Notes

AN OVER-LOOKED POPULATION OF *PULSATILLA VULGARIS* MILL. IN SOUTH LINCOLNSHIRE (V.C. 53)

On 25 April 2009, a single flowering plant of *Pulsatilla vulgaris* was discovered at a new site by Richard Jefferson and Fiona Hart on a west-facing slope of Swinstead Valley Site of Special Scientific Interest (S.S.S.I.), near Swinstead, South Lincolnshire (v.c. 53, TF007222).The site was visited again on the 4 May, when a further patch was located close-by and on 6 May when a more detailed search by Richard Jefferson and Kevin Walker revealed a total of four "plants". Two had flowered but in both cases the inflorescences had been removed by sheep or rabbits. The other two plants were small and had not flowered. All were located within a 20 × 5 m area on an exposed "shoulder" of limestone grassland on the east side of a narrow valley. The plants were on a moderately steep (c. 30º) west-facing slope (280–310ºN) where the vegetation had been kept very short by rabbit and sheep grazing (2·0 ±0·2 cm based on 10 measurements adjacent to each clump). The vegetation was species-rich (20–30 species m^{-2}) and had good fit to *Brachypodium pinnatum-Bromus* [*Bromopsis*] *erectus* grassland (74% fit to CG5a, typical sub-community) as described by the National Vegetation Classification (NVC) (Rodwell 1992). The most abundant species were *Bromopsis erecta*, *Festuca ovina*, *Helianthemum nummularium*, *Sanguisorba minor* and *Thymus polytrichus* (Table 1). This appeared to be the only area of short-turf CG5a as the majority of slopes supported taller CG5a (*Brachypodium pinnatum-Bromus* [*Bromopsis*] *erectus*) grassland. The only other threatened species (after IUCN 2001) present was *Astragalus danicus*, a few patches of which occurred within a few metres of the *Pulsatilla*. The slope forms part of the Swinstead Valley S.S.S.I., notified in 1989 for its species-rich limestone grassland, although *Pulsatilla* and *Astragalus* are not mentioned in the citation.

This appears to be the first discovery of a new population of *Pulsatilla* in England for over 100 years as the majority of new twentieth century records appear to be rediscoveries of old sites or simply the first published accounts of long known sites (Walker *et al*. in prep). Of the 120 or so known populations only 18 survive in 19 10-km squares (Table 2). Half of these sites hold less than 100 plants whereas the three largest populations support around 150,000 in total (Therfield Heath, Barnack Hills and Holes, Barnsley Wold).

In Lincolnshire, Gibbons (1975) noted that *Pulsatilla* was "formerly widespread on [Jurassic] limestone grassland in the County". This is likely to be an over-estimate as the

TABLE 1. % COVER OF SPECIES GROWING WITH *PULSATILLA VULGARIS* IN SWINSTEAD VALLEY, LINCOLNSHIRE ($1M^2$ QUADRATS)

Species	Q1	Q2	Species	Q1	Q2
Brachypodium pinnatum	4	8	*Leontodon hispidus*	2	12
Briza media	+	+	*Linum catharticum*	+	+
Bromopsis erecta	15	12	*Lotus corniculatus*		3
Campanula glomerata	+	1	*Medicago lupulina*		2
Campanula rotundifolia	+	1	*Picris hieracioides*	+	
Carex caryophyllea	+	+	*Pilosella officinarum*	2	5
Carex flacca	4	1	*Primula veris*	+	1
Carlina vulgaris		+	***Pulsatilla vulgaris***	**+**	**+**
Cirsium acaule	10		*Sanguisorba minor*	15	25
Crataegus monogyna		+	*Scabiosa columbaria*	2	2
Festuca ovina	20	15	*Senecio jacobaea*		+
Galium aparine		+	*Succisa pratensis*	+	
Galium verum	1	+	*Taraxacum officinale*	1	+
Helianthemum nummularium	15	5	*Thymus polytrichus*	10	12
Helictotrichon pratense		+	*Viola hirta*		+
Koeleria macrantha	+	+	Number of species	23	28

