Conservation of Britain's biodiversity: *Hieracium riddelsdellii* (Asteraceae), Riddelsdell's Hawkweed

T. C. G. RICH*

Department of Biodiversity and Systematic Biology, National Museum of Wales, Cardiff CF10 3NP

ABSTRACT

Hieracium riddelsdellii Pugsley, Riddelsdell's Hawkweed, is a rare Welsh endemic plant. It was first found in 1899, was described as a variety in 1907, and raised to a species in 1941. It has been reported from four sites, but is currently only known in two localities in the Brecon Beacons (v.c. 42) and one in Carmarthenshire (v.c. 44), with an estimated total population of about 870 plants. Records for Berwickshire (v.c. 81) refer to another taxon. It qualifies as 'Vulnerable' under the IUCN Threat Criteria. The main threat is the spread of *Cotoneaster integrifolius* over its Carboniferous Limestone rocky habitats, but all populations would also benefit from relaxation of grazing pressure. It is being cultivated at the National Botanic Garden of Wales and seed has been deposited in the Millennium Seed Bank.

KEYWORDS: endemic, IUCN Threat Criteria, lectotype, Wales.

INTRODUCTION

Hieracium riddelsdellii Pugsley (Asteraceae), Riddelsdell's Hawkweed, is a very rare, endemic plant, which has been reported from localities in the Brecon Beacons (v.c. 42), Carmarthenshire (v.c. 44) and Berwickshire (v.c. 81) (Sell & West 1968; Wigginton 1999). It was reported from four 10-km squares by D. McCosh in the Vascular Plant Red Data Book (Wigginton 1999): these were SN81 Craig-y-nos, SN82 Llyn y Fan Fach, SN92 Craig Cerrig-gleisiad and NT96 Burnmouth (D. McCosh, pers. comm., 2004). Recently, as the status of some of its records and the relationship between the Brecon and Berwickshire plants had been revised, further information on its distribution and population sizes was required to inform conservation work. A joint project was therefore set up between the National Museum of Wales, the National Botanic Garden of Wales and the Countryside Council for Wales to review its current status and determine its need for conservation. In this paper the information is summarised; full details can be found in Rich (2004a, b).

TAXONOMY AND IDENTIFICATION

Hieracium riddelsdellii was first separated as a distinct taxon by A. Ley who named it as *H. ciliatum* Almq. var. *venosum* (Ley 1907). Ley had first found it abundantly on the Craig-y-nos ridge in 1899 and cultivated it thereafter. Later, whilst naming *H. repandum* Ley (now *H. repandulare* Druce), he transferred it to that species, retaining it at varietal rank (Ley 1909). Pugsley (1941) raised it to species rank and named it after H. J. Riddelsdell (one of the early collectors), as the name *H. venosum* L. was already in use for another species. It is a member of *Hieracium* Section *Stelligera* Zahn (Section *Sub-Oreadea* Pugsley).

A lectotype for *H. ciliatum* Almq. var. *venosum* Ley, for which *H. riddelsdellii* Pugsley is a *nom. nov*., has been selected by P. D. Sell and C. West as the sheet collected on 1 August 1899 from the high limestone ridge above Craig-y-nos, Breconshire by A. Ley in **herb. Ley** (currently in **CGE**) which has Ley's original description and notes attached; it is hereby designated by P. D. Sell. Some other sheets in **BM** and **BIRM** have a different selection noted, which should now be disregarded.

SUMMARY OF SYNONYMY:

Hieracium riddelsdellii Pugsley, *Journal of Botany (London)* **79**: 181 (1941).

= *H. ciliatum* Almq. var. *venosum* Ley, *Journal of Botany (London)* **45**: 109 (1907).
= *H. repandum* Ley var. *venosum* Ley, *Journal of Botany (London)* **47**: 13 (1909).

