

Conservation of Britain's biodiversity: status of the two Wye Valley endemics *Hieracium pachyphyloides*, Carboniferous Hawkweed and *H. vagicola*, Tutshill Hawkweed (Asteraceae)

J. SAWTSCHUK

Université de Bretagne Occidentale – Institut de Géoarchitecture CS 93837 29238 Brest cedex 3, France

and

T. C. G. RICH*

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

ABSTRACT

Reviews of historical data combined with field surveys have been carried out to assess the status of two hawkweeds endemic to the Wye Valley, *Hieracium pachyphyloides* and *H. vagicola*. *H. pachyphyloides* has declined from six sites to one site, and *H. vagicola* from two sites to one site. Both species are 'Critically Endangered' under the I.U.C.N. threat criteria. The main threats are rock climbing, closure of woodland canopies and spread of alien plants. Conservation action is urgently required.

KEYWORDS: endemic, England, I.U.C.N. Threat Criteria, rock climbing, Wales.

INTRODUCTION

There are two *Hieracium* species endemic to the lower Wye Valley on the border between England and Wales, *H. pachyphyloides* (Zahn) Roffey, Carboniferous Hawkweed, and *H. vagicola* P. D. Sell, Tutshill Hawkweed (Sell & Murrell 2006). Both are rare plants about which very little is known, so a review of the historical data has been combined with field surveys to determine their current statuses and needs for conservation, as required under the Global Plant Conservation Strategy (Secretariat for the Conservation of Biodiversity 2002). The data are summarised here; full details can be found in Sawtschuk (2006).

The glaucous-leaved hawkweed in the Wye Valley gorge between Ross and Monmouth now known as *H. pachyphyloides* was known to W. H. Purchas and A. Ley for many years under the name *H. caesium* Fries (Purchas &

Ley 1889). Following the clarification that *H. caesium* was a Scandinavian plant which did not occur in Britain, and that the Wye Valley plants differed from other plants also once referred to *H. caesium*, Purchas described it as *H. murorum* L. var. *pachyphyllum* (Purchas 1895). Williams (1902) raised this variety to species rank as *H. pachyphyllum* but the combination was invalid as that name was already in use for a different European species described by Brenner in 1892. Zahn (1921) treated it as a subspecies of *H. murorum*, selecting the new epithet *pachyphyloides* as the combination *H. murorum* L. subsp. *pachyphyllum* Brenner also already existed. Roffey (1925) then raised it to its current status as a species using Zahn's epithet. It is a member of Section *Hieracium*.

Hieracium vagicola has only recently been described (Sell & Murrell 2006). Plants were formerly included under *H. subbritannicum* (Ley) P. D. Sell & C. West, another endemic of the Wye Valley and South Wales, but differ mainly in the dense stellate hairs on the involucre bracts. It is a member of Section *Stelligera*.

The species are illustrated in Figures 1 and 2, and are described in detail in Sell & Murrell (2006). Key identification features to help separate them from the other glaucous-leaved species recorded in the Wye Valley (*H. schmidtii* Tausch, *H. subplanifolium* Pugsley and *H. subbritannicum*) are for *H. pachyphyloides*, the weakly toothed, truncate-based leaves with numerous pale, simple eglandular hairs abaxially and the greyish-green involucre bracts with many, black-based