TABLE 2. EXTANT SITES FOR *PULSATILLA VULGARIS* IN ENGLAND WITH INDICATION OF GEOLOGY, MANAGEMENT & POPULATION SIZE

Site	VC	10-km	Geology/Management	Size
Church Hill, Therfield Heath	20	TL33	Chalk, winter grazing	E
Aston Upthorpe Down	22	SU58	Chalk, ungrazed exclosure	B(R)
Steps Hill, Incombe Hole	24	SP91	Chalk, intermittent grazing	B
Devil's Dyke-Newmarket Heath	29	TL66	Chalk, part grazed/ungrazed	C
Barton Hills	30	TL03	Chalk, grazed exc. 1–3	D
Ravensburgh Castle, Barton Hills	30	TL02	Chalk, ungrazed	B
Deacon Hill	30	TL12	Chalk, part grazed/ungrazed	A
Knocking Hoe	30	TL13	Chalk, grazed	D
Barnack Hills and Holes	32	TF00	Limestone, grazed exc. 3–9	E
Barnsley Wold Warren	33	SP00	Limestone, grazed exc. 3–5	E
Beaumonts Hay	33	SP12	Limestone, irregular grazing	A
Bourton Downs	33	SP13	Limestone, grazed exc. 4–8	C
Hornsleasow Roughs	33	SP15	Limestone, grazed exc. 3–5	C
Taylor's Hill, Hilcot	33	SP01	Limestone, grazed	C
Rodborough Common, Minchinampton	34	SO80	Limestone, light mowing/grazing	B
Ancaster Valley	53	SK94	Limestone, winter grazed	B(R)
Swinstead Valley	53	TF02	Limestone, summer grazed	A
Ledsham	63	SE43	Limestone, winter grazed	A(R)

Code for population sizes: A, 1-10; B, 11-100; C, 101-1000; D, 1001-10000; E, 10000-100000; (R), total includes reintroduced plants.

TABLE 3. RECORDED SITES FOR *PULSATILLA VULGARIS* IN LINCOLNSHIRE WITH INDICATION OF THE YEAR OF FIRST AND LAST RECORD WHERE POPULATIONS ARE NOW KNOWN TO BE EXTINCT. LISTED IN ORDER OF THE YEAR OF LAST RECORD

Site	VC	10-km	First record	Last record
Lincoln Heath (Blackstone Hill)	53	SK96	1746	1746
Ropsley Heath	53	SK93	1790	1790
Colsterworth (part of Lincoln Heath)	53	SK92	<1800	1800
Ashby-de-la-Launde	53	TF05	1836	1836
Brauncewell	53	TF05	1800	1855
Billinghay	53	TF15	1873	1873
Great Ponton, Stoke Rochford, between	53	SK93	1886	1886
Great Ponton	53	SK93	1886	1891
Grantham	53	SK93	1893	1893
West Willoughby Quarry (Copper Hill), Ancaster	53	SK94	1886	1894
Temple Bruer	53	TF05	1900	1900
Stamford, near	53	TF00	1928	1928
Byard's Leap, near	53	TF04	1944	1967
Heydour Warren, Ancaster	53	SK94	1967	1967
Holywell Mound	53	TF01	1948	1988
Honington Camp	53	SK94	1914	1992
Ancaster Valley	53	SK94	1886	Extant
Swinstead Valley	53	TF02	2009	Extant
Glentham, near	54	SK99	1878	1878
Stainton le Vale	54	TF19	1878	1878
Epworth	54	SE70	1895	1895
Castlethorpe	54	SE90	1857	1903
Broughton Far Wood	54	SE91	1875	1969

records for v.c. 53 and 54 show that it has always been a localised plant (Table 3). It was last recorded in North Lincolnshire at Broughton Far Wood (Clapgate Pits) in 1968. It was formerly more widespread in South Lincolnshire where there are records for 18 sites, although some of these may be synonymous. Most were lost during the eighteenth and nineteenth centuries due to the ploughing up of downland following Parliamentary Enclosure (Wells 1968, 1969; Jones 1969). More recent losses, such as at Holywell Mound and Honington Camp, occurred due to agricultural improvement or the loss of grazing on isolated grassland sites. It currently survives on two sites, including the site described in this note. The population at Ancaster Valley faced extinction in the 1980s due to the encroachment of gorse scrub. This has since been removed and grazing re-introduced. A few of the original plants have survived and seed from these have been used to produce plants for reintroduction onto the same slope.

Pulsatilla vulgaris is classed as Vulnerable in Great Britain under IUCN criteria (IUCN 2001), and is a priority species under the UK Biodiversity Action Plan [http://www.ukbap.org.uk/PrioritySpecies.aspx?group=9]. The discovery of the Swinstead population therefore represents a very significant new discovery both locally and at a national level.

