

Conservation of Britain's biodiversity: *Hieracium asteridiophyllum* and *H. cillense* (Asteraceae)

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ABSTRACT

Hieracium cillense and *H. asteridiophyllum* are very rare endemic Welsh hawkweeds confined to limestone cliffs in and around Craig y Cilau National Nature Reserve, Llangattock, Brecon (v.c. 42). In June 2000 surveys were carried out of their entire populations to assess their requirements for conservation. 659 plants of *H. cillense* were found; 396 plants in the N.N.R., and 263 in a new extension of the population to the east. 512 plants of *H. asteridiophyllum* were found; 296 plants in the N.N.R., and 216 mostly in a new extension of the population to the east. Compared with population sizes in the N.N.R. in 1975, more plants of *H. cillense* were found and fewer of *H. asteridiophyllum*; the differences are probably due to the problems of recording. Both species are 'Critically Endangered' under the I.U.C.N. criteria, but they are probably not at significant risk. Seed has been deposited in the Millennium Seed Bank and plants are being cultivated at the National Botanic Garden of Wales.

KEYWORDS: distribution, ecology, endemic, hawkweed, population size.

INTRODUCTION

Hieracium cillense Pugsly., Craig y Cilau Hawkweed, and *H. asteridiophyllum* P. D. Sell & C. West, Llangattock Hawkweed, are very rare, endemic hawkweeds, as far as is known confined to the area around Craig y Cilau National Nature Reserve, Llangattock in the Brecon Beacons (v.c. 42). Craig y Cilau is one of the most outstanding botanical sites in Wales, the scenic limestone cliffs supporting many rare plants and animals as well as superb geological and geomorphological features. It is perhaps best known for its five rare endemic *Sorbus* species, but it is equally important for *Hieracium*, of which at least 15 have been recorded.

Hieracium cillense and *H. asteridiophyllum* are unusual amongst hawkweeds in Britain in that there is already some information available on their population sizes. In 1975, P. D. Sell and L. Farrell carried out surveys on Craig y Cilau N.N.R. and reported 253 plants of *H. cillense* and 458 plants of *H. asteridiophyllum* (rare species forms held by the Countryside Council for Wales). Both species are now listed with 77 other rare hawkweeds in the *Vascular Plant Red Data Book* (Wigginton 1999), but there is no recent information on their population sizes. A joint project was therefore set up between the National Museum & Gallery, Cardiff and C.C.W. to establish their current status and determine their needs for conservation. The data are summarised in this paper; full details can be found in Rich (2001a, 2001b).

About 400 species of *Hieracium* are recognised in Britain, most of which are apomictic (i.e. reproduce asexually) and triploid or tetraploid. *H. cillense* was first described as a distinct variety in 1905 by the Reverend Augustin Ley, and was later raised to a species by Pugsley (1941). It is a distinct plant which is almost instantly recognisable in the field by the leaves which are covered in dense, fine, stellate hairs on both sides which give them a greyish-green hue. Sell & West (1968) noted that it is similar to the widespread European species *H. lasiophyllum* Koch, from which it may have been derived.

H. asteridiophyllum was also first collected by Ley, but was only named as a distinct species in 1955 after much confusion (Sell & West 1955, Sell 1987). It is very similar to the more widespread species *H. pellucidum*, from which it can be distinguished by having pilose hairs on the phyllaries in addition to the glandular ones. From the other hawkweeds in the Craig y Cilau area, these two species can be picked out by the clustered, smaller, deeper yellow heads with black glands on the phyllaries (this yellow/black contrast is quite distinctive), dark styles and a basal rosette of dark green, ovate leaves.

