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Conservation of Britain's biodiversity: Status of the rare English endemic *Hieracium surrejanum* (Surrey Hawkweed; Asteraceae)

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Abstract
Hieracium surrejanum F.Hanb., Surrey Hawkweed, is a rare endemic confined to Surrey and Sussex in South-east England. Lectotypes for *H. surrejanum* and var. *megalodon* E.F.Linton are designated. The two varieties were compared and were found not to merit separation. A review of the herbarium, database and literature records indicated 13 confirmed sites and 12 unconfirmed or rejected sites. A field survey of all sites in 2025 found 1481 plants in 5 populations with 88% of the total population in one site; it was not refound in 8 sites (61% decline). It is a woodland edge species mostly occurring on roadside banks and cuttings on free-draining, mildly acid soils in partially shaded situations. It qualifies as IUCN threat status 'Vulnerable' under Criterion B2ab(iv).

Keywords: IUCN threat status; lectotype

Introduction

In 1889, the Reverend Edward S. Marshall discovered an unusual *Hieracium* near Witley, Surrey. Hanbury (1894) described it as a new species *H. surrejanum* F.Hanb. after the two Swedish *Hieracium* experts C.J. Lindeberg and M. Elfstrand had commented that they did not recognise it. Hanbury distinguished it from *H. vulgatum* Fr. (i.e. what is now *H. triviale* (Norrl.) Norrl. in Britain sensu Tyler, 2014) by it having short, broad, obtuse leaves, almost pure yellow styles and broad involucres with black-based simple hairs, few stellate hairs and few glandular hairs.

In January 1901, E.F. Linton distributed material of *H. surrejanum* in the sixth fascicle of the *Set of British Hieracia (1896, etc.)* as no. 147 from the east side of Hindhead (Marshall's original site; numerous specimens in **BM**, **CGE**, **E**, **K**, **OXF**, **NMW** and **RNG**) together with an un-named form as *Set of British Hieracia (1896 etc.)* no. 148 from Brook Rocks, Surrey (**BM**, **CGE**, **E**, **K**, **OXF** and **NMW**; these are incorrectly cited as *Sets* 146 and 147 respectively in Linton, 1901). Linton (1901) named this form var. *megalodon* E.F.Linton (meaning 'large-toothed') which he stated differed in having more coarsely dentate leaves and paler heads than the type. Williams (1902) pointed out the descriptions were so short they did not characterise the varieties well.

Hanbury (in Babington, 1904) gave more characters including the stem leaves being broader, with the rosette leaves being rounder with longer petioles. W.R. Linton (1905) also gave additional characters but included material from the Fleet, Brookwood and Fittleworth which are now separated as *H. mammidens* P.D.Sell (Rich, 2024a). Pugsley (1948) noted that at Brook Rocks, varying forms occurred connecting the var. *megalodon* with the type variety, and thereafter the variety has not been accepted (Sell & Murrell, 2006).

Shaw (2020) provided an excellent detailed account of *H. surrejanum* and augmented the description of Sell & Murrell (2006). He noted that *H. surrejanum* is readily distinguished from other section *Vulgata* (Griseb.) Willk. & Lange hawkweeds in S.E. England by the combination of obtuse, broad (up to 1.7 mm wide) phyllaries, broad leaves and pure yellow styles. A summary of the key identification features is given in Figure 1.

There are several other species with which *H. surrejanum* has been confused. The closely-related *H. mammidens* has more sharply dentate leaves, numerous stellate hairs under the stem leaves, numerous glandular hairs on the peduncles and involucral bracts, and hairy ligule tips in bud. *Hieracium lepiduloides* McCosh differs in having narrower leaves, predominantly glandular-hairy bracts and discoloured styles. *Hieracium kentii* P.D.Sell (Section *Hieracium*) is broadly similar in both appearance and habitat but differs in having usually only 1 (occasionally 2) stem leaf, narrowly acute bracts with dense glandular hairs and slightly discoloured styles. Pugsley (1948) noted *H. surrejanum* is similar to the French *H. asperatum* Jord. ex Boreau but that, as understood by Sell & Murrell (2006), has spotted leaves.

The aim of this paper is to present the results of a taxonomic review of the infraspecific variants, a review of the historical records with a field survey of all sites, and an updated IUCN (2012) conservation assessment. Although most of the Sussex sites were recorded by M. Shaw for the recent *Flora of Sussex* (Abraham *et al*., 2018), there had been no records from Surrey since 1983 (Leslie, 1987) as the 1990 record in Sankey *et al*. (2024) is now unconfirmed.