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

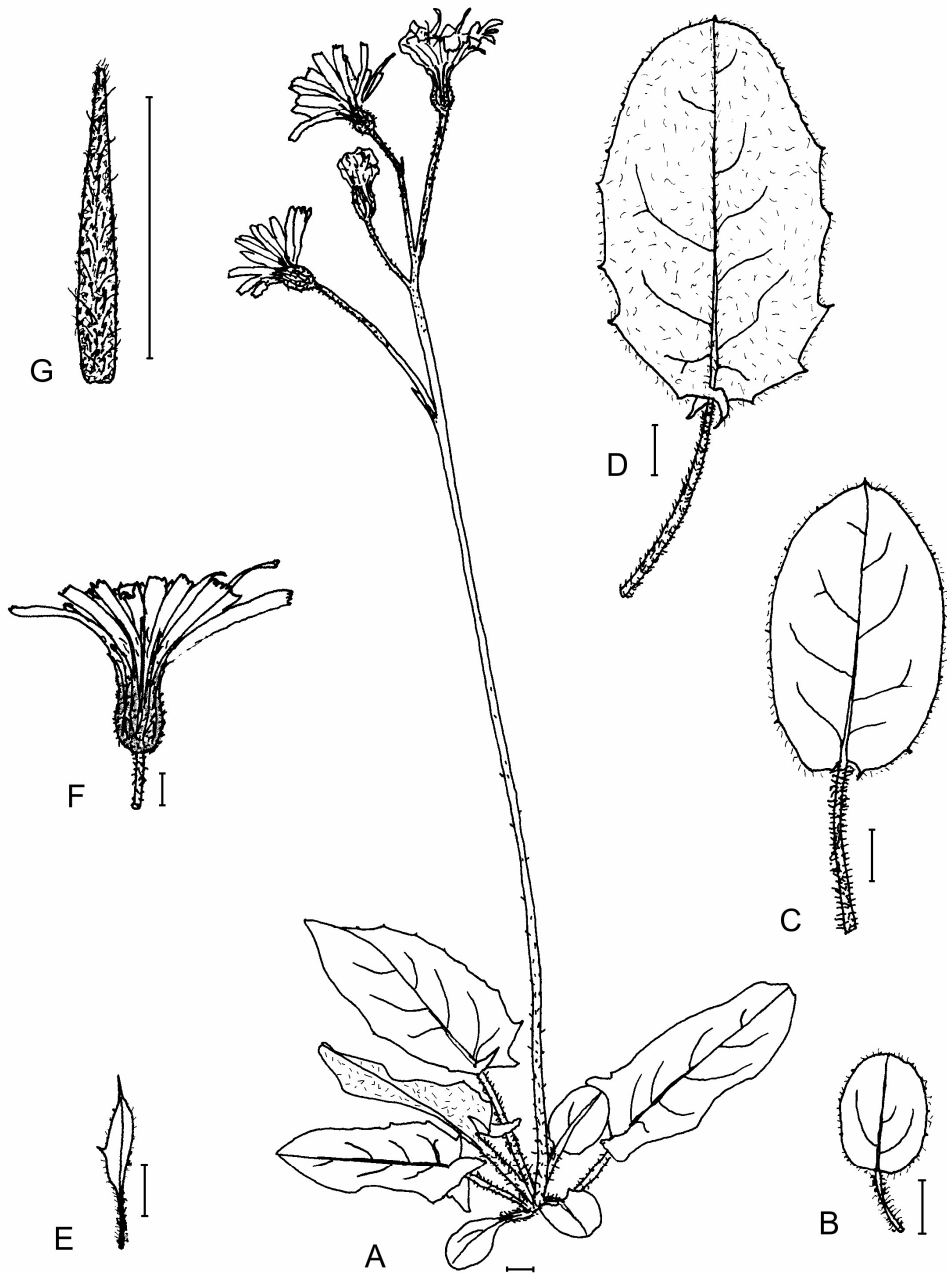


FIGURE 1. *Hieracium pachyphyloides*. A, Whole plant. B-C, Outer rosette leaves, upper surfaces. D, Inner rosette leaf, lower surface. E, Stem leaf. F, Capitulum. G, Involucral bract. Scale bars 1 cm. Del. T. Rich.