TABLE 1. POPULATION COUNTS OF *HIERACIUM ASTERIDIOPHYLLUM* AND *H. CILLENSE* FOR APPROXIMATELY THE SAME AREAS OF CRAIG Y CILAU N.N.R. BY P. D. SELL & L. FARRELL IN 1975 AND BY T. RICH IN 2000

| | <i>H. cillense</i> | | <i>H. asteridiophyllum</i> | |
|---|--------------------|------------|----------------------------|------------|
| | 1975 | 2000 | 1975 | 2000 |
| Craig y Cilau, main Cliff | 0 | 2 | 338 | 110 |
| Llangattock Quarries, Agen Allwedd cliffs | 0 | 19 | 0 | 9 |
| Llangattock Quarries, cliffs east of Agen Allwedd | 46 | 54 | 46 | 0 |
| Top cliff below Waun Rudd west | 0 | 0 | 4 | 17 |
| Top cliff below Waun Rudd east | 195 | 319 | 68 | 65 |
| Chwar Mawr (all cliffs) | 12 | 2 | 1 | 95 |
| Total for N.N.R. | 253 | 396 | 458 | 296 |
| Quarry above Mayberry Cottage (outside N.N.R.) | - | 0 | - | 8 |
| Quarries west of Waun ddu (outside N.N.R.) | - | 0 | - | 3 |
| Darren Cilau-Ogof Darren Cilau (outside N.N.R.) | - | 263 | - | 205 |
| Total | | 659 | | 512 |

DISTRIBUTION AND POPULATION SIZES

Historical information in the literature and on herbarium sheets at **BM**, **BRISTM**, **CGE**, **LIV** and **NMW** was abstracted. Information from the *Hieracium* database was provided by D. McCosh. The records traced are listed in Appendices 1 and 2, which indicate that both species are confined to the Craig y Cilau area (also known historically as Craig Cille). Sell (1987) indicated that *H. asteridiophyllum* was restricted to one section of cliff c. 1.5 km long, but the type specimen had been reported further east at Darren Cilau.

Field surveys were carried out on 7, 16, 20 and 28 June 2000. The first day was mainly spent with familiarisation of the Craig y Cilau hawkweeds, another day was spent collecting ecological information, and two days were spent estimating the population sizes. One further day was spent surveying nearby sites which had possible habitat, but no new populations were found.

Plants were generally surveyed by walking under the cliffs and looking up, sometimes using binoculars. No rock climbing was attempted, with the exception of some scrambles up the safer sections. All accessible cliffs were covered except those above Darren Cilau quarries which were considered too dangerous (eight dead sheep were counted at the foot of the cliffs over 2 km). It was possible to walk along two levels of the main Craig y Cilau upper cliffs using sheep paths, the upper one of which is very narrow and scary. Cliffs with broken rocky bases were much harder to get close to and survey properly than those with massive bases. In general, it was only possible to count plants on the lowest third of the larger cliffs, and there is no doubt that the population sizes are under-estimates, possibly by 50% or more.

H. cillense was most abundant on the top cliffs below Waun Rudd and in the eastern end of Darren Cilau quarry, with a few smaller populations elsewhere, with a total of 659 plants (Figure 1). *H. asteridiophyllum* was more widespread, with most plants on the main lower Craig y Cilau cliff and at the west end of Darren Cilau quarry, with a total of 512 plants (Figure 2). It was pleasing to discover extensions of the known ranges of both species to the east of the N.N.R., though they are clearly parts of the same populations. Figure 3 shows an updated national distribution map, which is the same for both species.

Population counts for sub-sites within the N.N.R. are summarised in Table 1 and compared with the 1975 Sell and Farrell counts for approximately the same areas. Sell and Farrell essentially recorded in the same way; they scrambled along the ledges and used binoculars and included vegetative rosettes, but they only spent one very hot day surveying and counted both *Sorbus* and *Hieracium* at the same time. L. Farrell did most of the counting (pers. comm., 2000).

The counts for the same areas in 1975 and 2000 show some discrepancies (Table 1). For equivalent areas searched, I usually recorded more *H. cillense* plants than Sell & Farrell, but the counts were more variable for *H. asteridiophyllum*. I found both more widely. As Sell & Farrell

