Conservation of Britain's biodiversity: *Hieracium snowdoniense* (Asteraceae), Snowdonia Hawkweed

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ABSTRACT

Hieracium snowdoniense. P. D. Sell & C. West (Asteraceae), Snowdonia Hawkweed, is a rare endemic plant only known in Snowdonia, Wales. It has been recorded from about seven sites historically. Only one plant was found during field surveys in 2000 and 2002. It may have declined due to over-grazing and acid rain deposition affecting soils. It is 'Critically Endangered' under the I.U.C.N. threat criteria. Seed has been collected and it is being cultivated at the National Botanic Garden of Wales.

KEYWORDS: Compositae, Endemic, rare species, Snowdonia, Wales.

INTRODUCTION

Hieracium snowdoniense P. D. Sell & C. West (Asteraceae), Snowdonia Hawkweed, or Heboglys Yryri in Welsh, is a rare, endemic plant only known from the mountains of Snowdonia, Wales. It is a Red Data Book species recorded from rocky faces of mountains in two 10-km squares (Wigginton 1999; Sell & West 1968). As part of a joint project between the National Museum & Gallery, Cardiff and the Countryside Council for Wales into the ecology and distribution of critical taxa, the information available about *H. snowdoniense* was drawn together and combined with field surveys in 2000 and 2002 to assess its current status. In this paper the information about this rare species is summarised; full details are given in Hand & Rich (2000) and Rich & Hand (2002).

H. snowdoniense belongs to *Hieracium* Section *Vulgata* (Griseb.) Willk. & Lange. It was first named as *H. murorum* L. var. *pulcherrimum* F. J. Hanb. by Hanbury (1892), who included it with a plant from Catterick Force near Settle, Yorkshire. However, Hanbury's herbarium was subsequently found to contain two different plants; the Settle plant which was used as the basis of the description was subsequently found to be *H. killinense* (Zahn) Roffey, which left the Welsh plant without a name, so Linton (1905) provided a new one, and description, under *H. pellucidum* L. var. *pulcherrimum*, which was, excluding the pilose-tipped ligules (a character of the Settle plant), restricted to the Welsh plant. Zahn (1921) then raised it to a subspecies of *H. murorum*, partly confusing it with *H. cuneifrons* Ley from Brecon in the process, and cited Hanbury's varietal name as the basionym. Unfortunately this meant that his combination and the subsequent combination of *H. pulcherrimum* at species rank by Roffey in the *London Catalogue* were illegitimate. Pugsley (1948) used Roffey's name, and gave a good description and notes. Finally, Sell & West (1955) made the new combination *H. snowdoniense* by which it is now properly called.

H. snowdoniense is a distinctive species, distinguished by its beautiful, close panicle of deep, golden-yellow flowers, livid styles, very black, velvety, glandular involucre, slender almost straight peduncles and glabrous-tipped ligules. The leaves are lanceolate to ovate, weakly toothed and narrowed at the base into a shaggy petiole (Fig. 1).