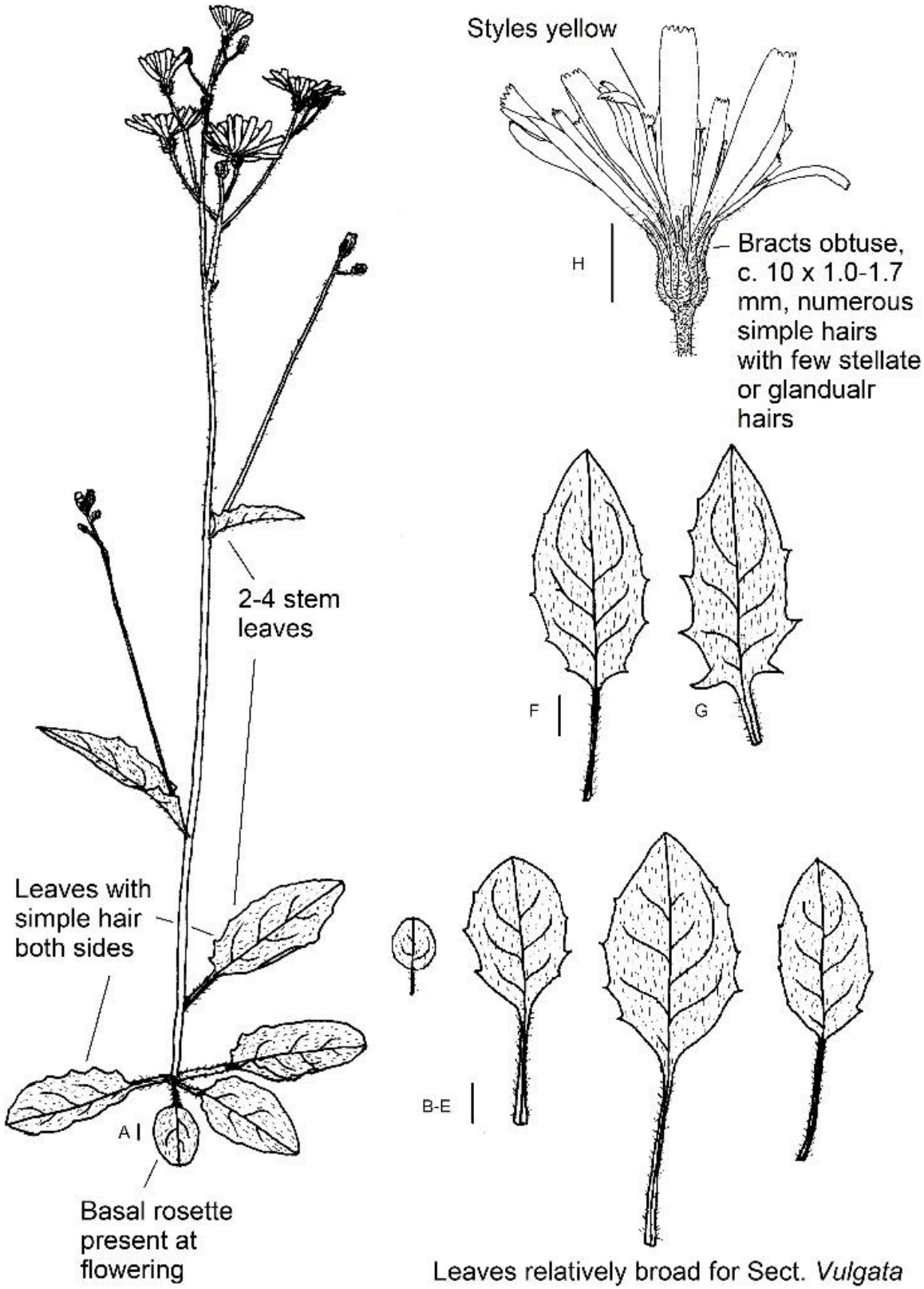

Figure 1. Summary of key identification features of *H. surrejanum*. A, plant. B-E, basal rosette leaves from outer to inner (below Hindhead). F, lower stem leaf of var. *surrejanum* (below Hindhead). G, lower stem leaf of var. *megalodon* (Brook Rocks). H, capitulum (Woolbeding). Scale bars 1 cm. Del T. Rich.

Methods

Data sources

Records were compiled from herbaria (**BM**, **CGE**, **E**, **K**, **HME** (no material traced), **MNE**, **OXF**, **NMW**, **RNG**, **SLBI**), D. McCosh's *Hieracium* database, M. Shaw's database (as used for Shaw, 2020), the BSBI Distribution Database, Herbaria@home, Surrey and Sussex Floras (e.g. Wolley-Dod, 1937; Salmon, 1931; Lousley, 1976; Leslie, 1983; Briggs, 1990; Abraham *et al*., 2014), newsletters and other literature, and correspondence with original recorders.

The records were reviewed carefully, with those determined by the *Hieracium* experts D. McCosh, M. Shaw, R.C. Stern and C. West accepted. Records supported by vouchers were also checked and accepted, though variations in the way duplicates are labelled meant it is not always clear if localities cited differently refer to one or more sites. For example, W.C. Barton collected specimens from 'north of Bexleyhill Common', 'roadside north of Bexleyhill Common', and 'north of Lodsworth' on 30 August 1918; the latter is assumed to be a different locality although Bexleyhill is in Lodsworth parish and is also north of Lodsworth. Records without vouchers were harder to deal with unless from known sites. For example, there are five Surrey Flora Committee (SFC) records for 1987 in the BSBI database which lack voucher specimens and where it has not been refound in the field; there is also a note in the SFC newsletter that *H. surrejanum* was not repeatedly seen in 1987 as had been thought (Surrey Flora Committee, 1988), and the one specimen traced from this time has been redetermined as *H. argillaceum* (**NMW**, ex herb. E.J. Clement); these SFC records are treated as unconfirmed.

In total, 68 records were accepted representing 13 sites in VC13 West Sussex and VC17 Surrey; the records are listed in Appendix 1 and were used to direct selection of lectotypes and the field work.

Comparison of H. surrejanum var. surrejanum and var. megalodon

Images of *H. surrejanum* from the *Set of British Hieracia (1896 etc.)* no. 147 from Hindhead (i.e. var. *surrejanum*, 25 individual plants on 11 herbarium sheets) were compared against var. *megalodon* syntypes in the *Set of British Hieracia (1896 etc.)* no. 148 from Brook Rocks (27 plants on 16 sheets) and with all other material collected at Brook Rocks (49 plants on 26 sheets).

As not all specimen images had scales, the following relative characters, which reflect the different characters attributed to the varieties, were scored on one lower stem leaf of each of 20 plants:

1. Lamina length:width (excluding teeth) ratio.
2. Widest point along leaf lamina (excluding teeth).
3. Lamina to petiole ratio.
4. Number of teeth on margin.
5. Size of largest tooth relative to leaf width.

Basal rosette leaves were found to be too variably preserved to be worth analysing, and the colour of the capitulum was not quantifiable on old specimens of varying quality.

To compare variation in relative leaf tooth width in a living population, the leaf length, width and longest tooth length were measured on 75

randomly selected plants at *c.*0.5 m intervals along the verges at Woolbeding on 13 July 2025.

Data were analysed in PAST version 5.2.2 April 2025 (Hammer *et al.*, 2001) using non-parametric tests as all the data were skewed.

Field population surveys

All sites were visited once, twice or three times between April and July 2025, mostly in May when few other hawkweeds were in flower to make finding *H. surrejanum* easier. Once populations were found, flowering and vegetative plants were counted systematically. Soil pH was measured in soil samples as a 50:50 by volume slurry of soil:tap water using a calibrated Preciva ATC pen pH meter (model PH320001). Full details of the field survey are available on request.

Conservation status

Conservation status was assessed following the version 3.1 IUCN (2012) criteria (Stroh *et al.*, 2025). Only plants in flower were assumed to be mature for assessing effective population size.

Results

Taxonomy

Lectotypification of *H. surrejanum* F.Hanb.

No type specimen was indicated when Hanbury described *H. surrejanum* as this was not a requirement at the time. An appropriate specimen with comments from Hanbury and Lindeberg is already anonymously labelled as a type in herb. Hanbury (**BM** no. 000052214) but as this selection is unpublished and unattributed it is hereby designated as the lectotype. The lectotype is labelled "banks bordering a copse, on the edge of the Wealden [clay] and lower greensand, near Witley, Surrey, 4 June 1889, E.S. Marshall no. 480". Two isolectotypes, also Marshall's no. 480, differ in labelling: one is labelled "Wealden bank, below Hindhead" (**BM** no. 000052833), and one in **herb. E.S. Marshall** differs in labelling again "copse-bank, lane near 'Creed Hole' near Witley" (**CGE** no. 06006). Shaw (2020, his Figure 193) gives an illustration of the latter specimen as the holotype based on a 1998 label by P.D. Sell, but the specimen is not the original material seen by Hanbury so cannot be the holotype.

My interpretation of the 'near Witley' locality from the three different labels for the one collection is that it is near Creedhole Farm at grid reference *c.*SU9036 at the western end of Witley parish on the east side of Hindhead, where the Hythe Sandstone of the Lower Greensand meets the Wealden Clay, rather than actually near the village of Witley 5 km to the north-east. E.S. Marshall was curate at Witley 1884-1890, and Vicar at the adjacent parish of Milford 1890-1900 and also collected *H. surrejanum* at High Button above Creedhole in 1897 (**BM**) in what is presumably the same site (it still occurs at High Button today). Shaw (2020) was unable to trace Creedhole, probably due to the distance of this site from Witley village itself.