*e-mail: tim.rich@nmgw.ac.uk

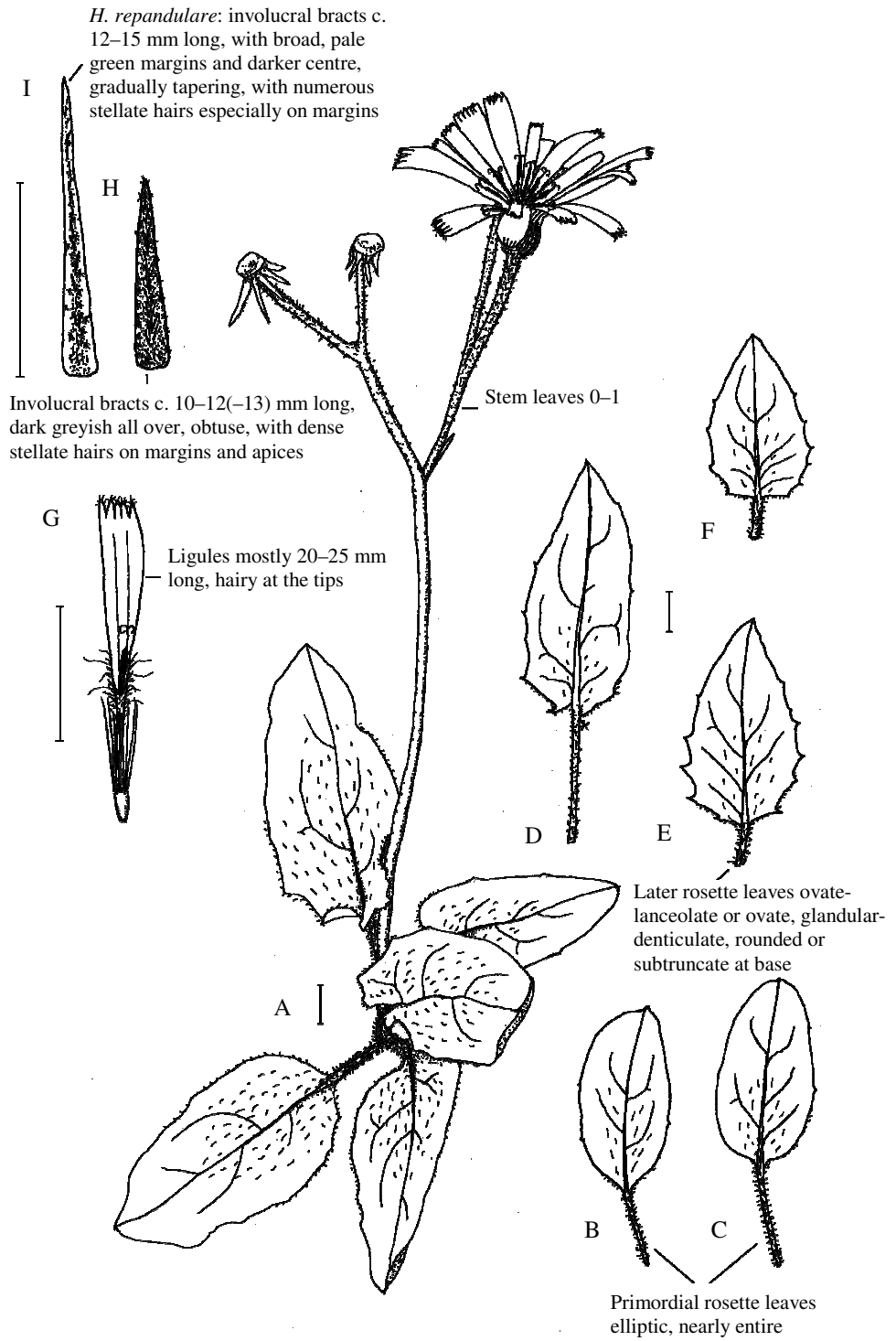

FIGURE 1. Illustration of *Hieracium riddelsdellii* showing main identification features. A. Whole plant. B– F. Basal rosette leaves. G. Flower. H. Involucral bract. I. Involucral bract of *H. repandulare*. Scale bars 1 cm.

TABLE 1. CHARACTERS DISTINGUISHING *HIERACIUM RIDDELSDELLII* AND *H. REPANDULARE*

Character	*H. riddelsdellii*	*H. repandulare*
Base of rosette leaves	Rounded to truncate, entire or with a few small teeth, younger rosette leaves sometimes with more pronounced teeth, usually green or partially flushed red	Rounded to truncate (rarely cordate), entire or toothed with small or pronounced teeth, often glaucous, sometimes green
Involucral bracts	*c.* 10–12(–13) mm long, greyish over most of involucral bract, obtuse-subacute, with dense stellate hairs on margins and apices (Figure 1, H)	*c.* 12–15 mm long, with broad pale green margins and darker centre, gradually tapering, with numerous stellate hairs especially on margins (Figure 1, I)
Capitula	Smaller, ligules up to 28 mm long	Larger, ligules up to 34 mm long

Key taxonomic features of *H. riddelsdellii* are the oval basal rosette leaves which are glandular-denticulate with a rounded or sub-truncate base and sometimes large teeth, the rather slender usually leafless stem, the medium-sized heads which are rounded below, the dark green, mostly obtuse/subacute involucral bracts with dense stellate hairs on margins and apices (the latter like a white tuft in fresh material), the hairy tips to the ligules, and the yellow styles (Figure 1).