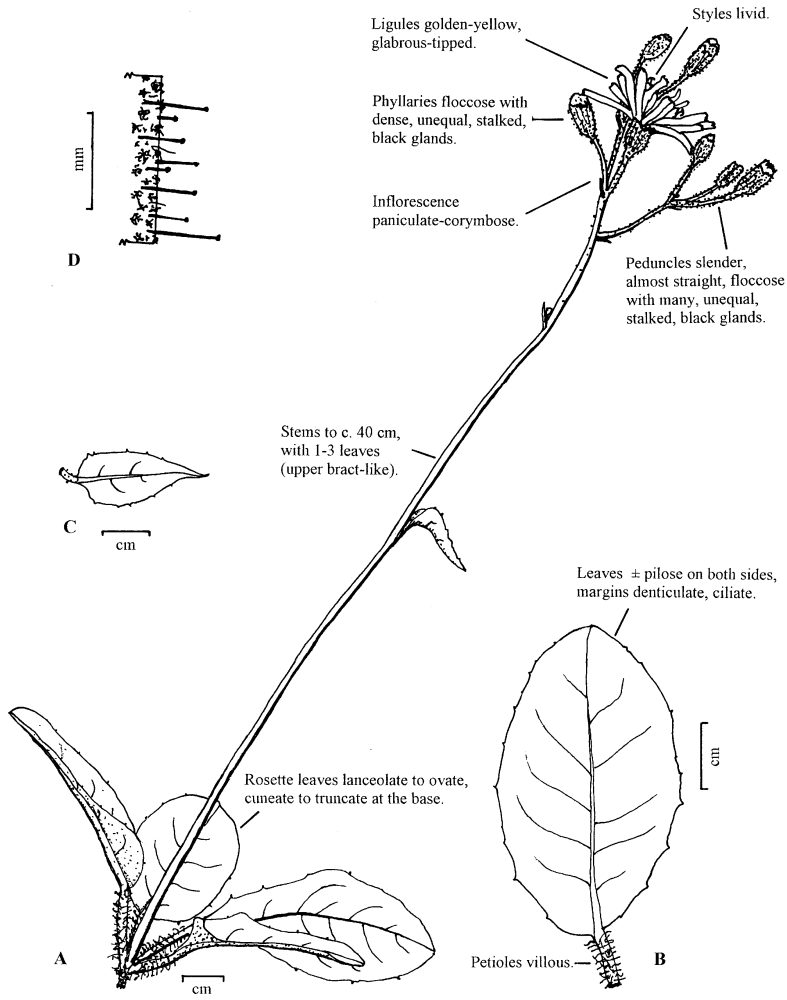

FIGURE 1. *Hieracium snowdoniense* with some distinguishing features (del. TCGR). A. Whole plant. B. Rosette leaf. C. Stem leaf. D. Detail of hairs on peduncles and phyllaries.

DISTRIBUTION AND POPULATION SIZE

Historical information was abstracted from the literature and from herbarium sheets at **BM**, **CGE**, **LIV** (Corrie 2000), **MANCH** and **NMW**. Information from the *Hieracium* database was provided by D. McCosh. The records traced are listed in Table 1, which suggest the plant has been found in about seven different sites (records cited as Ysgolion Duon and Carnedd Daffydd may refer to one or two parts of the same mountain). These records were used to direct the field surveys.

Field surveys were carried out between 25 July and 2 August 2000, and 8–10 August 2002. Sites were surveyed from the bottoms and tops of crags, and using binoculars. No rock climbing or rope access work was undertaken, though rough scrambling was often necessary to gain access to some rocks. No plants were found at Carnedd Daffydd (3 visits), Cwm Glas (1 visit), Cwm Perfedd (1 visit), Glyder Fach (1 visit), Nant Ffrancon (2 visits), Pen-y-Gwryd (1 visit) or Ysgolion Duon (3 visits). After an unsuccessful search in 2000, one plant was finally located in Devil's Kitchen, Cwm Idwal in July 2002, close to where it had last been seen in 1953. The rediscovery attracted significant media coverage (e.g. Kennedy 2002). An updated distribution map is given in Figure 2.

TABLE 1. HERBARIUM AND LITERATURE RECORDS OF *HIERACIUM SNOWDONIENSE*. THE GRID REFERENCES INDICATE THE APPROXIMATE LOCATION OF THE SITES

CWM GLAS (SH6155)
Cwm Glas Fach, Snowdon, 13 July 1904, A. Ley (**CGE**).
Cwm Glas, undated, J. E. Griffith (**BM**).

NANT FFRANCON (SH6365–SH6461)
Nant Ffrancon, Aug 1894, J. E. Griffith (**CGE, MANCH**).