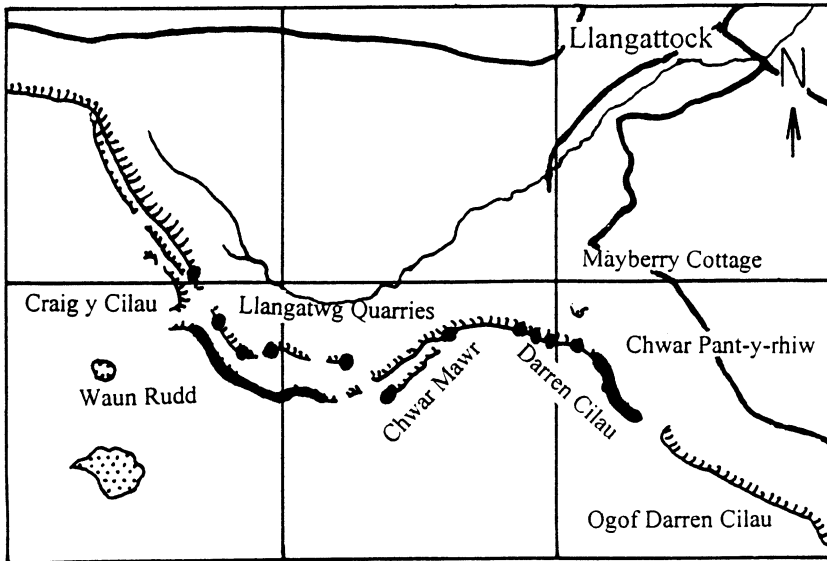


FIGURE 1. Distribution of *Hieracium cillense* around Craig y Cilau.

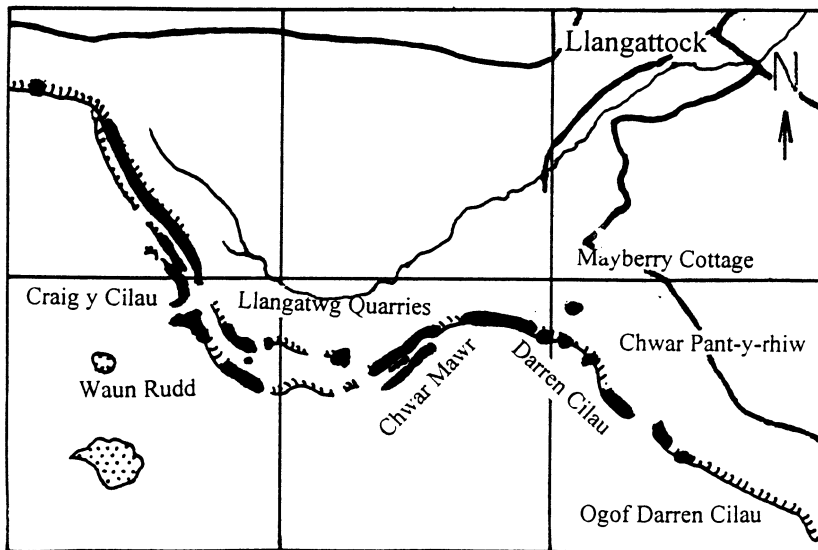


FIGURE 2. Distribution of *Hieracium asteridiophyllum* around Craig y Cilau.

only spent one day recording, and probably covered fewer crags, I would have expected to have recorded more plants of both species if the populations had remained the same size. The undoubted greater expertise of P. D. Sell should not have played a significant role in recording differences for *H. cillense* which is readily identifiable, but may have done so for *H. asteridiophyllum*. Surveys were carried out at the same time of year. The differences in numbers of plants are probably largely due to differences in recording, but may also include some population changes.

ECOLOGY

Both species have very similar life cycles, but there are a few differences in ecology. They are both perennials which are probably quite long-lived. The leaves of both species are largely clustered in basal rosettes, which is typical of hawkweeds that grow in rocky places. Their main flowering periods are from early June to early July, with most seed being shed by the end of the July (*H. cillense* usually coming into flower a little later than *H. asteridiophyllum*). Both are probably obligate apomicts like the other *Hieracium* species, and produce seed asexually. The seeds have a small pappus and are wind-dispersed.

Both occurred on natural rocks and on quarry faces, usually on steep or nearly vertical rocks. Plants were mostly rooted directly into rock crevices with no apparent soil, on shallow, narrow ledges, or into shallow brown rendzinas over shattered rocky outcrops. The pH of the soil ranged from 7.1 to 7.5 (measured with a pHep2 Hanna pocket-sized pH meter in a 50:50 mixture with distilled water). *H. cillense* was most abundant on the Upper Limestone Shales in the N.N.R., and on the Carboniferous Limestone at Darren Cilau quarry. *H. asteridiophyllum* was most abundant on Carboniferous Limestone.

