 km?	1896	No	Possibly inadequate information
Blackhall Woods	1 km	1871	No	Forestry caused habitat change, but imprecise original record
Den of Airlee	1 km	1846	No	Imprecise original site, now densely shaded
Glen of Reichip	1 km?	1821	No	Possibly inadequate information, site now densely shaded
Ben Hiel - Ben Loyal	6-figure	Undated	No	Probable error for M. pratense
Falls of Frenich	1 km?	Undated	No	Possibly inadequate information
Falls of Clyde	1 km?	-	No	Error for M. pratense
Rowardennan	1 km	-	No	Error for <i>M. pratense</i>

295

## T. C. G. RICH AND C. SYDES

	Melampyrum sylvaticum	Ajuga pyramidalis
Pre-1970 sites		
Sites refound in 1995	2	2
Sites not refound but possibly still present	2	5
Probable loss due to habitat change	3	2
Incorrect/inadequate information	3	1
Erroneous record	3	1
Post-1970 sites		
Sites refound in 1995	2	4
Sites not refound	0	1
Incorrect information	1	1
New sites	0	1
Total sites investigated	16	16

# TABLE 3. CLASSIFICATION OF RESULTS INTO CATEGORIES RELATED TO RECORDING

# TABLE 4. NUMBERS OF RECORDS IN SCARCE PLANTS DATABASE AND ADDITIONAL RECORDS TRACED AFTER CORRECTION FOR DUPLICATES AND ERRORS

Species		Scarce Plants Database	Additional records traced	Total records
Ajuga pyramidalis	Total no. records	330	31	361
5 6 1 5	Pre-1970 hectads	37	2	39
	Post-1970 hectads	53	0	53
Melampyrum sylvaticum	Total no. records	70	135	205
	Pre-1970 hectads	22	26	48
	Post-1970 hectads	21	1	22

## DISCUSSION

Assessing the causes of the declines in *Ajuga* and *Melampyrum* was complicated by the problems of recording and lack of detailed information. 13% of the records in the Scarce Plants Database were found to be erroneous. Inadequate original information probably accounted for failure to refind another 17% of the records. Where we were able to trace the original recorders, they kindly provided valuable information about the records which would have been useful in the field, such as occurrence on cliffs or the accuracy of the grid references. Similarly, the work on historical records in herbaria and the literature provided valuable information. It is recommended for similar projects in the future that this original information be obtained prior to commencing field work.

*Ajuga pyramidalis* and *M. sylvaticum* were refound in 29% of the pre-1970 1-km squares overall (Table 3). Suitable habitat was still present in a further 29% of the squares overall, and we may have over-looked the species in some of these sites. Searching the pre-1970 sites thoroughly is very difficult, especially when they are as large an area as a 1-km square, and both species can be difficult to find. *A. pyramidalis* tends to occur in very small, scattered populations, and localities on cliffs are difficult to search adequately or safely. *M. sylvaticum* is also usually found in small, discrete populations, often in steep, wooded ravines where access is difficult. It is always difficult to be certain that a species has gone from a site. Nevertheless, ecological theory suggests that populations can be expected to become extinct on some sites for a variety of reasons including natural metapopulation dynamics.

Habitat change (e.g. scrub invasion, forestry) has probably accounted for loss of 22% of the *Ajuga* pre-1970 1-km squares (Table 1), and 50% of the *M. sylvaticum* squares in eastern Scotland (Table 2). Further discussion of the causes of the declines in these species are given in Rich *et al.* (1999) and Rich *et al.* (1998) respectively. It is concluded that both species have declined, but the true extent of decline was masked by the problems of recording.

The data recorded for rare species have become more detailed in recent years. The range of species recorded in this way should be broadened and the quality of information enhanced so that conservation resources do not have to be diverted into checking data when the Scarce Plants in turn become rare. The resource of historic records in Britain's herbaria is under-utilised and could greatly extend our knowledge of past change.

### ACKNOWLEDGMENTS

We would like to thank those who gave access to land or helped with the field work or information: Penny Angold, Elaine Bullard, Kathy Fallowfield, Ro FitzGerald, Sam Hallet, Barbara Hogarth, Graeme Kay, Peter Macpherson, Douglas McKean, Henry Noltie, Fred Rumsey, Alex Scott, Ros Smith, Edna Stewart, Neale Taylor, Agnes Walker, Keith Watson, Phyllis White and Peter Wortham. We would like to thank the Keepers of **BM**, **BRISTM**, **E**, **GL**, **GLAM**, **K**, **LIV**, **MANCH** and **OXF** for access to the herbaria and libraries, and an anonymous referee for suggesting improvements to the manuscript.

The work was funded by Scottish Natural Heritage, contract SNH/001G/95 IBB.

### REFERENCES

KENT, D. H. & ALLEN, D. E. (1984). British and Irish herbaria. Botanical Society of the British Isles, London.

PERRING, F. H. & WALTERS, S. M. (1962). Atlas of the British flora. Thomas Nelson, London.

- RICH, T. C. G. (1997). Using botanical records to interpret changes in frequency of British plants. *The Biology Curator* 10: 8–12.
- RICH, T. C. G., FITZGERALD, R. & KAY, G. M. (1996). *Review and survey of scarce vascular plants. 3 volumes.* Unpublished contract report to Scottish Natural Heritage.
- RICH, T. C. G., FITZGERALD, R. & SYDES, C. (1998). Distribution and ecology of Small Cow-wheat (*Melampyrum sylvaticum* L.; Scrophulariaceae) in the British Isles. *Botanical journal of Scotland* 50: 29– 46.

RICH, T. C. G., KAY, G. M., & SYDES, C. (1999). Distribution and ecology of Pyramidal Bugle (Ajuga pyramidalis L.; Lamiaceae) in the British Isles. Botanical journal of Scotland 51: 181–193.

SIMPSON, N. D. (1960). A bibliographical index of the British flora. Privately published.

- STEWART, A., PRESTON, C. D. & PEARMAN, D. A., eds. (1994). Scarce plants in Britain. Joint Nature Conservation Committee, Peterborough.
- SYDES, C. (1997). Vascular plant biodiversity in Scotland, in FLEMING, U. V. & USHER, M. B., eds. Biodiversity in Scotland: status, trends and initiatives, pp. 89–104. The Stationery Office, Edinburgh.

(Accepted January 2000)