DEVIL'S KITCHEN, CWM IDWAL (SH6358)
Twll Du, June 1887, J. E. Griffith (**LIV**).
Devil's Kitchen, on rocks on cliffs, seen from the end of a rope (SH6359), 26 June 1953, P. D. Sell (**CGE**; pers. comm. 2002).
Rock ledges and cliffs near top, Twll Du, 24 June 1961, J. N. Mills (**MANCH**)
Rock ledges and cliffs near top, Twll Du, 1 July 1967, J. N. Mills (**MANCH**)

YSGOLION DUON (SH6663–SH6763)
Ysgolion Duon, July 1892, J. E. Griffith (**BM**, **NMW**; Griffith 1895).
Ysgolion Duon, July 1893, J. E. Griffith (**BM**, **CGE**, **LIV**; type specimen in **BIRM**, cf. Sell & West 1955).
Ysgolion Duon, Carnedd Daffydd, 14 July 1904, A. Ley (**CGE**, **NMW**).

CARNEDD DAFFYDD (SH6563–SH6663)
Carnedd Daffydd, root from cliff cultivated at Clapton 1894, F. J. Hanbury (**BM**).
Carnedd Daffydd, cliff, 'though the specimens were fine, they were by no means abundant' 28 July 1891, F. J. Hanbury & A. Ley (**CGE**; Hanbury 1892).
Carnedd Daffydd, 28 July 1892, Linton (**LIV**; Linton 1905).

GLYDER FACH (SH6558)
Glyder Fach (Linton 1905; no specimen traced).

CWM PERFEDD (SH6262)
Cwm Perfedd, July 1892, J. E. Griffith (**BM**, **NMW**; Griffith 1895).

PEN-Y-GWRYD (SH6555)
Pen-y-Gwryd (Pugsley 1948; no specimen traced).

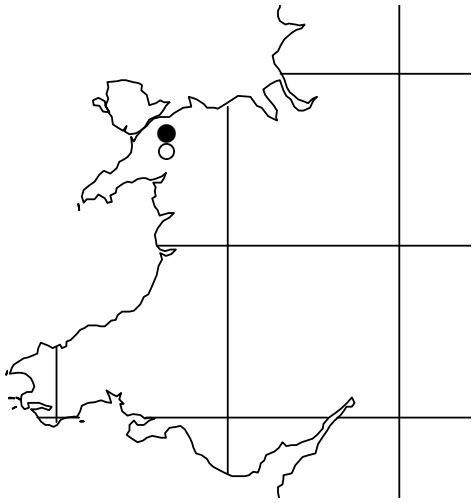

FIGURE 2. Distribution of *Hieracium snowdoniense*. ●, 2002. ○, Pre-1950. Plotted using DMAPW by Alan Morton.

We are aware of at least four other searches for this species since the 1950s, all of which have failed to find the plant, and thus have some confidence that the negative results for six sites may be real, though clearly it may survive on the unsurveyed parts of cliffs. It is difficult to search such large complex mountains thoroughly, especially where the historical records are unspecific (e.g. Nant Ffrancon, an area of approximately 8 km²), and vegetative rosettes, which cannot be reliably identified, are easily overlooked.

The current known population is thus one plant, and it must rank as one of the rarest plants in the world. Indeed, it may always have been a rare plant. Hanbury (1892) noted of *H. snowdoniense* 'with the Rev. Augustin Ley, found it in Carnedd Dafydd cliffs near Bethesda. Though the specimens were fine, they were by no means abundant, and in all probabilities we failed in finding its headquarters in the district'.

TABLE 2. SPECIES ASSOCIATED WITH *HIERACIUM SNOWDONIENSE* IN AN APPROXIMATE 2 × 2 M QUADRAT IN CWM IDWAL, 2002

Species	Domin	Species	Domin
Hieracium snowdoniense	1	*Leucanthemum vulgare*	3
Agrostis capillaris	3	*Luzula sylvatica*	4
Alchemilla glabra	1	*Mnium hornum*	2
Anthoxanthum odoratum	2	*Oxyria digyna*	1
Calliergon cuspidatum	3	*Peltigera membranacea*	3
Calluna vulgaris	4	*Plagiochila spinulosa*	1
Cirsium palustre	1	*Pleurozium schreberi*	1
Cladonia pyxidata	3	*Pseudotaxiphyllum elegans*	1
Deschampsia flexuosa	4	*Rhytidiadelphus loreus*	3
Dicranum scoparium	3	*Saxifraga hypnoides*	2
Diplophyllum albicans	1	*Scleropodium purum*	2
Festuca rubra	3	*Sedum rosea*	1
Filipendula ulmaria	2	*Solidago virgaurea*	2
Geum rivale	2	*Succisa pratensis*	3
Hymenophyllum wilsonii	3	*Thuidium tamariscinum*	4
Hypericum pulchrum	3	*Tritomaria quinquedentata*	1
Hypnum jutlandicum	3	*Veronica officinalis*	2

Vegetation cover 95%. Vegetation height 10 cm. Slope c. 85°.