Lectotypification of H. surrejanum *var.* megalodon *E.F.Linton*
In his description of var. *megalodon*, Linton (1901) cited the *Set of British Hieracia (1896 etc.)* no. 148 from Brook Rocks, Surrey. From the 16 exsiccatae traced, the sheet from this *Set* in **herb. E.F. Linton** (**BM** no. 016135511) is hereby designated as the lectotype. The other sheets in this *Set* are isolectotypes (**BM**, **CGE**, **E**, **K**, **OXF**, **NMW**).

Comparison of H. surrejanum *var.* surrejanum *and var.* megalodon
Silhouettes of lower stem leaves from var. *surrejanum,* var. *megalodon* and other material from Brook Rocks are shown in Figure 2 with a plot of largest tooth length relative to leaf width in Figure 3. The leaves of var. *surrejanum* in *Set of British Hieracia (1896 etc.)* 147 (Fig. 1A, 2A) are generally weakly toothed compared to the more strongly toothed leaves of var. *megalodon* in *Set of British Hieracia (1896 etc.)* 148 (Fig. 1B, 2A) but both sets show variation. Mann-Whitney tests show that var. *surrejanum* indeed differs from var. *megalodon* in having smaller teeth ($p<0.00003$) and leaves widest 42% of way along leaf *vs* 47% of way along leaf ($p=0.014$) but does not differ in leaf length:width ratio, lamina to petiole ratio or number of teeth.

However, when other material from Brook Rocks is considered, this shows a much larger range of toothing present in the Brook population from scarcely toothed to strongly toothed spanning both varieties (Fig. 2C, Fig. 3). This suggests that strongly toothed plants were deliberately selected for the *Set of British Hieracia (1896 etc.)* no. 148 from a variable population.

set 147 surrejanum var surrejanum - one lower stem leaf from each plant

Set 148 surrejanum megalodon - one lower stem leaf from each plant

surrejanum, Brook Rocks random selection, one lower stem leaf per plant

Figure 2. Silhouettes of lower stem leaves of *H. surrejanum* from herbarium material, one leaf from each plant (n= 20 for each group). A, var. *surrejanum* from *Set of British Hieracia (1896 etc.)* no. 147, Hindhead. B, var. *megalodon* from *Set of British Hieracia (1896 etc.)* no. 148, Brook Rocks. C, Other material collected at Brook Rocks.

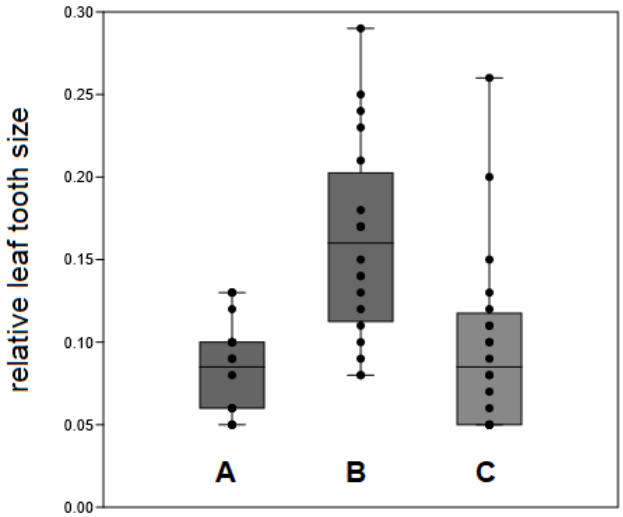

Figure 3. Box plots (mean and 1 standard error with data points, n= 20 for each group) for largest leaf tooth size relative to leaf width in *H. surrejanum* herbarium material. A, var. *surrejanum* from *Set of British Hieracia (1896 etc.)* no. 147, Hindhead. B, var. *megalodon* from *Set of British Hieracia (1896 etc.)* no. 148, Brook Rocks. C, Other material collected at Brook Rocks.

There are now so few plants remaining at Brook Rocks in a dangerous situation on the A286 bank that it is not practical to assess variation in toothing within the population, so all the Brook Rocks data from historic herbarium material were lumped and compared with tooth measurements from the large existing population at Woolbeding in 2025 (Fig. 4). Whilst the Brook Rocks data show bimodality resulting from selection (as above), the Woolbeding population shows positively skew continuous variation, and a large overlap with the Brook Rocks population. It would have been possible to select only large-toothed plants at Woolbeding to produce a similar skew to that seen at Brook Rocks. It is evident from the herbarium material that small- and large-toothed plants are present in most populations and that the variation is more or less continuous. Thus, as suggested by Pugsley (1948) from his field examination of the Brook Rocks population in 1922, there is no merit in recognising the varieties.

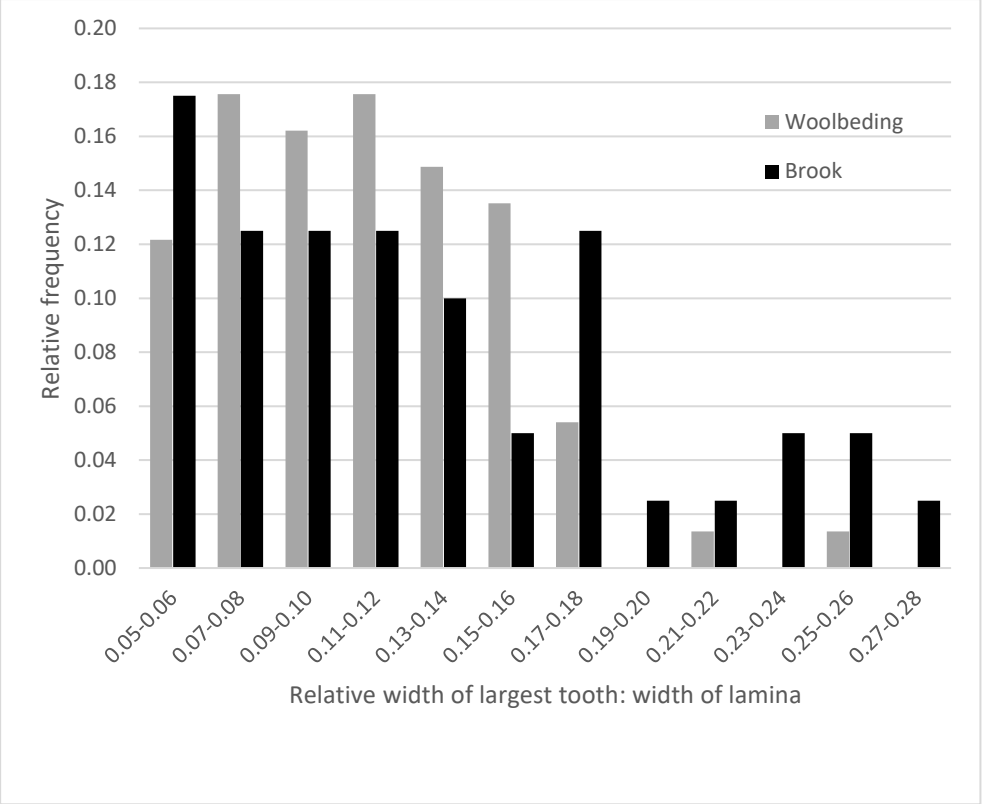

Figure 4. Histogram of relative largest tooth size on lowest stem leaf for Brook Rocks (n=40) and Woolbeding (n=75) plotted as relative frequency to allow comparison of the different sample sizes.