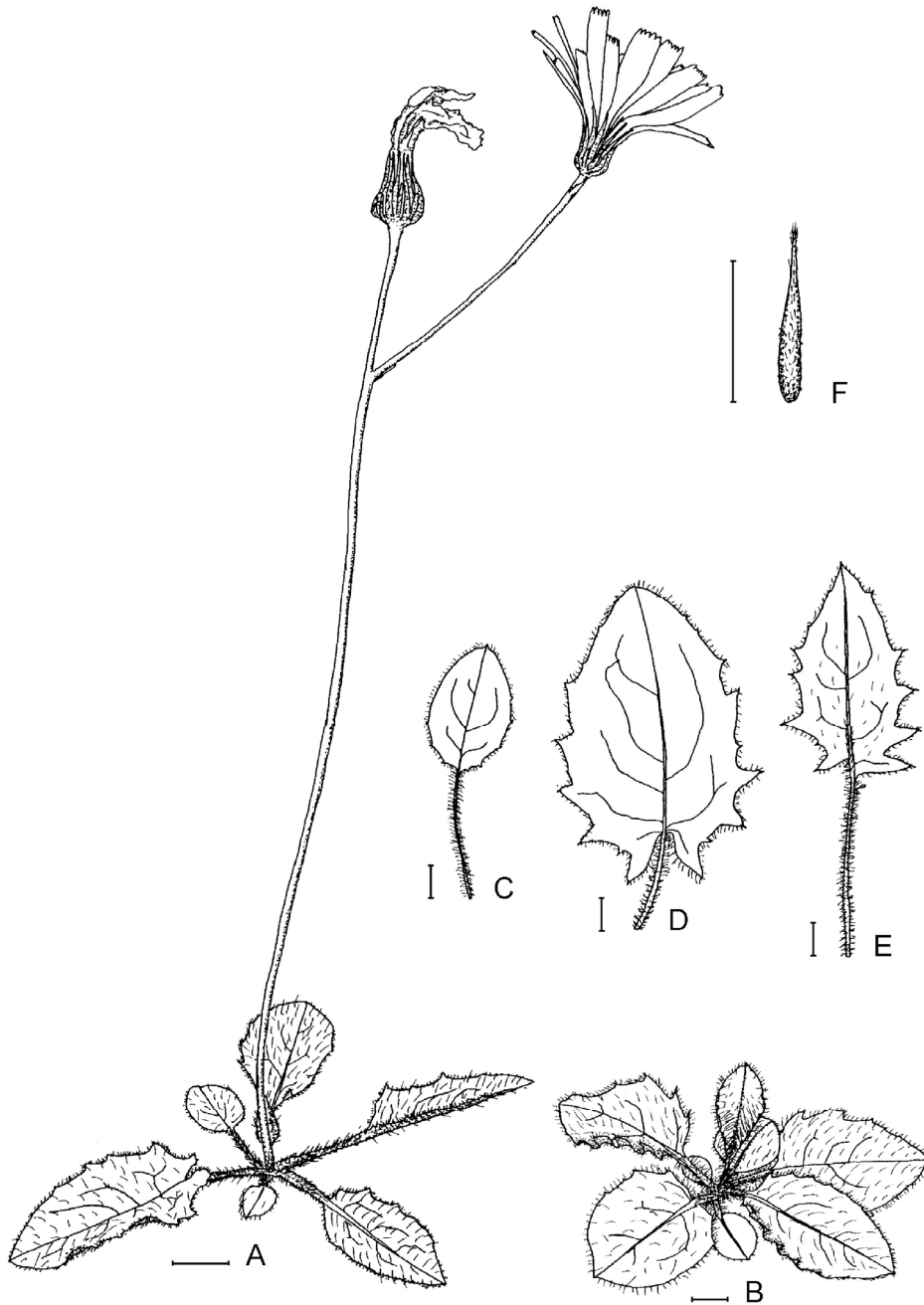


FIGURE 2. *Hieracium vagicola*. A, Whole plant. B, Vegetative rosette. C, Outer rosette leaf, upper surface. D, Inner rosette leaf, lower surface. E, Inner rosette leaf, upper surface. F, Involucral bract. Scale bars 1 cm. Del. T. Rich.

simple eglandular hairs, few glandular hairs and dense stellate hairs, and for *H. vagicola* the slender stems and strongly toothed basal leaves with the lowest teeth on either side somewhat reflexed at the truncate base with few to numerous simple eglandular hairs abaxially, and involucre bracts blackish-green with a long-drawn out filamentous apex and few to numerous simple eglandular hairs and glandular hairs, and dense stellate hairs.