It is intriguing to speculate as to why the *Pulsatilla vulgaris* population on this site has been over-looked until now. Its early flowering time, perhaps when many botanists are less active, combined with a small population on a part of the site with no public access until relatively recently (access permitted to open country (downland) following enactment of the Countryside & Rights of Way Act 2000) may be possible explanatory factors. It is very probable though, given the habitat, location and association with *Astragalus danicus* that this is a truly native locality for this most charismatic of grassland species.

A more thorough survey of the slope and the whole site is planned for 2010 will hopefully reveal a more extensive population.

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REFERENCES

GIBBONS, E. J. (1975). *The Flora of Lincolnshire*. Lincolnshire Natural History Brochure No. 6, Lincolnshire Naturalist's Union, Lincoln.

JONES, F. (1969). The decrease of *Pulsatilla vulgaris* in England. *Biological Conservation* **1**: 327–328.

IUCN (2001). *IUCN Red List Categories and Criteria*: *Version 3.1*. IUCN Species Survival Commission, IUCN, Gland, Switzerland and Cambridge, UK.

RODWELL, J. S., ed. (1992). *British Plant Communities. Volume 2. Grassland and montane communities*. Cambridge University Press, Cambridge.

WALKER, K. J., PINCHES, C. E. & WELLS, T. C. E. (in prep). Under-grazing and the decline of *Pulsatilla vulgaris* Mill. (Ranunculaceae) in England, UK.

WELLS, T. C. E. (1968). Land use changes affecting *Pulsatilla vulgaris* in England. *Biological Conservation* **1**: 37–44.

WELLS, T. C. E. (1969). The decrease of *Pulsatilla vulgaris* in England – A reply to Dr E. F. Jones. *Biological Conservation* **1**: 328–329.

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THE FIRST BRITISH RECORDS OF *POTAMOGETON COMPRESSUS* L. AND *P. FRIESII* RUPR.

During the fieldwork for his *Catalogus plantarum circa Cantabrigiam nascentium,* John Ray (1660) came across a number of plants which did not appear to have been described in the existing literature. Several of these species were aquatics, perhaps a reflection of the relative lack of attention paid to these by earlier authors and of the richness of the aquatic flora around Cambridge. Amongst these was a species he listed on p. 124 as *Potamogeiton ramosum caule compresso, folio graminis canini*, *nondum descriptum*, which can be translated as 'Branched *Potamogeiton* with a flattened stem, and the leaf of *Gramen caninum*, not yet described'. (*Gramen caninum* is also listed in the *Catalogus*, p. 66, with the English name 'Common Quich-grasse' and is the plant we currently call *Elytrigia repens,* the Couch or Couch Grass of gardeners.) Smith (1797) and Babington (1860) interpreted Ray's plant as the pondweed we now call *Potamogeton friesii* Rupr., although confusingly their name for this species was *P. compressum* (Smith) or *compressus* (Babington). Most later authors have followed suit, including Clarke (1900) and Druce (1932), who both cite Ray's plant as the first British record of *P. friesii* (although Druce unaccountably dates it as 1590 rather than 1660), Perring *et al.* (1964) and Ewen & Prime (1975).

An alternative treatment of Ray's name is in the account of Potamogetonaceae which J. E. Dandy & G. Taylor contributed to Evans' (1939) *A Flora of Cambridgeshire*. They include the following entry:

> [**P[otamogeton] acutifolius** Link. The only evidence of this as a Cambridgeshire species rests on a specimen in Buddle's herbarium at the British Museum, which, along with a specimen of *P. Friesii*, was described by Ray ("Hist. Pl.," i., 189 (1686)) under the name *Potamogiton caule compresso, folio Graminis canini*, and stated to occur copiously in the Cam near Cambridge and in many other rivers.]

Raven (1942) attributes the name to a third species, *P. zosterifolius* (the current *P. compressus*) though his note that "Ray's description suits this species better than *P. compressus*, the obscure form with which Babington, l.c. [1860] p. 250, identifies it" suggests that Babington's *P. compressus* was a segregate of *P. zosterifolius* rather than the then accepted name for *P. friesii*.

In their draft monograph '*British species of* Potamogeton *L.*', Dandy & Taylor make a detailed and (I think) incontrovertible case for regarding Ray's Cambridgeshire plant not as *P. friesii* or *P. acutifolius* but as *P. compressus*, as Raven had suggested. However, not many botanists interested in Ray's plants, or in the first records of British plants, or in the Cambridgeshire Flora, are likely to come across this unpublished manuscript. There were at least two copies in existence. Dandy's is now in the Archives of the Natural History Museum (DF 440/66). Taylor's was in his possession at the time of his death but is not specifically mentioned in the catalogue of his papers in the National Library of Scotland (Acc. 9533). It therefore seems desirable to make Dandy & Taylor's revised opinion more widely available.