Distribution and population sizes

Bedham (VC13)
Hieracium surrejanum was first recorded on Bedham Hill in 1938 by P.M. Hall and E.C. Wallace and has probably occurred on several roadsides around Bedham, most recently 2018 when about 20 plants occurred over a few square metres on the shaded road bank at Mockbeggars.

In July 2025, one possible vegetative rosette of *H. surrejanum* was seen at the Mockbeggars location photographed by M. Shaw in 2018, though the road bank has slumped since he saw it. There were two flowering and two vegetative *H. sylvularum* Jord. ex Boreau plants nearby, so the vegetative rosette will require verification when it flowers.

Bexleyhill (VC13)
It was first recorded on the roadside north of Bexleyhill Common in 1912 by C.C. Lacaita and was seen most recently by C. West in 1970. In 2025, no *H. surrejanum* plants were found on two visits on roadsides or adjacent paths, where only one plant of *H. sabaudum* was seen. *Hieracium trichocaulon* (Dahlst.) Johanss. and *H. kentii* were present immediately west of Bexleyhill hamlet.

Blackdown (VC13)
It was found once near Blackdown House in 1925 by J.E. Little. In 2025, no *H. surrejanum* plants were found on the roadsides or adjacent paths near Blackdown House (now renamed Blackdown Court), though one plant of *H. kentii* was present and is also recorded further north-west along Fernden Lane.

Byworth (VC13)
It was found once on the road embankment west of Highhoes Copse in 2006 by F. Abraham. In 2025, no *H. surrejanum* plants were found though young *H. cf. cantianum* F.Hanb. and *H. sabaudum* L. were present.

Chithurst (VC13)
It was found once on the road cutting near Hammer Pond in 1990 by J. Bevan (**OXF**). In 2025, no *H. surrejanum* or other hawkweeds were found.

Henley (VC13)
It was first found on a roadside at Verdleyhill, Henley in 1982 by R.C. Stern, who demonstrated it on the *Hieracium* Study Group meeting in 1983 (Stern, 1985) and also recorded it again in 1984. In 2025, no *H. surrejanum* plants were found either along the A286 (*H. trichocaulon* and *H. lepiduloides* were present) or the minor roads at Henley or in adjacent woodlands.

Lavington Common (VC13)
It was found once on the roadside at Lavington Common in 2012 by F. Abraham. In 2025, no *H. surrejanum* or other hawkweeds were found.

Lodsworth (VC13)
It was found once north of Lodsworth in 1918 by W.C. Barton (this site might relate to Bexleyhill, cf. above). In 2025, no *H. surrejanum* plants were found along road verges north of Lodsworth or around Leggatt Hill, though the exact site is not known.

Midhurst (VC13)
A 1945 record by P. Taylor from Midhurst (**K**) could relate to Midhurst itself (which would be the only record) or possibly refer to the known sites nearby at Bexleyhill, Henley or Woolbeding depending on how specific Taylor's locality was. No sites are currently known in the immediate vicinity of Midhurst.

Petworth Old Station (VC13)
It was first recorded on the River Rother bridge by the disused Petworth Station in 1957 (the station closed in 1955) by C. West (a typographical error in Shaw 2018 incorrectly cites a 1983 Hieracium Study Group record as 1883). It has been recorded there regularly since, being one of the two *H. surrejanum* sites recommended to visit by Shaw (2020).

In April 2025, 37 *H. surrejanum* rosettes were counted, mostly on the west side of the bridge. The plants were flowering in June 2025 when 23 were counted (22 flowering, 1 vegetative) but due to growth of ivy and bramble on

the bridge they were difficult to count clearly so the April count is used. There are also records for *H. lepiduloides* (**K**) and *H. erubescens* from this bridge but only *H. surrejanum* could be found in 2025.

Woolbeding Wood (VC13)
This site on Stedham Lane on the north side of Woolbeding Wood was first found in 1907 by T. Hilton, and has been variously cited as Stedham, Stedham Mill and Woolbeding. I have known the *Hieracium* here since 1981 but have only been aware that they were *H. surrejanum* since 2012.

In May 2025, 1312 plants (1184 flowering or in bud, 127 vegetative) plants occurred over *c*.220 m of roadside with *H. trichocaulon* and *H. sabaudum*.

Brook Rocks (VC17)
This site on the sandstone rocks both sides of the A286 on the hill immediately north of Brook was first found in 1896 by E.S. Marshall and is the best known and most frequently collected site (e.g. Salmon, 1931; Lousley, 1976), with the most recent unambiguous record from 1983 (Leslie, 1987).

In May 2025, 31 plants (24 flowering or in bud, 7 vegetative) were found during a rapid survey of this narrow, dangerous section of the A286; there could be more present but the site is difficult to survey safely.

Creedhole/High Button (VC17)
This was the original 'near Witley' site found in 1889 by E.S. Marshall (cf. lectotypification above) and probably encompasses other vaguely cited records such as 'east side of Hindhead'/'below Hindhead'. It is assumed that Marshall's records for 'lane near Creedhole and High Button' refer to the same site. The most recent record traced was in 1953 by C. West (**MNE**).

In April 2025, 107 plants were counted on a woodland bank at High Button. In June 2025, 105 plants were counted of which only 24 were flowering as most of the population had been strimmed. *Hieracium trichocaulon* and *H. sabaudum* were also present.

Witley (VC17)
There are numerous records for 'Witley', for example, Marshall's original 1889 'near Witley' is actually at Creedhole, G.C. Druce cited 'near Witley' on most herbarium material or Jackson (1909) lists 'Witley'. These have a variety of interpretations which relate either to the village or to the parish.

The only specific *H. surrejanum* record for Witley itself is from Church Lane in 1928 by G.C. Druce (**OXF**). Given that Church Lane was where E.S. Marshall was curate and he had found *H. acamptum* P.D.Sell & C.West in 1896 (its only site; Shaw, 2020), it is surprising Marshall did not also record *H. surrejanum* and that there are no specific *H. surrejanum* records from the suite of other *Hieracium* experts who also looked for *H. acamptum*. A 1987 Surrey Flora Committee record for Church Lane is *H. argillaceum* (**NMW**, ex herb. E.J. Clement). The label on the Druce Church Lane specimen is typed, differing from the other handwritten labels from his 'near Witley' collections (**BM**, **E**, **K**, **OXF**, **RNG**) so it is possible that this has subsequently been

incorrectly relabelled. In 2025 Jim Bevan kindly examined this specimen but was unable to definitively identify it however the record is currently accepted.