METHODS

Historical data were compiled from herbaria (**BEL**, **BIRM**, **BM**, **CGE**, **E**, **LIV**, **MANCH**, **NMW**), the literature and correspondence with local botanists. The records traced are given in Appendices 1 and 2.

Field surveys were carried out between 2003 and 2007 using the historical records to target areas to search. As both species occur in Carboniferous Limestone cliffs and quarries, they were searched for by walking along the tops and bottoms of the cliffs, and by using binoculars. Some limited climbing with roped access was carried out at Symonds Yat. Access to rocks in one place at Symonds Yat was restricted due to nesting peregrines. Reasons for possible loss of populations and threats to extant populations were assessed in the field. Voucher specimens and photographs have been deposited in **NMW**.

Associated species were recorded in estimated 2 m × 2 m quadrats around the species. 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.

RESULTS

HISTORICAL RECORDS

About 12 populations of *H. pachyphyloides* have been recorded in six localities in three vice-counties (Appendix 1). In three localities it has only been collected once about 100 years ago and all are imprecise or ambiguous. The limestone cliffs near Chepstow on the Gloucestershire side of the Wye could refer to any of the cliffs and quarries from Tutshill to Ban-y-gor rocks. Brockweir Common is disused name for the general area around St Briavels and the Hudnals, an area of hilly pastures (Peterken

2005), and it is not clear exactly where the hawkweed might have occurred as there are no obvious cliffs. The third record 'Bigswear opposite Tintern' is ambiguous as Bigswear is c. 5 km north of Tintern, and cannot be described as 'opposite'; it is possible that the record refers to the Shorn Cliff, opposite Tintern Abbey. The fourth *H. pachyphyloides* locality around Symonds Yat and Coldwell Rocks includes cliffs, quarries and the railway line, where it was frequently collected in several places in this area until the 1960s. It was collected four times at Piercefield Park but has not been seen for over 100 years. It has occurred in several places on the Great Doward, where it was last collected in 1910.

The *H. pachyphyloides* literature record for Stroud in Riddelsdell *et al.* (1948) is best not accepted without a voucher. There is a correctly identified specimen from Pwll Byffre in **BM** which is likely to either be a confused label/specimen or a misidentification (no glaucous-leaved plants were present there in 2004 or 2005 and there are no other collections for this well known site). Records for Ireland refer to *H. basalticola* Pugsley.

Hieracium vagicola has been recorded in two areas in the Tutshill to Ban-y-gor rocks area (Appendix 2). Shoolbred (1920) cited it from Beaucliffe, an old name for Cockshoot, but we have traced no voucher material (a possible specimen in **NMW** is labelled Bannagher [=Ban-y-gor?] cliffs but is not *H. vagicola*). The cliffs and quarries from Pen Moel to Lancaut form one large locality where it has occurred scattered in various subpopulations, and was last recorded in 1984. A record for the Symonds Yat area, whilst plausible, is based on a rather confusingly labelled specimen, and is best rejected.

FIELD SURVEYS 2003–2007

Both hawkweeds grow on cliffs and rocky places which are difficult to search thoroughly, and consequently we made several visits to sites to try to refine the plants in their historic sites (Kéry *et al.* (2006) found between two and four visits were usually required to be fairly certain of refinding rare species). The quality of the historical information does not always make refinding sites simple and we often had to use our intuition about *Hieracium* ecology to find suitable places to search.

Both hawkweeds lost much of their distinctive glaucous leaf coloration later in the season, and we recommend future surveys are carried out in May–June when the glaucous coloration on the early leaves is strong and the plants are flowering.

Hieracium pachyphyloides was refound in three subpopulations of 22, 32 and 19 plants in the Symonds Yat and Coldwell Rocks area, where they had not been recorded for nearly 50

years. It was not refound in the Tutshill to Ban-y-gor rocks area (3 visits), Brockweir Common (3 visits), Bigsweir (2 visits, including Shorn Cliff from below only), Piercefield Park (3 visits) or the Great Doward (7 visits).

Hieracium vagicola was refound in one population of 126 plants at Woodcroft Quarry. It was not refound at Pen Moel (1 visit), Lancaut (2 visits) or Cockshoot, Ban-y-gor (1 visit).