Dandy & Taylor withdraw their earlier suggestion that Ray's plant was *P. acutifolius* in a footnote:

> Our statement in A. H. Evans's "Flora of Cambridgeshire" (1939), p. 167, that specimens of *P. acutifolius* and *P. Friesii* were described by Ray (Hist. Pl.. i: 189 (1686)) under the name *Potamogiton caule compresso folio Graminis canini* was due to the mistaken belief that Ray's descriptions (1686) were based on plants in Buddle's herbarium. Actually, of course, the *Potamogiton caule compresso etc.* of 1686 was based directly on the *Potamogeiton ramosum caule compresso etc.* of 1660, and we know of no existing specimen which could be the basis.

Their main argument is given in the text dealing with *P. compressus* as follows:

> The earliest definite record of this species from Britain is in Ray's "Catalogus Plantarum circa Cantabrigiam nascentium" (1660), though there is an undated and unlocalised specimen in the herbarium of R. Uvedale (1642–1722)[1]. Ray described the species (op. cit.: 124, 125) under the name *Potamogeiton*

[1]Uvedale's herbarium is "one of the best-preserved in the Sloane Herbarium [**BM**], of which it forms volumes H.S. 302-315" (Dandy 1958).

ramosum caule compresso, folio graminis canini, and it is worth while reproducing his description in full because it has been generally misinterpreted as a description of *P. Friesii*, perhaps because it was confused with that species (*Potamogeton perpulchrum etc.* Plukenet) in the third edition of Ray's "Synopsis" (1724), p. 149. Ray's original description (1660) runs as follows:- *Caules* cubitum & nonnunquam sesquicubitum excedunt, ramosi & valde compressi. *Folia* longa, angusta, graminis canini foliorum æmula, præterquam quòd ubique ferè ejusdem latitudinis sint, & in obtusum mucronem desinant, alternatim posita, nisi unde spicarum pediculi oriuntur, ubi bina ex adverso: in singulis nervi tres insigniores per folii longitudinem[2] decurrunt. Sub unoquoque folio membrana tenuis & pellucida caulem investit. Spica brevis, *flores* dilutè virides sustinens, quatuor foliolis constantes ad stylum incarnatis. *Stylus* duobus ut plurimum apicibus terminatur. *Seminis* vasculũ ex altera parte rectâ, ex altera circulari linea clauditur. *Small branched Pondweed with a flat stalk. In the river Cam in many places*.

It might be useful to insert here a translation of Ray's description, kindly prepared by P. H. Oswald:

> The branched & strongly flattened *stems* exceed a cubit & sometimes a cubit and a half. The *leaves* are long, narrow, approaching the leaves of couch-grass except that they are of almost the same width throughout & end in a blunt point, arranged alternately, except at the point whence the stalks of the flower-spikes arise, where they are two opposite each other; on each three more significant veins run along the whole length of the leaf. Under each leaf a thin & translucent membrane invests the stem. The flower-spike is short, bearing washed-out green *flowers*, consisting of four tepals which are flesh-pink near the style. The *style* ends in two points at most. The *seed* vessel is enclosed by a line that is straight on one side and curved on the other.

Dandy & Taylor's text continues:

> It would be difficult to imagine a clearer short description of *P. compressus*, when we remember that the allied *P. acutifolius* was unknown to Ray. Most of the description, it is true, inevitably agrees also with *P. Friesii*, but certain significant characters rule out that species. The expression "*Folia* ... graminis canini foliorum æmula" could rightly be used only of *P. compressus* and *P. acutifolius* (which is not known from the Cam), as these, with their many-nerved narrow leaves, are the only two British species which could possibly be said to have leaves like those of *Agropyron repens* (*Gramen caninum*). Further, the statement "nervi tres insigniores" implies three nerves more strongly marked than others, and this admirably fits *P. compressus*, for though the leaves of this species have five true vascular nerves interspersed with a large number of fine sclerenchymatous ones, the two outer vascular nerves are faint and it is the middle three which show up prominently. The description of the fruiting-carpel (*seminis vasculum*) applies much better to *P. compressus* than to *P. Friesii*; but it is the statement "*Stylus* duobus ut plurimum apicibus terminatur" which clinches the identity of Ray's plant, because in *P. compressus* the flowers usually have only two carpels, whereas in *P. Friesii* they have the normal complement of four. *P. compressus* has since Ray's time been collected in several places in the Cam about the Cambridge district.
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> The next species in Ray's "Catalogus" is *Potamogeiton pusillum gramineo folio, caule rotundo* (= *P. Berchtoldii*) and in his description of this Ray states that it differs from the preceding species in size, "quæ huic decuplò minor est". Now *P. Berchtoldii* could scarcely be said to be ten times smaller than *P. Friesii*, but, allowing for some exaggeration, it might be described as ten times smaller than *P. compressus*.