H. cillense was most abundant on the open crags, and rarely occurred in significantly shaded situations. *H. asteridiophyllum* occurred in both open and partly shaded situations, and was one of the most common hawkweed species on the main cliff in partly shaded situations. These differences in shade tolerance and substrate may account for the different distributions on crags within the N.N.R. as many of the lower cliffs and those at the east end have patches of woodland and scrub with *Fagus*, *Fraxinus*, *Sorbus* spp., etc.

Both species usually occurred in as scattered plants in open vegetation with low cover, but sometimes also occurs in more closed grassy vegetation on some of the less steeply sloping outcrops. In terms of the National Vegetation Classification (Rodwell *et al.* 1991–2000), the vegetation on the ledges and rock faces is the OV39 *Asplenium trichomanes* - *Asplenium rutamuraria* community, that on the grassy outcrops CG10 *Festuca ovina* - *Agrostis capillaris* - *Thymus praecox* grassland, and that on the wooded cliffs W9 *Fraxinus excelsior* - *Sorbus aucuparia* - *Mercurialis perennis* woodland. Both were often associated with the two other common Craig y Cilau hawkweeds, *H. cyathis* (Ley) W. R. Linton and *H. subbritannicum* (Ley) Sell & West, and more rarely with *H. dicella* Sell & West.

CONSERVATION

Both species qualify as 'Critically Endangered' under the 1994 IUCN criteria (area of occupancy <10 km²). They are both included in the *Vascular Plant Red Data Book* (Wigginton 1999), but are not protected under Schedule 8 of the Wildlife and Countryside Act 1981. The site is within the Brecon Beacons National Park, and most of the populations of both species occur on the National Nature Reserve. These designations give a significant degree of protection to the sites and as most plants occur on relatively inaccessible rocks they are scarcely under any significant threat. Climbing at Darren Cilau is restricted and stipulates no clearance of vegetation.

Seeds of both species were collected in July 2000 and sent to the Millennium Seed Bank at the Royal Botanic Gardens, Wakehurst Place for long-term storage. Material of both species is also being cultivated at the National Botanic Garden of Wales.

Both species are palatable, and thus largely confined to cliffs inaccessible to sheep; reduction of sheep stocking levels might allow spread into places where they are currently grazed out. The cliff habitats are essentially unmanaged, and the only potential management in the future might be very localised control growth of scrub or trees.

It is recommended that the populations should be surveyed every 25 years. Given the difficulties of counting plants, caution should be applied to interpreting changes in population size. For *H. cillense*, there should be cause for concern if the population counted in the N.N.R. drops below 200 plants, or the total population drops below 400 plants; for *H. asteridiophyllum*, the figures are 200 plants and 300 plants respectively.

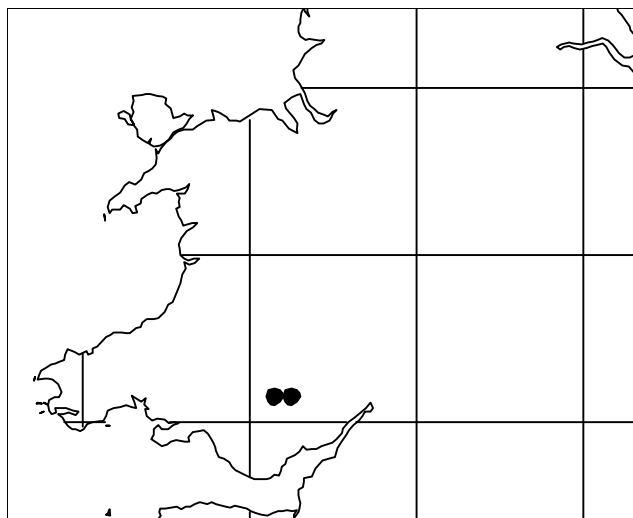


FIGURE 3. National distributions of *Hieracium cillense* and *H. asteridiophyllum* (the same for both species).