Sell & West (1968) noted that *H. riddelsdellii* is very similar to *H. repandulare* and could have been derived from the same parent, and that there are no very close allies of either. The differences between the two species are set out in Table 1; the best characters are the size, shape and hairiness of the involucral bracts. Pugsley (1948) suggested *H. riddelsdellii* could also be distinguished from *H. repandulare* in lacking the pronounced out-curved teeth at the base of the rosette leaves and the more compact inflorescence. However, during field work it was found that the leaf bases of both species are significantly more variable than noted by Pugsley, and toothing of the leaves is unreliable for identifying them. The differences in compactness of the inflorescence are also more visible in cultivated plants than in the field.

Sell & West (1968) noted that plants at Burnmouth, Berwickshire (v.c. 81) matched the Brecon plants exactly morphologically and could be regarded as conspecific, though perhaps of different origin. More recently, this diagnosis has been questioned (Braithwaite & Long 1990). The original record was based on a specimen in **CGE** which is no longer in the *H. riddelsdellii* folder and has been re-determined, though P. D. Sell cannot currently recall to which species (pers. comm. 2005). D. McCosh has failed to refind *H. riddelsdellii*-like plants on several visits to the Burnmouth populations; *H. britanniciforme* Pugsley is the most common plant at Burnmouth, and another nearby locality has a *Hieracium* species with noticeably pilose ligules but which is not *H. riddelsdellii*.

DISTRIBUTION

The historical records traced from the literature and herbaria (**BM**, **BIRM**, **CGE**, **E**, **LIV**, **MANCH, OXF** and **NMW**) are summarised in Table 2. It has been confirmed in three sites, and recorded doubtfully in another. Ley (1907, 1909) reported it only at Craig-y-nos; he had also collected it at Llyn y Fan Fach but included it under *H. repandulare*. There are also many duplicates of his cultivated specimens from Craig-y-nos 1903–1910. Records for Craig Cerrig-gleisiad are errors for *H. repandulare*.

The historic records were used to direct the field surveys. In addition, other suitable areas were searched in the Upper Tawe valley.

CRAIG-Y-NOS RIDGE, V.C. 42 BRECON (SN8314 AREA)

Craig-y-nos Ridge (also known as Cribarth) is a large Carboniferous Limestone hill on the west side the Tawe Valley, with low broken cliffs and screes along the south-east side and quarries on the top and at the east end of the hill. *Hieracium riddelsdellii* was found scattered and sometimes abundant throughout much of the site, especially on the unquarried rocks. In 2004, 388 plants in flower were counted, but there were many vegetative rosettes suggesting a total population of about double that, c. 750 plants (Rich 2004b).

CRAIG RHIWARTH V.C. 42 BRECON (SN8314 AREA)

There is a specimen from Craig Rhiwarth, 8 July 1906, A. Ley in **CGE**, but I am

TABLE 2. HERBARIUM RECORDS OF *HIERACIUM RIDDELSDELLII*

Locality/date	Collector	Site	Source and notes
Craig-y-nos/Cribarth (v.c. 42)			
1/8/1899	A. Ley	Craig-y-nos, high limestone ridge west of, 1250 ft., abundantly	**BM**, **CGE** (lectotype), **LIV**, **OXF**, **NMW**
6/7/1900	A. Ley	Craig-y-nos ridge	**BM**
10/6/1904	A. Ley	Craig-y-nos ridge	**BM**, **CGE**, **LIV**, **OXF**, **NMW**
11/6/1904	A. Ley & H. J. Riddelsdell	Craig-y-nos ridge	**BM**, **BIRM**, **CGE**, **LIV**, **MANCH**, **NMW**
3/7/1906	E. F. Linton	Craig-y-nos	**BM**, **LIV**
8/7/1906	A. Ley	Craig-y-nos	**CGE**
3/6/1953	J. E. Raven	Craig-y-nos, old quarry	**E**
23/6/1953	P. D. Sell	Craig-y-nos Castle, quarry by, SN841150	**CGE**
29/5/1955	C. A. E. Andrews	Craig-y-nos quarry	**BIRM**
22/7/1957	F. R. Browning	Craig-y-nos	**BM**
15/6/1958	B. A. Miles	Old quarry above Pant-y-wal Farm	**CGE**
1/6/1963	J. N. Mills	Craig-y-nos, limestone cliffs SN841150	**MANCH**
15/6/2000	T. C. G. Rich & S. O. Hand	Craig-y-nos ridge and quarry SN8314, 8414 and 8515	**NMW**
Penwyllt (v.c. 42)			
23/8/1965	J. N. Mills	Penallt, disused quarry near SN856161	**MANCH**
Llyn y Fan Fach (v.c. 44)			
4/7/1906	A. Ley	Craig y Llyn Fan Fechan, Carmarthenshire	**CGE**
20/7/1960	B. A. Miles	Llyn y Fan Fach, cliffs above, main gully in western corner SN800214	**CGE**
27/6/2002	T. C. G. Rich	Llyn y Fan Fach, 9 plants and 1 seedling, main gully, SN800215	**NMW**