In 2025, no *H. surrejanum* plants were found in Church Lane or by adjacent paths, though other hawkweeds (e.g. *H. argillaceum*, *H. trichocaulon* and *H. sabaudum*) were present.

Rejected or unconfirmed records

North Hampshire (VC12)
McCosh & Rich (2018) noted a recent discovery of *H. surrejanum* near Aldershot (VC12); the McCosh database shows this was based on an M. Shaw record from Caesar's Camp with a specimen in **herb. M. Shaw**. As this occurs at exactly the same location as *H. mammidens* it is now thought to be a misidentification of *H. mammidens* which can have some simple hairs on the involucral bracts (cf. Rich, 2025). Shaw (2020) did not include the record and I was unable to refind the original specimen with McCosh's determination in **herb. M. Shaw** (**BM**), which has probably been relabelled.

West Sussex (VC13)
There are several records from clay banks near Fittleworth Station in 1902 by E.S. Marshall in various databases, including Shaw (2020) who included this record as his pre-1970 hectad record for TQ01. All specimens seen which have been checked are *H. mammidens* which was once well known at Fittleworth Station (Rich, 2025).

East Sussex (VC14)
A 1994 *H. surrejanum* record for Dallington (Briggs, 2001) was *H. sublepistoides.*

West Kent (VC16)
The **MNE** voucher for the *H. surrejanum* Goodley Stock record in Philp (2010) was redetermined by D. McCosh to section *Vulgata*, so is currently not accepted and its identity remains to be resolved.

Critchmere (VC17)
A 1987 Surrey Flora Committee (SFC) record for the A287 verge at Critchmere is unconfirmed; in 2025, *H. lepiduloides* and *H. exotericum* occurred there (see also Shaw, 2020).

Frensham (VC17)
The identification of a 1987 SFC record for Bacon Lane, Frensham had already been queried in the BSBI databases as possibly *H. cheriense* Jord. ex Boreau; in 2025, only *H. sylvularum* was found on Bacon Lane to the north of the 1987 record.

Sandhills, Fintry (VC17)
A 1987 SFC record for Fintry at Sandhills and nearby opposite Copse Cottage is unconfirmed; in 2025, *H. sylvularum* and *H. exotericum* Jord. ex Boreau occurred at the location indicated (see also Shaw, 2020).

Shottermill, Farnham Lane (VC17)
A 1987 SFC record for Farnham Lane is unconfirmed; in 2025, *H. sylvularum* was found close to the previous location, though this is unlikely to have been confused with *H. surrejanum*.

Thursley (VC17)
Two sheets collected in 1953 named by J.E. Raven as *H. surrejanum* (**E**) were redetermined as 'close to *H. surrejanum'* by D. McCosh differing in having narrower leaves, many glandular hairs and narrower bracts; they may be *H. lepiduloides* (as recorded in Lousley, 1976).

Wareham Hill (VC17)
Salmon (1931) included a record by J. Roffey from Wareham Hill, Witley which is immediately south of Brook. However, the only specimens of Roffey's traced were collected on 15 July 1922 when he visited Brook Rocks with H.W. Pugsley; the occurrence on Wareham Hill whilst plausible is thus unconfirmed. The A286 at Wareham Hill has been since been realigned and reprofiled and no plants were seen in 2025.

Wormley (VC17)
A 1990 record for the A283 bank at Wormley is unconfirmed; no hawkweeds were found there in 2025.

Berkshire (VC22)
It is not known to what the Finchampstead *H. surrejanum* record in Monckton (1916) refers, as the cited *Flora Wellingtoniensis* record was published in 1880 before *H. surrejanum* had even been described and no specimens from Finchampstead have been traced.

Summary of population survey
The numbers of plants found are summarised in Table 1. This show that there are 1254 plants in 5 out of 13 confirmed sites. 88% of the population occurs at Woolbeding Wood.

The sites are mapped in Figure 5; it has been recorded in five hectads and is still present in four. Records for three other hectads (cf. McCosh & Rich, 2018) are now rejected.

Table 1. Summary of population sizes of *H. surrejanum* in 2025 from confirmed sites.

VC	Site	Population size
13	Bedham	Perhaps 1 or 2 vegetative rosettes
	Bexley Hill	0
	Blackdown	0
	Byworth	0
	Chithurst	0
	Henley	0
	Lavington Common	0
	Lodsworth	0
	Petworth Old Station	37 (of which at least 22 flowering)
	Woolbeding Wood	1312 (1184 flowering/buds, 127 vegetative)
17	Brook Rocks	31 (24 flowering, 7 vegetative)
	Creedhole/High Button	107 (24 flowering but majority mown)
	Witley, Church Lane	0
	Total	*c.*1487 (1254 flowering, *c.*233 vegetative)

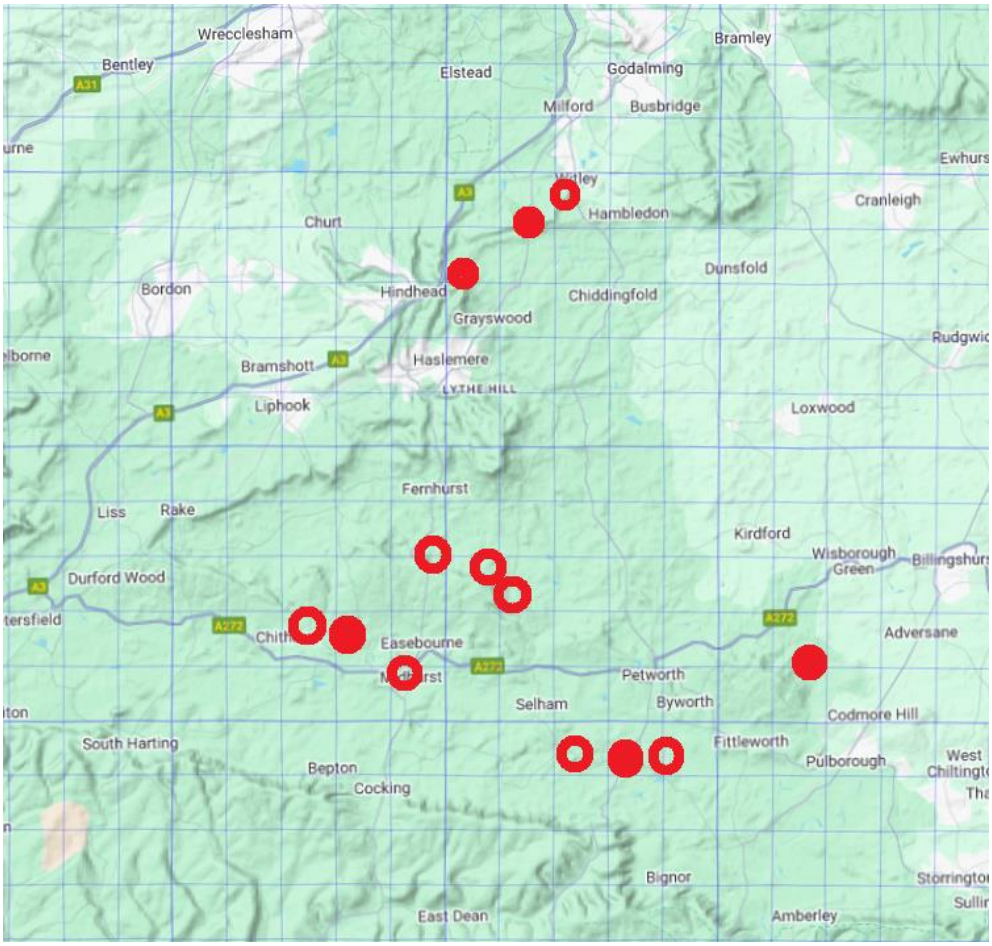

Figure 5. Distribution of *H. surrejanum* in Southern England. Closed circles: 2025. Open circles: old records.