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APPENDIX 1. HERBARIUM AND LITERATURE RECORDS OF *HIERACIUM CILLENSE*

| Date | Collector | Site | Source and notes |
|-----------|-------------------------|---|--|
| 14/6/1897 | A. Ley | Craig Cille | BM, CGE , det. Sell & West; Set of British Hieracia no. 139 in part |
| 14/6/1900 | A. Ley | Craig Cille | BM, CGE, LIV, NMW det. Sell & West; Set of British Hieracia no. 139 in part |
| 9/6/1903 | A. Ley | Craig Cille | CGE , det. Sell & West |
| 2/6/1904 | H. J. Riddelsdell | Craig Cille | BM , det. McCosh |
| 15/6/1904 | A. Ley | Craig Cille | BRISTM, LIV , det. Sell & West |
| 6/7/1923 | H. J. Riddelsdell | Craig Cille | NMW , det. C. E. A. Andrews |
| 29/6/1927 | A. E. Wade | Craig y Cilau | NMW , det. Sell & West |
| 3/7/1935 | H. W. Pugsley | Craig Cille | BM , det. West |
| 1952 | C. West | Darren Cilau | CGE (holotype; Sell & West 1955) |
| 22/6/1953 | P. D. Sell | Dan-y-Darren (Craig Cille), limestone cliffs | CGE , det. Sell |
| 22/7/1955 | B. A. Miles | Craig Cille, SO191157 | CGE , det. Sell & West |
| 14/6/1964 | U. K. Duncan | Craig y Cilau, west of Llangattock quarries | CGE , det. Sell |
| 8/6/1972 | P. D. Sell | Dan-y-Darren near Llangattock, limestone cliffs, SO186163 | CGE , det. Sell |
| 5/7/1974 | P. D. Sell | Dan-y-Darren, Craig y Cilau, cliff face, SO186161 | CGE , det. Sell |
| 22/6/1975 | P. D. Sell | Craig y Cilau, frequent in central area, SO188159 | CGE , det. Sell |
| 30/6/1975 | P. D. Sell & L. Farrell | Craig y Cilau NNR, 458 plants, from SO181166 to SO190156 | C.C.W. Rare Species Form and Sell (1987) |

APPENDIX 2. HERBARIUM AND LITERATURE RECORDS OF *H. ASTERIDIOPHYLLUM*

| Date | Collector | Site | Source and notes |
|-----------|----------------------------|--|--|
| 12/6/1893 | (A. Ley) | Craig Cille, limestone rocks | BM Ley (1909) |
| 4/6/1895 | A. Ley | Craig Cille, limestone rocks | NMW |
| 5/6/1899 | A. Ley | Craig Cille, centre of crag at base below cave | CGE |
| 9/6/1903 | W. R. Linton | Craig Cille | LIV |
| 11/6/1903 | H. J. Riddelsdell | Craig Cille | BM |
| 6/1904 | H. J. Riddelsdell | Craig Cille | BM, CGE |
| 5/6/1904 | A. Ley | Craig Cille, central portion | BM (holotype, cf. Pugsley 1948), CGE |
| 3/7/1908 | A. Ley | Craig Cille, central part of cliff | BM, CGE, NMW |
| 6/7/1923 | M. A. Wedgwood | Craig Cille | BM |
| 1925 | J. E. Roffey | Craig y Cilau | Pugsley (1948) |
| 9/6/1927 | H. A. Hyde & A. E. Wade | Craig y Cilau | NMW |
| 3/7/1935 | C. I. & N. Y. Sandwith | Craig Cille | BRISTM |
| 7/1952 | C. West & J. W. Cardew (?) | Craig Cille | CGE |
| 5/6/1954 | J. E. Raven | Craig Cille | CGE |
| 22/7/1955 | B. A. Miles | Craig Cille | CGE |
| 27/7/1957 | J. E. Raven | Craig Cille | herb. D. McCosh |
| 22/6/1975 | P. D. Sell | Craig y Cilau, frequent in rock crevices in central area | CGE |
| 23/6/1975 | P. D. Sell | Craig y Cilau, central area | CGE |
| 30/6/1975 | P. D. Sell & L. Farrell | Craig y Cilau N.N.R.; 253 plants | C.C.W. Rare Species Form |
| 1980 | M. Porter | Craig y Cilau | Ellis (1983) |