BIOLOGY AND ECOLOGY

Like all hawkweeds, *H. snowdoniense* is probably a polycarpic perennial which is an obligate apomict which reproduces by seed. According to the specimens seen, the main flowering period is July, but like many other mountain hawkweeds it may flower irregularly rather than annually (D. McCosh, pers. comm.). Seeds were ripe about one month after flowering. The seeds have a small pappus and are wind-dispersed.

There is very little information available on its ecology. The plant seen grew on a steep, more or less north-facing, rocky cliff of acid ash-flow tuff/pyroclastic breccia which, like the basalt of the Cwm Idwal massif, clearly had some base-enrichment though the soil was still quite acidic (pH 4·8, measured with a pHep2 Hanna pocket-sized pH meter in a 50:50 mixture with distilled water). It occurred in damp, flushed U17a *Luzula sylvatica – Geum rivale* tall-herb community *Alchemilla glabra – Bryum pseudotriquetrum* sub-community of the national vegetation classification (Rodwell 1992) (Table 2). This vegetation type is typical of base-enriched, mesotrophic, damp soils on inaccessible ledges and cliffs in the mountains of northern Britain, but is restricted in distribution in Snowdonia, and is a typical vegetation type of many other upland hawkweeds. It has been recorded from altitudes ranging from about 300–900 m, possibly descending lower in the Nant Ffrancon valley.

CONSERVATION

With a total known world population of one plant, *H. snowdoniense* really must be regarded as IUCN category 'Critically Endangered' (IUCN 2001). It is not protected under Schedule 8 of the Wildlife and Countryside Act 1981, but it is also not likely that such protection would contribute to its survival in upland Snowdonia. All current and historic sites lie within Sites of Special Scientific Interest, the Snowdonia National Park and the Yryri Candidate Special Area of Conservation, which give significant degrees of protection to the sites.

The most likely cause of the decline is a long and sustained period of over-grazing, and especially the huge increase in sheep grazing at high altitudes in the mountains over the last 50 years (A. Turner, pers. comm. 2002). Most hawkweeds are highly palatable to sheep, and it may simply have been eaten to extinction in the more accessible sites. Over-grazing is a serious problem throughout Snowdonia, where most *Hieracium* species are now largely restricted to rocks and ledges out of reach of the sheep and goats. An exceptional recent management development at Cwm Idwal National Nature Reserve, funded by the Countryside Council for Wales, the National Trust and the European Union has been the removal of sheep grazing to benefit the wildlife. Already since 2000 the grasslands have become more flowery and colourful, and it is hoped that this removal of grazing will also allow *H. snowdoniense* to spread into other areas.

Another possible explanation is the change in soils following acidification by acid rain which is widely affecting Snowdonia (Gritten 1992). Snowdonia receives one of the highest recorded wet-deposited sulphate and nitrate rates in Britain (Williams *et al*. 1989). Studies by Kuylenstierna & Chadwick (1991) found average soil pH reductions of c. 0·8–0·9 pH units (range 0·1 and 1·7) on weakly-buffered soils in 12 sites in Snowdonia between 1957 and 1990, and also found that the higher the original pH, the greater the decrease. As many of the relatives of *H. snowdoniense* (i.e. Series *Pellucida*) are calcicoles, it is also likely that it prefers more basic soils, and the severe increase in soil acidity in Snowdonia may have significantly affected the habitats of some populations.

There is no evidence for decline due to collecting by botanists, but with only one plant remaining this is now a significant threat. Some losses might have occurred due to natural events such as rock falls.