unconvinced of its identity. Craig Rhiwarth is a very likely locality being directly up-wind and on the opposite side of the valley to the Craig-y-nos Ridge. The site has been searched three times since 2000, and no material has been found.

PENWYLLT, V.C. 42 BRECON (SN8516 AREA)

There are numerous disused Carboniferous Limestone quarries around Penwyllt, all but one of which with no access have been searched. The Twyn Disgwylfa Quarry (SN856161) has been markedly enlarged since *H. riddelsdellii* was recorded by J. N. Mills in 1965 (Table 2), and no plants could be found in 2004. *Hieracium riddelsdellii* was however found in the two adjacent disused quarries to the south, with 105 plants flowering in the larger quarry at SN856156, and four plants flowering on west-facing cliffs in the smaller quarry at SN856157.

LLYN Y FAN FACH, V.C. 44 CARMARTHEN (SN800215)

The Old Red Sandstone crags above Llyn y Fan Fach form a cirque which has had at least fourteen species of *Hieracium* reported, though only about half this number have been collected in recent years. On 27 June 2002, nine plants and one seedling of *H. riddelsdellii* were refound in three close groups on the low cliffs at the bottom on the main gully above the western end of Llyn y Fan Fach, where *H. riddelsdellii* had previously been localized by B. A. Miles.

Hieracium riddelsdellii is thus currently known from three populations in two 10-km squares in two vice-counties, with a total estimated population of 870 plants. One population at Twyn Disgwylfa Quarry has been destroyed. A 10-km square distribution map is given in Figure 2.

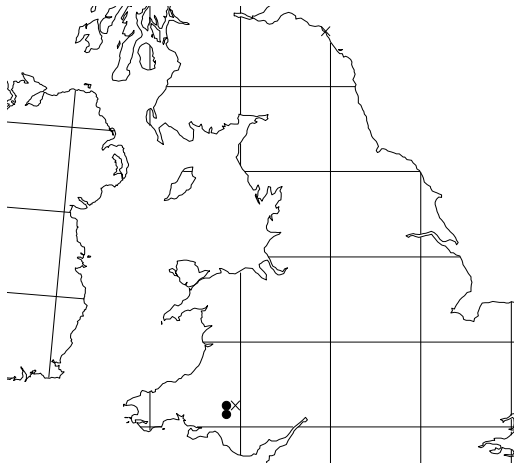

FIGURE 2. National distribution map of *H. riddelsdellii*, plotted using DMAPW by Alan Morton. ● 2002–2004. × = error.

LIFE CYCLE AND ECOLOGY

Like most British *Hieracium* species, *H. riddelsdellii* is a polycarpic perennial which reproduces by seed. The main flowering period is mid May to mid June, and seeds ripen about 3–4 weeks after flowering. It is probably an obligate apomict: the stamens and styles were excised on one of the two flowering heads in bud on the one plant available in cultivation in 2004, which did not prevent seed set (further larger scale trials are required). The mean potential pollen viability assessed using Alexander's Stain (Alexander 1969) was 57·2% ± 3·36 s.e. (n = 25) (H. Cleal & T. Rich, unpublished). The seeds have a small pappus and are wind-dispersed. DNA analysis of five *H. riddelsdellii* plants using amplified fragment length polymorphism (AFLP) during an investigation of genetic variation in *Hieracium cyathis* (Ley) W. R. Linton showed each plant was genetically different (M. D. Lledó, pers. comm. 2006).

The associated vegetation was recorded in seven representative 2 m × 2 m quadrats. The vegetation was usually open (mean percentage cover 9%, range 5–20%), short (mean height 5 cm, range 2–10 cm), and on steep slopes (mean slope 79°, range 70–90°) of all aspects. In terms of *British Plant Communities* (Rodwell *et al*. 1991–2000), the vegetation was generally the OV39 *Asplenium trichomanes – Asplenium ruta-muraria* community and the CG10 *Festuca ovina – Agrostis capillaris – Thymus praecox* grassland.