The records are mapped in Figure 3.

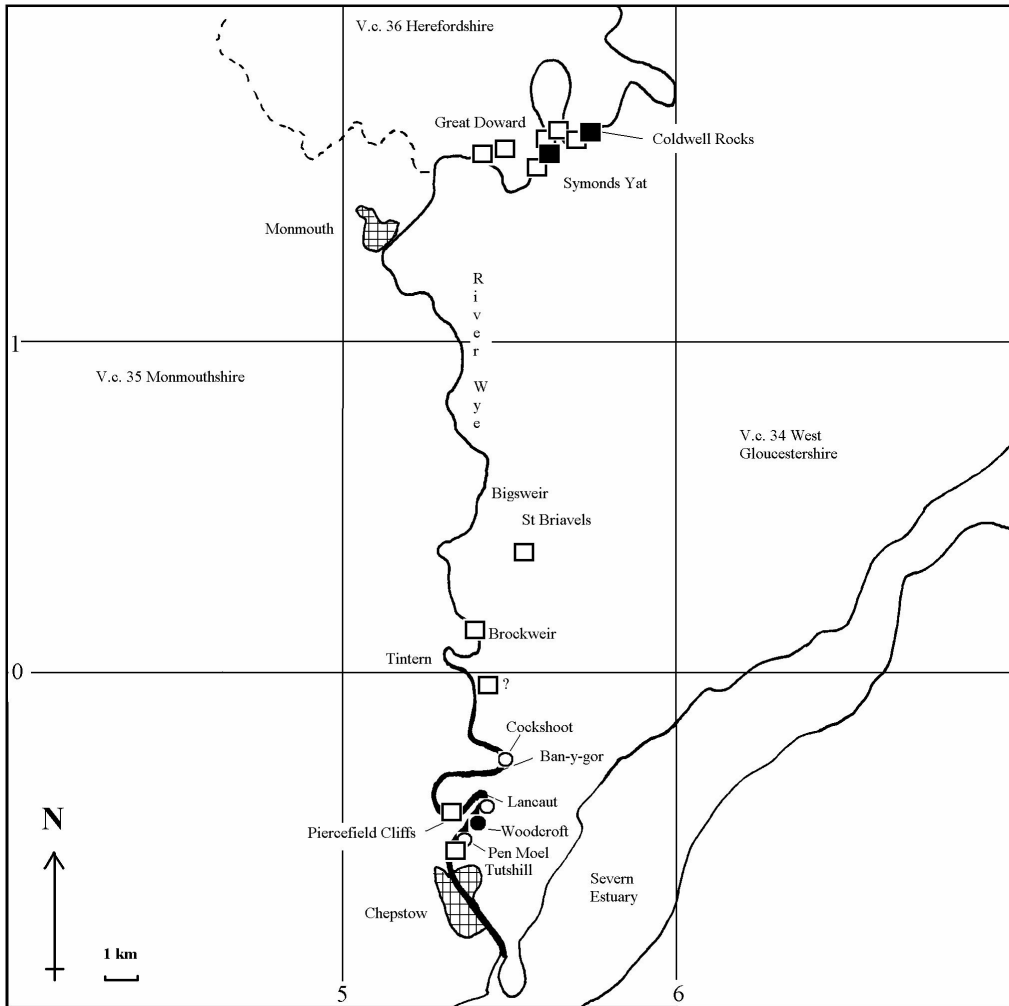


FIGURE 3. Distribution of *Hieracium pachyphyloides* and *H. vagicola* in the Wye Valley. *H. pachyphyloides*: □, old records; ■, 2006. *H. vagicola*: ○, old records; ●, 2006.