A graphical representation of the records for each site over time in order of discovery is given in Figure 6, though it will undoubtedly have been present but unrecorded for unknown numbers of years before and after the records shown. This shows a relatively even rate of discovery of one site every 9.5 years which reflects the random nature of chance botanical finds and collection of specimens. There are large differences in persistence at each site with six sites where it has been recorded only once and seven sites where it has been recorded for more than 50 years. Sites are lost at a rate of about one every 11.75 years, with four lost since the 1980s.

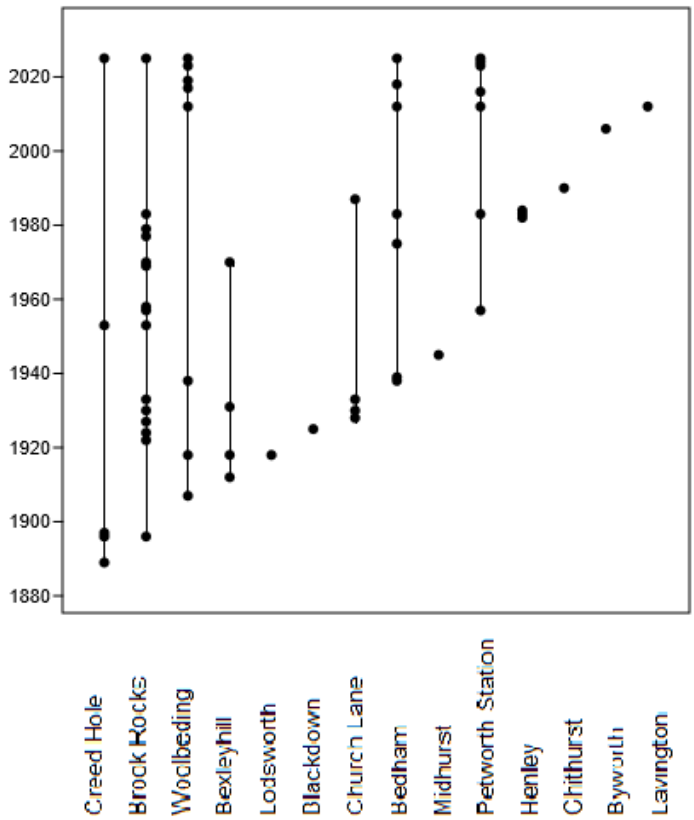

Figure 6. Records of *H. surrejanum* for each site shown in order of discovery.

Figure 7 shows the number of sites per decade plotted by extrapolating between the first and most recent records. This shows an increase in sites up to the 1940s with a peak in the 1980s and a recent slight decline. There is no indication of the extent of general *Hieracium* recording effort that can be used to correct these relative frequencies (the issues with analysis of data of this type and how they are related to variations in botanical recording are discussed in detail by Rich & Karran, 2006, and Rich, 2006).

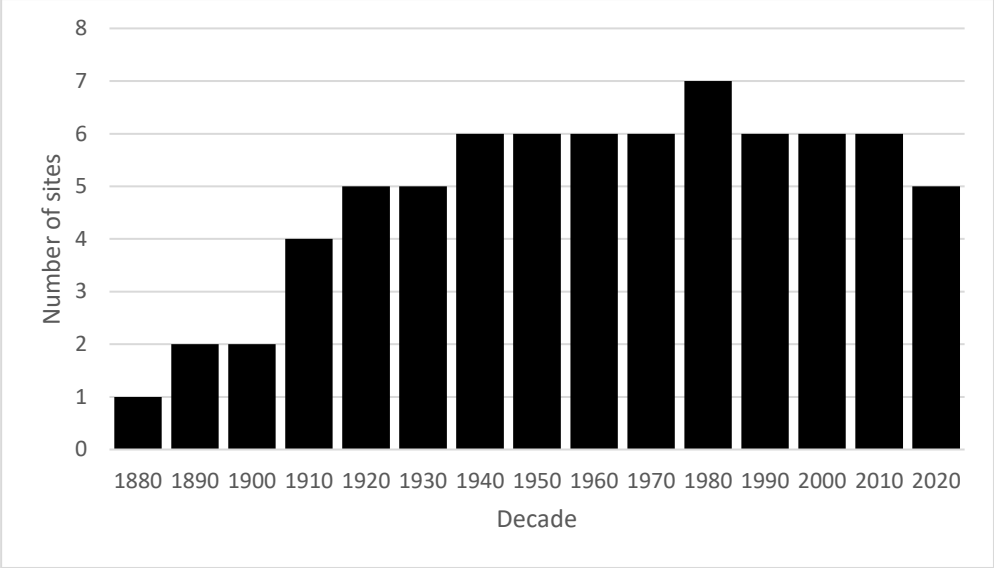

Figure 7. Extrapolated number of sites per decade for *H. surrejanum*, uncorrected for recording effort.

Biology and ecology

Hieracium surrejanum is a woodland edge species completing most of its life cycle early in the year before summer drought and full canopy closure. The basal rosette leaves develop from early March (some leaves may over-winter). Flowering stems are produced from April onwards and it mainly flowers from mid-May to early July with some plants continuing to the autumn if the weather is suitable. Sell & Murrell (2006) state it is apomictic, but this was assumed rather than tested experimentally (as for the vast majority of taxa they cite as apomictic). Seed dispersal occurs from about 3-4 weeks after flowering. It is not known how long plants live for, but like other section *Vulgata* species they are likely to be short-lived polycarpic perennials living for 3-5 years. Seeds germinate readily when sown fresh but there have been no studies on the seed bank.

All the sites are at least partially wooded where it mostly occurs in W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland or occasionally in W15 *Fagus sylvatica-Deschampsia flexuosa* woodland (Rodwell, 1991). In the ground flora it is associated with species like *Hieracium trichocaulon, H. sabaudum*, *Luzula forsteri, Melica uniflora* and *Solidago virgaurea* and is absent from adjacent areas with robust competitive vegetation with species such as *Urtica dioica* or *Anthriscus sylvestris*. Like many hawkweeds it is relatively drought-tolerant, and the habitats are often noticeably droughted under trees by mid-summer.