Soil pH was measured with a pHep2 Hanna pocket-sized pH meter in a 50:50 mixture with distilled water on soil samples collected from around the roots. Five pHs of soils measured from the limestones of Craig-y-nos area were 6·9, 6·9, 7·0, 7·1 and 7·7, and pH 6·5 was measured from soils derived from the Old Red Sandstones at Llyn y Fan Fach; these indicate *H. riddelsdellii* is a calcicole.

In 2000, 2003 and 2004, many flowering heads were infected by a small grub causing distorted growth and sterility (Pugsley 1948 noted this for *Hieracia* generally), and in 2004 many plants were heavily infested with aphids which were unusually abundant that year.

CONSERVATION

Under the IUCN (2001) Threat Criteria, *H. riddelsdellii* qualifies as 'Vulnerable' (total population less than 1000 individuals, highly restricted area of distribution). It is not protected under Schedule 8 of the Wildlife and Countryside Act 1981, but is included in the Vascular Plant Red Data Book (Wigginton 1999).

All the *H. riddelsdellii* sites are in the Brecon Beacons National Park, which gives them a limited degree of protection. The population at Llyn y Fan Fach is within the Mynydd Du (Black Mountain) S.S.S.I. The Penwyllt population is within the boundary of the Ogof Ffynnon Ddu S.S.S.I. which is designated for its cave system but not for its surface biological interest. The main population at Craig-y-nos is not within an S.S.S.I., and is clearly a priority for designation to conserve *H. riddelsdellii* as it contains 86% of the population.

All sites except for the northern of the two quarries at Penwyllt are heavily sheep-grazed, and *H. riddelsdellii* is largely confined to rocks out of the reach of sheep (most *Hieracia* are sensitive to grazing, and *H. riddelsdellii* is no exception). As a plant of open rocks and cliffs, generally no management is required provided these habitats stay free from scrub and are ungrazed. If grazing is relaxed significantly, it could spread onto adjacent rocky grasslands (all *Hieracia* present would probably benefit from this).

The only immediate threat to the populations is the continued spread of the alien *Cotoneaster integrifolius* in the quarries at Penwyllt which already requires control. There are no immediate threats to survival of *H. riddelsdellii* at either Craig-y-nos or Llyn y Fan Fach, though longer term intensive grazing will limit the ability of the population to spread.

Two collections of plants grown from seeds are currently being cultivated at the National Botanic Garden of Wales, and seed from 39 plants has been deposited in the Millennium Seed Bank.

ACKNOWLEDGMENTS

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

I would like to thank the Keepers for access to the herbaria and libraries, Wendy Atkinson, Scott Hand, Richard Lester, Lola Lledó, Lindsey Loughtman, Serena Marner, Douglas McKean, Gina Murrell, Peter Sell, Charlie Stirton, Sarah Whild and Leander Wolstenholme for their help, Alan Orange for identifying bryophytes and lichens, Helen Cleal for data on pollen viability, and David McCosh for naming plants and supplying information from the *Hieracium* database.

REFERENCES

ALEXANDER, M. P. (1969). Differential staining of aborted and non-aborted pollen. *Stain Technology* **44**: 117–122.

BRAITHWAITE, M. E. & LONG, D. G. (1990). *The botanist in Berwickshire*. The Berwickshire Naturalists Club, Berwick.

IUCN (2001). *IUCN Red list categories and criteria. Version 3.1*. IUCN, Gland.

LEY, A. (1907). *Hieracium* notes. *Journal of Botany* **45**: 108–112.

LEY, A. (1909). Brecon and West Yorkshire hawkweeds. *Journal of Botany* **47**: 8–16 and 47–55.

PUGSLEY, H. W. (1941). New species of *Hieracium* in Britain. *Journal of Botany* **79**: 177–183 and 193–197.

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. (2004a). *Distribution and conservation of* Hieracium riddelsdellii*, Riddelsdell's Hawkweed.* Unpublished interim report to Countryside Council for Wales.

RICH, T. C. G. (2004b). *Distribution and conservation of* Hieracium riddelsdellii*, Riddelsdell's Hawkweed:* additional information 2004. Unpublished report to Countryside Council for Wales.

RODWELL, J. S. *et al.*, eds. (1991–2000). *British plant communities*. Volumes 1–5. Cambridge University Press, Cambridge.

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.

(*Accepted February 2006*)