HABITATS

Hieracium pachyphyloides occurred in crevices and ledges on vertical Carboniferous Limestone rock faces and on the flatter tops of rocky bluffs. Typical associated herbs included *Asplenium trichomanes* L., *A. ruta-muraria* L., *Geranium robertianum* L., *Melica uniflora* Retz., *Scabiosa columbaria* L. and other *Hieracium* species in scrappy, open, herbaceous vegetation in open woodland. Overall the vegetation is probably best attributed to the W8g *Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis* woodland *Teucrium scorodonia* subcommunity of Rodwell (1991). Although this is a woodland community, the hawkweed is a light-demanding species which does not tolerate shade and is only found in the more open areas. Two soil pHs measured were pH 6.5 and 7.2.

Hieracium vagicola occurred in crevices and ledges on vertical Carboniferous Limestone rocks and on quarry spoil heaps. Associated species included *Bromopsis erecta* (Huds.) Fourr., *Festuca ovina* L. and *Scabiosa columbaria* L. The more natural crevice vegetation is probably best referred to the OV39 *Asplenium trichomanes* – *A. ruta-muraria* community of Rodwell (2000) but we have been unable to access it safely to record it in detail. On the quarry spoils heaps *H. vagicola* occurs in a disturbed, open, scrappy scrub community of *Fraxinus excelsior* L., *Ligustrum vulgare* L., *Rosa* spp. and *Buddleja davidii* Franch., probably best included in the W21d *Crataegus monogyna*-*Hedera helix* scrub, *Viburnum lantana* subcommunity of Rodwell (1991). The soil from a spoil heap was pH 7.1.

DISCUSSION

The field survey showed that *Hieracium pachyphyloides* has declined from six sites to one site, and *H. vagicola* from two sites to one site. Both species could occur elsewhere on the vast areas of cliff in the Wye Valley which we have not surveyed as there are no historical records.

Both species can be classified under the I.U.C.N. (2001) threat criteria as 'Critically Endangered' due to their small, declining populations and clear, continuing threats to their survival. Although much of the Wye Valley has numerous nature conservation designations at national (S.S.S.I.) and international (S.A.C.) level and large-scale

conservation projects such as the Ravine WoodLIFE project, the designations will do nothing to protect either species; specific conservation action is urgently required for both.

The probable major reason for loss or decline of both *Hieracium* species from many of the wooded cliffs, quarries and railway lines is shading due to closure of canopy by trees or by scrub invasion. Historically the woodlands in the Wye Valley would have been managed, with the coppicing and clearance regularly creating suitable open habitat for many light-demanding species such as *H. pachyphyloides* and *H. vagicola*. Old photographs of the Wye valley (Helme 1989; Rainsbury 1989) show some of the rocks and cliffs, especially around Symonds Yat and at Pen Moel, to have been much more open in the past when the areas were quarried or managed. Some scenic pathways giving access to areas such as Piercefield or Coldwell Rocks are no longer maintained for the views and have shaded over. To what extent both hawkweeds have been lost directly due to quarrying of their limestone rock habitat is unclear, but both have benefited at least temporarily from the open conditions created by quarrying. The cessation of quarrying has allowed scrub and woodland to reinvade and has resulted in loss. *Hieracium pachyphyloides* was also lost from the Great Doward quarry by infilling after quarrying had ceased. The closure of the Wye Valley railway has allowed scrub invasion of the cuttings (previously kept open to minimise fire risk) where *H. pachyphyloides* once occurred. The reason for loss from the Brockweir Common area is not known but it could have been a transient population.

There are two immediate threats to survival of *H. pachyphyloides*. First, the continuing closure of the canopy which will cause further loss by shading at Coldwell Rocks. Second, two subpopulations at Symonds Yat are seriously endangered by, yet partly maintained by, rock climbing. Climbing is very popular at Symonds Yat (Willson 1999) and during the good weather there are regularly large groups of school children on adventure activities during the week, and literally hundreds of recreational climbers may be present at the weekends. On the one hand the climbers trample the vegetation (including *H. pachyphyloides*) underfoot and sometimes very locally remove plants from the cliff faces (McMillan & Larson 2002; Müller *et al.* 2004;

Kuntz & Larson 2006), but on the other hand they help to maintain the cliff bases and tops open by their access paths. The balance between damage and benefit is very fine. Stopping the climbing activities completely would probably result in the plants being shaded out within a few years. The best way to protect *H. pachyphyloides* in this area is to regularly monitor the populations and work with the rock climbing community to control access to specific climbs when threats are perceived.