The sites are almost all on cuttings or man-made banks by roads or tracks, in shaded or partially shaded habitats provided there is very little competitive ground flora – when shaded it is most abundant on the more open places with minimal competing vegetation. It will not tolerate regular mowing or grazing but seems to do well under the existing occasional road verge cutting regime at Woolbeding Wood (one cut mid-summer and one in winter).

The habitats, underlying geology (British Geological Survey, 2025) and soils are listed in Table 2. The soils are usually mildly acidic (pH 4.2 to 5.7), sandy and free-draining, and are derived from the underlying Cretaceous sandstones (seven sites) or mudstones (four sites). Where they are associated with outcrops of sandstone, they occur in the associated soils rather than directly on the rocks. Although it has not been measured, the soils are almost certainly low in nutrients such as nitrogen and phosphorus. The Petworth Station site on mortar of the old bridge is likely to have a higher pH but has not been measured.

Table 2. Habitats, underlying geology and soils of *H. surrejanum*

Site	Habitat	Geology	Soils
Bedham	Bank of lane	Mudstone (Weald Clay Formation)	Light brown, fine, not gritty, pH 5.4, 5.7
Bexley Hill	Roadside	Mudstone (Weald Clay Formation)	n/a
Blackdown	(Not stated)	Mudstone (Weald Clay Formation) or Sandstone (Hythe Formation)	n/a
Brook Rocks	Bank of A-road	Sandstone (Hythe Formation)	Fine, blackish, gritty, pH 5.0, 5.1
Byworth	Bank of lane	Sandstone and mudstone (Fittleworth Member)	n/a
Chithurst	Bank of lane	Sandstone (Hythe Formation)	n/a
Creedhole	Bank of track	Sandstone (Hythe Formation)	Fine, light brown, not gritty, pH 4.2, 4.3, 5.1
Henley	Roadside bank	Mudstone (Weald Clay Formation) or Sandstone (Hythe Formation)	n/a
Lavington Common	Bank of lane	Mudstone (Marehill Clay Member)	n/a
Lodsworth	(Not stated)	Sandstone (Easebourne Member)	n/a
Petworth Old Station	Bridge	n/a	Mortar of old bridge
Witley, Church Lane	Bank of lane	Sandstone (Hythe Formation)	n/a
Woolbeding Wood	Bank of lane	Sandstone (Easebourne Member)	Light brown, fine, slightly gritty, pH 5.0, 5.2

Conservation status

The 2025 survey showed there were 1254 mature plants of *H. surrejanum* in five sites (94% of which occur in one population) and it had been lost from

eight sites (61% loss), with an on-going loss of about one site every 11.75 years. It had an Area of Occupancy of 5 km² (calculated as the extant occurrence in five monads), and Extent of Occurrence estimated to be 178 km² (calculated from the envelope of all sites). Under the IUCN (2012, version 3.1) threat status criteria, it qualifies as 'Vulnerable' under criteria B2ab(iv).

Discussion

The morphological analysis shows that the infraspecific variation described within *H. surrejanum* is continuous and thus does not merit recognition. This is relatively unusual in *Hieracium* where many of the varieties listed in monographs such as Linton (1905) and Pugsley (1948) have since been raised to species status.

Hieracium surrejanum is confirmed as a rare endemic confined to the western Weald, but following the detailed review of the records is probably rarer than has been realized. Its restricted distribution contrasts with that of the other Wealden rarity *H. mammidens* which is more widespread across the Weald to Kent, though both have similar habitats and life histories, and both have shown similar declines. *Hieracium mammidens* has a much smaller population size and is under significantly more threat (Rich, 2025; Stroh *et al*., 2025). Interestingly, the extinct Wealden endemic *H. acamptum* occurred in Church Lane, Witley in its only locality in the same habitat, though it has not been recorded there at the same time as *H. surrejanum* (Shaw, 2020).

Sell & West (1968) questioned the native status of *H. surrejanum* based on its morphological similarity to the European introduction *H. lepidulum* (Stenstr.) Omang (i.e. now *H. lepiduloides* McCosh) coupled with the strong geographical overlap in early records for both species, but *H. surrejanum* is now accepted as native (Sell & Murrell, 2006; McCosh & Rich, 2018). *Hieracium lepiduloides* certainly occurs in similar but more disturbed habitats such as road verges, railways and walls, has a wider distribution in South-East England and is accepted as an introduction.

Previous conservation assessments have been based on inferred or partial data without field surveys. McCosh & Rich (2011) assessed it as IUCN threat status "Endangered?" based on the limited data available and it being recorded in three of nine sites since 1950 (Rich, 2013). Stroh *et al*. (2014) downgraded this to 'Near Threatened' for England alone, though it is not clear on what basis as no further work had been done. McCosh & Rich (2018) raised the status back to 'Vulnerable' which was retained by Rich (2024) under criteria B1ab based on the restricted number of locations and on-going decline (analysis of Shaw's (2020) database having shown records from *c.*18 locations, with 7 locations recorded since 2000, suggesting *c.*61% decline). The current assessment of 'Vulnerable' under Criterion B2ab(iv) (Stroh *et al*. 2025) is for the first time based on a systematic survey and provides a firm basis for future conservation priorities.

It is not clear why *H. surrejanum* has declined. Possible causes are increased shading of roadside sites due to lack of management of adjacent hedges and woods, increases of nutrients on roadsides from fertiliser runoff resulting in dense competitive vegetation, intensive mowing regimes on

verges, upgrading of roads with removal of habitat, and simple random events like roadside banks collapsing.

None of the five extant sites have any statutory protection. The population at Woolbeding Wood is mostly on land owned by the National Trust who have been made aware of its presence and are now considering population reinforcement and transfer within their Woolbeding Estate. The sites at Creedhole and Petworth old station are under significant threat from inappropriate management, and the sites at Bedham and Brook Rocks from too much shade.

Seed has been deposited in the Millennium Seed Bank from Creedhole and Woolbeding Wood.

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Appendix 1: List of accepted records of *H. surrejanum.*
Assumed grid references for old records are given in brackets.

VC13 West Sussex
Bedham (TQ02)
Bedham Hill, bank of lane near, 1938, P.M. Hall & E.C. Wallace (*B.E.C. report 12*:46, 1939); Bedham Hill, shady lane bank, 25/06/1939, N.D. Simpson, P.M. Hall, etc, **BM**; Bedham, TQ02F, 06/06/1975, R.C. Stern; Bedham, TQ0121, shady lane bank, 26/06/1983, Milton, J.N.B., **CGE**; Bedham, TQ02692187, 27/06/2012, F. Abraham; Bedham Lane, north of Fittleworth, TQ02692186, On shady bank on north side of lane, between junctions with Wakestone Lane and Pallingham Quay Farm, over several metres [*c.*20 plants shown in photos], 06/06/2018, M.M. Shaw, **BM**.

Bexleyhill (SU92)
Bexleyhill, Lodsworth, on sandstone, *c.*200 ft (*c.*60 m), 10/07/1912, C.C. Lacaita, **BM**; Bexleyhill Common, road north of, 30/08/1918, W.C. Barton, **BM**; Bexleyhill, Lodsworth, 03/07/1931, R.J. Burdon, **BM**, **K**; Bexleyhill, SU914253, roadside bank, 17/08/1970, C. West, **MNE**.