Two ripe seed heads were collected on 8 August 2002 and seedlings are being cultivated at the National Botanic Garden of Wales. Further surveys should be carried out, especially in Cwm Idwal, to see if more plants can be found, and consideration should be given to a restocking programme at Cwm Idwal and other sites where the grazing is controlled.

ACKNOWLEDGMENTS

This work was jointly funded by the Countryside Council for Wales and National Museum & Gallery, Cardiff as part of a collaborative project into conservation and ecology of critical species.

We would like to thank Janet Buckles, Duncan and Alison Hayes, Andy Jones, Hywel Roberts and Alex Turner for assistance with field work, Alan Orange for determining or checking the mosses and lichens, David McCosh for records from the B.S.B.I. *Hieracium* database and discussion, Geoff Battershall, Nigel Brown, Julie Evans, Andy Karran, Lindsey Loughtman, Chris Meechan, Gina Murrell, Julie Richards, Peter Sell and Presilla Tolfree for information and help, and the Keepers of the herbaria for access to specimens and libraries.

REFERENCES

CORRIE, K. (2000). *Catalogue of the hawkweeds of Britain and Ireland in the herbarium of Liverpool Museum*. National Museums and Galleries on Merseyside, Liverpool.

GRIFFITH, J. G. (1895). *The flora of Anglesey and Carnarvonshire*. Nixon & Jarvis, Bangor.

GRITTEN, R. H. (1992). Acid deposition in Snowdonia, North Wales. *Botanical Journal of the Linnean Society* **108**: 111–116.

HANBURY, F. J. (1892). Further notes on *Hieracia* new to Britain. *Journal of Botany* **30**: 258–261.

HAND, S. O. & RICH, T. C. G. (2000). *Distribution and conservation of* Hieracium snowdoniense, *Snowdonia Hawkweed*. Unpublished report from National Museums and Galleries of Wales to Countryside Council for Wales.

I.U.C.N. (2001). *IUCN Red List Categories and Criteria version 3.1*. Gland: The World Conservation Union.

KENNEDY, M. (2002). Wales welcomes back one of world's rarest plants. *The Guardian* Tuesday August 6 **2002**: 6.

KUYLENSTIERNA, J. C. I. & CHADWICK, M. J. (1991). Increases in soil acidity in north-west Wales between 1957 and 1990. *Ambio* **20**: 118–119.

LINTON, W. R. (1905). *An account of the British Hieracia*. West, Newman & Co, London.

PUGSLEY, H. W. (1948). A prodromus of the British *Hieracia*. *Journal of the Linnean Society of London (Botany)* **54**: 1–356.

RICH, T. C. G. & HAND, S. O. (2002). Hieracium snowdoniense, *Snowdonia Hawkweed: Additional Records and Information 2002*. Unpublished report, National Museums and Galleries of Wales/Countryside Council for Wales, Cardiff.

RODWELL, J. S., ed. (1992). *British plant communities. Volume 3. Grassland and montane communities*. Cambridge University Press, Cambridge.

SELL, P. D. & WEST, C. (1955). Notes on British *Hieracia*. I. *Watsonia* **3**: 233–236.

SELL, P. D. & WEST, C. (1968). *Hieracium* L., in PERRING, F. H. ed., *Critical Supplement to the Atlas of the British flora*. B.S.B.I., London.

WIGGINTON, M. J., ed. (1999). *British Red Data Books. 1. Vascular Plants*, 3rd ed. Joint Nature Conservation Committee, Peterborough.

WILLIAMS, M. L., ATKINS, D. H. F., BOWER, J. S., CAMPBELL, G. W., IRWIN, J. G. & SIMPSON, D. (1989). *A preliminary assessment of the air pollution climate of the UK*. Warren Spring Laboratory, Department of Trade and Industry.

ZAHN, K. H. (1921). Compositae – *Hieracium*, in ENGLER, A., ed., *Das Pflanzenreich* IV. 280. Heft **79**: 302. Engelmann, Berlin.

(*Accepted November 2002*)