There are three main threats to *H. vagicola*. First, climbing, which is not as popular at Woodcroft Quarry as at Symonds Yat, and does not include school groups. At this quarry, the forth-coming fourth edition of Willson's (1997) climber's guide will specifically mention *H. vagicola* with a request for its conservation and advise climbers of its occurrence including re-routing of some climbs. Second, further development of the quarry, which still has extant extraction permissions, could result in further loss. The quarry is excluded from the Lower Wye Gorge S.S.S.I. and thus *H. vagicola* is very

vulnerable. Third, spread of alien plants such as *Buddleja* or *Cotoneaster microphyllus* Wallr. which are both already well-established in the quarry.

Further work is required to ensure ex-situ conservation of both these hawkweeds. A small batch of seed material of *H. pachyphyloides* has been deposited in the Millennium Seed Bank. One plant of *H. vagicola* is currently held in cultivation.

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APPENDIX 1. HISTORICAL RECORDS OF *HIERACIUM PACHYPHYLLOIDES*

V.C. 34 WEST GLOUCESTERSHIRE

Near Chepstow (ST59). Limestone cliffs and quarry base, Gloucestershire side of Wye, near Chepstow, 18 September 1893, W. A. Shoolbred (NMW).

Brockweir (SO50). Brockweir Common, wood, 20 June 1894, W. A. Shoolbred (NMW).

Bigswear (SO50). Bigswear, opposite Tintern, July 1911, H. J. Riddelsdell (BM).

Symonds Yat (SO51). Symonds Yat, 7 June 1889, A. Ley (BM, CGE). Symonds Yat, 26 May 1896, A. Ley (BM, Set of British *Hieracia* no. 64). Symonds Yat, limestone rocks above the station, 12 May 1894, A. Ley (BM, NMW, CGE). Symonds Yat, May 1894, Captain Steuart (NMW). Symonds Yat, May 1894, A. Ley (BM). Symonds Yat, 12 June 1901, E. S. Marshall (CGE). Symonds Yat, 30 May 1904, A. Ley (LIV, NMW). Symonds Yat, railway bank, 30 May 1904, S. H. Bickham & A. Ley (BM, CGE). Symonds Yat, 17 June 1904, E. F. Linton (Set of British *Hieracia* no. 64. LIV, NMW). Symonds Yat, railway bank, 22 May 1905, S. H. Bickham (BM, LIV). Symonds Yat, bank the station, 22 June 1908, A. Ley (BM). Symonds Yat, 28 May 1913, H. J. Riddelsdell (BM, NMW, CGE, Riddelsdell *et al.* 1948). Symonds Yat, railway bank, August 1922, H. S. Redgrove (BM). Symonds Yat, near station, 2 June 1953, J. E. Raven (CGE, herb. McCosh). Symonds Yat, railway bank near station, 14 June 1953, C. A. E. Andrews (BIRM). Symonds Yat, north side of railway, east end of tunnel, May 1956, C. A. E. Andrews (BIRM). Symonds Yat, 2 June 1956, F. R. Browning (E). Symonds Yat, 17 June 1962, cutting at E. end of Symonds Yat Railway tunnel, B. A. Miles (CGE). Symonds Yat, bank of disused railway (cultivated), 5 July 1964, J. N. Mills (MANCH).

Coldwell Rocks (SO5616). Coldwell Rocks, 1847, W. H. Purchas (Purchas & Ley 1889).

Coldwell Rocks, 23 June 1868, on the Wye, W. H. Purchas (CGE). Coldwell, near Lydbrook, 9 June 1886, A. Ley (CGE). Coldwell, limestone rocks, 5 June 1890, A. Ley (BM). Coldwell, quarry, 13 June 1899, A. Ley (BM).

V.C. 35 MONMOUTHSHIRE

Piercefield (ST59). Piercefield, limestone cliffs above the Wye, 5 May and 3 September 1893, W. A. Shoolbred (NMW; Wade 1970). Piercefield Cliffs, June 1894, W. A. Shoolbred (NMW). Piercefield, limestone cliff, 4 June 1897, W. A. Shoolbred (BM).