Blackdown (*SU9128)*
Blackdown, near Blackdown House, 25/06/1925, J.E. Little, **BM**.

Byworth
Byworth, sandy bank, SU987192, roadside bank, 27/06/2006, F. Abraham, voucher not traced.

Chithurst
Chithurst, Chithurst Lane, SU845235, sand rocks, 15/06/1990, J. Bevan, **OXF**.

Henley (SU82)
Verdley Hill, Henley, SU82X, Roadside bank, 13/06/1982, R.C. Stern, voucher not traced; Henley, SU82X, roadsides with *H. trichocaulon* and *H. cf. diaphanum*, 26/06/1983, BSBI Hieracium Study Group; Henley, SU82X, Shady bank, 22/06/1984, R.C. Stern, voucher not traced.

Lavington Common
Lavington Common, SU94911872, 16/06/2012, F. Abraham, voucher not traced.

Lodsworth (SU92)
Lodsworth, north of (assumed different to Bexleyhill records from same day), 30/08/1918, W.C. Barton, **BM**.

Midhurst (SU82)
Midhurst, hedgebank, 02/07/1945, P. Taylor, **K**.

Petworth Station
Petworth Station, SU9822, 22/06/1957, C. West, **MNE**; Petworth, old station, SU9619, old station, 26/06/1983, BSBI Hieracium Study Group, **CGE**; Petworth, old station bridge, SU9697519225, On east wall of upper road bridge over Rother, A285, 08/06/2012, M.M. Shaw, **BM**; Petworth, old station bridge, SU9697919219, On west wall of bridge over Rother, on approach road to Old Station, 08/06/2012, M.M. Shaw, **BM**; Petworth, old station bridge, SU9698219223, On west wall of bridge over Rother, on approach road to Old Station, 08/06/2012, M.M. Shaw, **BM**; Petworth, old station bridge, SU9698319218, On west wall of bridge over Rother, on approach road to Old Station, 21/05/2019, M.M. Shaw, **BM**; Petworth, old station bridge, SU969192, Petworth, old station bridge, 11/06/2013, E.J. Clement, H.W. Matcham & M.M. Shaw, **NMW**; Petworth, old station bridge, SU969192, On west wall of bridge, 25/06/2016, D. Nelson & T.C.G. Rich, **K**; Petworth, old station bridge, SU96971922, 21/05/2023, S. Thomas; Petworth, old station bridge, SU969192, 03/07/2024, F. Hutchinson.

Woolbeding Wood (SU8623)
Woolbeding Wood, hanger by Stedham Mill (assumed basis for B.E.C. for 1912, 3:205 record), 08/1907, T. Hilton, **BM**; Stedham/Woolbeding, between, roadside, borders of wood between Stedham and Woolbeding, 10/09/1918, W.C. Barton, **BM**, **CGE**, **SLBI**; Woolbeding Wood, bank of lane near Stedham Mill, 12/06/1938, P.M. Hall, **BM**; Woolbeding Wood, SU86652335, Stedham

Lane, bank on south side, large patch, 14/06/2012, M.M. Shaw; Woolbeding Wood, SU8677923314, corner of Woolbeding Lane and Stedham Lane, 14/06/2012, M.M. Shaw, **BM**; Woolbeding Wood, SU86542336, associated with *H. trichocaulon* and *H. sabaudum*, 26/07/2012, T.C.G. Rich, & C. Gait, **NMW**; Woolbeding Wood, SU86652335, Stedham Lane, bank on south side. Well in flower, 24/05/2017, M.M. Shaw, **BM**; Woolbeding Wood, SU866233, roadside bank, 23/04/2019, T.C.G. Rich, **NMW**; Woolbeding Wood, SU866233, 1244 plants, 21/04/2023, T.C.G. Rich,

VC17 Surrey

Brook Rocks (SU9238)

Brook Rocks, Witley, *Set No. 148* 'surrejanum f.', 28/05/1896, E.S. Marshall, **BM**, **CGE**, **E**, **K**, **OXF**, **NMW**; Brook, Witley, 15/07/1922, H.W. Pugsley & J. Roffey (some labels say collected by J. Roffey alone), **BM**; Brook, 03/08/1924, M.L. Wedgwood, **SLBI**; Brook, 03/08/1924, J. Cryer & M.L. Wedgewood, **BM**; Brook Rocks, Witley, 16/06/1927, T.J. Foggitt, **BM**; Brook Rocks, SU9337, cutting on roadside near Brook, 13/07/1930, J.E. Lousley, **RNG**; Brook Rocks, Witley, 03/08/1933, F.R. Browning, **BM**; Brook Rocks, Witley, sandrocks (sic) in lane, 24/06/1933, E.C. Wallace, **RNG**; Brook Rocks, Witley, undated, A.J. Wilmott, **BM**; Brook Rocks, Witley, 09/06/1953, J.E. Raven, **E**; Brook Rocks, Witley, 07/1953, C. West, **MNE**; Brook Rocks, Witley, 30/05/1957 and 06/1957, C.E.A. Andrews, **BIRM**; Brook Rocks, Witley, 28/06/1958, B.A. Miles, **CGE**; Brook Rocks, Witley, 18/07/1969, B. Dodds, **MNE**; Brook Rocks, SU930385, broken sandy cliffs by road, 30/07/1970, J.N. Mills & J.R.J. Mills, **MANCH**; Brook Rocks, SU930385, 24/06/1977, R.J. Pankhurst, **BM**; Brook Rocks, Witley, 04/08/1979, C.A. Lister & C. West, **MNE**; Brook Rocks, 14/06/1981, J. Bevan & E.C. Wallace; Brook Rocks, cutting in roadside near Brook, 1983, A.C. Leslie (Leslie, 1983).

Creed Hole (SU9036)

Creed Hole, Witley, copse bank, lane near, 04/06/1889, E.S. Marshall, **CGE**; Witley, nr, banks bordering a copse, on the edge of the wealden and lower greensand, 04/06/1889, E.S. Marshall, **BM**; Hindhead, *Set No. 147*, sandy hedge bank, E side of Hindhead, end of May and June 1896, E.S. Marshall, **BM**, **CGE**, **E**, **K**, **OXF**, **NMW**; Witley, bank at High Button, Hindhead, 24/06/1897, E.S. Marshall, **BM**; Creed Hole, Witley, 07/1953, C. West, **MNE**.

Witley (SU93)

Witley, near, 07/06/1890, F.J. Hanbury, **BM**; Witley, near, 10/06/1893, A.H. Wolley-Dod, **BM**; Witley, 13/04/1905, R.J. Burdon, **OXF**. Witley, near, SU9337, 07/1928, G.C. Druce, **BM**, **E**, **K**, **OXF**, **RNG**; Witley, Church Lane, SU9337, Church Lane, 07/1928, G.C. Druce, **OXF**.