V.C. 36 HEREFORDSHIRE

Great Doward (S051). Great Doward, limestone debris, B. Watkins, 1868 (Purchas & Ley 1889).

Great Doward Quarries, on the limestone debris in the Great Quarry, 20 June 1881, 28 June 1881, and lime point near the Quarry Limestone, 8 June 1886 A. Ley (CGE). Great Doward Hill, 2 June 1882, A. Ley (BM). Great Doward Quarries, 2 June 1882, A. Ley (BIRM). Great Doward Hill, 10 June 1889, F. J. Hanbury (BM). Great Doward Quarries, 9 June 1886, A. Ley (CGE). Great Doward Hill, rocks about the caves, 7 June 1889, A. Ley (CGE). Great Doward Hill, limestone, 12 July 1889, F. J. Hanbury (BM). Great Doward, rocks near the King Arthur's cave, 9 October 1893, A. Ley (CGE). Great Doward, in the quarry, 12 May 1894, A. Ley (CGE, BM, LIV, NMW; Purchas & Ley 1889). Great Doward, 31 May 1897, E. F. & W. R. Linton (CGE, LIV). Great Doward, limestone quarries, 31 May 1897, A. Ley (BM, LIV, NMW; Set of British *Hieracia* no. 64). Great Doward, May 1889, E. Armitage (NMW). Great Doward Hill, 21 May 1902, A. Ley (BM, LIV). Great Doward Hill, 10 June 1902, A. Ley (NMW). Great Doward Hill, August 1903, H. J. Riddelsdell (BM). Doward, May 1904, E. Armitage (NMW). Great Doward, 22 May 1905, A. Ley (LIV). Great Doward, 1 June 1910, H. J. Riddelsdell (BEL, BM, CGE, NMW).

DOUBTFUL RECORDS:

Stroud, banks near, v.c. 34 West Gloucester (Riddelsdell *et al.* 1948).

Pwll Byffre, v.c. 42 Breconshire, 10 July 1929, H. J. Riddelsdell (BM); possibly a confused label.

APPENDIX 2. HISTORICAL RECORDS OF *HIERACIUM VAGICOLA*

V.C. 34 WEST GLOUCESTERSHIRE

Cockshoot, Ban-y-gor (ST59). Beaucliffe (Shoolbred 1920).

Lancaut (ST59). Lancaut cliffs (Shoolbred 1886, 1920). One plant (as *H. subbritannicum*), 10 June 1984, *Hieracia* Study Group (*Hieracia* Study Group 1985).

Pen Moel (ST59). Pen Moel, limestone cliffs and debris under quarry, 25 June 1891, 8 July 1891, 5 May 1893, 16 May 1894 and 27 August 1895, W. A. Shoolbred (**BM**, **CGE**, **NMW**; Shoolbred 1886, 1920). Pen Moel cliffs, 26 June 1895, E. S. Marshall (**CGE**). Pen Moel rocks, 6 September 1900, A. Ley (**BM**, **CGE**, **NMW**; Set of British *Hieracia* no. 136). Pen Moel, 12 June 1913, W. C. Barton (**BM**). Pen Moel, rocky bank by road, 31 July 1916, L. B. Hall (**BM**). Pen Moel, rocks by roadside, 30 July 1920, C. E. Salmon (**BM**). Pen Moel cliffs, below, 24 June 1932, H. W. Pugsley (**BM**). Pen Moel, 1958, C. West (cultivated as H.105, **CGE**).

Woodcroft (ST59). Woodcroft (Shoolbred 1920). Woodcroft, August 1922, H. S. Redgrove (**BM**). Woodcroft, bank at, 24 June 1932, H. W. Pugsley (**BM**). Woodcroft, ST540960, 1958, P. D. Sell (**CGE**).

DOUBTFUL RECORDS:

Symonds Yat, date 'forgotten' with 1 June 1895 added later, A. Ley (**BM**; sheet has a series of mixed and confusing labels).