There is little which needs to be added to Dandy & Taylor's text. *P. compressus* survived in the vicinity of Cambridge until 1848; it may have been one of the few plants to succumb to the notorious pollution of the river which resulted from the expansion of the city and the construction of sewers running into the river in the Victorian period (Preston 2008). There are also records downstream of Cambridge, until the species was last collected in 1912 at Roswell Pits, Ely, by the River Great Ouse downstream of its confluence with the Cam. Rather surprisingly, *P. compressus* reappeared

[2]This appears as 'longidudinem' in the monograph, clearly a typing error as Ray's original reads 'longitudinem'.

in the county in 2004 and 2005 in a quite different river system, the River Nene and the nearby Morton's Leam near Peterborough (Leslie 2006). Dandy & Taylor do not explain why they identify Ray's smaller species as *Potamogeton berchtoldii* rather than *P. pusillus*. Their decision was presumably based on the later specimens they had seen (Dandy & Taylor 1940 a, b), which would have suggested that *P. berchtoldii* was the commoner plant in Cambridgeshire and the only one recorded south of the Fens. Recent records suggest that *P. pusillus* is now more frequent.

The attribution of Ray's plant to *P. compressus* leaves *P. friesii* without an accepted first record. There are four very early specimens in the Sloane herbarium (**BM**) which are unlocalised and undated, all confirmed as *P. friesii* by Dandy & Taylor. They almost certainly date from the 17th or very early 18th century, and are in the herbaria of C. Merrett (1614–1695), H.S. vol. 19, fol. 125, J. Banister (1654–1692), vol. 168, f. 280, L. Plukenet (1642–1706), vol. 97, fol. 122 and A. Buddle (*c*. 1660–1715), vol. 117, fol. 27 n. 35 (in part). The Plukenet specimen may be the basis for his (1696) *Potamogeton perpulchrum nostras lucens angustissimus longis & obtusis foliis pallide virentibus*, which is also unlocalised and which Dandy & Taylor considered the first published record. As Dandy & Taylor mention in their account of *P. compressus*, Plukenet's name was included as a synonym of Ray's Cambridge taxon in Dillenius' edition of Ray's *Synopsis methodica Stirpium Britannicarum* (1724). These species continued to be confused until the late 18th century, and the first clear account of *P. friesii* appears to be Smith's text and Sowerby's accompanying plate of '*P. compressum*' in *English Botany* (Smith 1797), although (as mentioned above) Smith cites Ray's name in synonymy. He describes the species as "not very uncommon in ditches and slow streams about London, and other parts of Great Britain". The oldest localised British specimen appears to have been one labelled Eton, July 1796 (**BM**), with no collector, which is listed in Dandy & Taylor's card index of checked specimens, but it is no longer present in **BM** and was presumably damaged or destroyed with many other *Potamogeton* specimens when the Natural History Museum was blitzed in the Second World War.

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REFERENCES

BABINGTON, C. C. (1860). *Flora of Cambridgeshire*, p. 250. John van Voorst, London.
CLARKE, W. A. (1900). *First records of British flowering plants,* ed. 2, p. 155. West, Newman & Co., London.
DANDY, J. E. (1958). *The Sloane herbarium.* British Museum (Natural History), London.
DANDY, J. E. & TAYLOR, G. (1940a). Studies of British Potamogetons. – XII. *Potamogeton pusillus* in Great Britain. *Journal of Botany Britain and Foreign* **78**: 1–11.
DANDY, J. E. & TAYLOR, G. (1940b). Studies of British Potamogetons. – XIII. *Potamogeton Berchtoldii* in Great Britain. *Journal of Botany Britain and Foreign* **78**: 49–66.
DRUCE, G. C. (1932). *The Comital Flora of the British Isles.* T. Buncle & Co., Arbroath.
EVANS, A. H. (1939). *A Flora of Cambridgeshire*, p. 167. Gurney & Jackson, London & Edinburgh.
EWEN, A. H. & PRIME, C. T., trans. & ed. (1975). *Ray's Flora of Cambridgeshire* (Catalogus Plantarum circa Cantabrigiam nascentium), p. 98. Wheldon & Wesley, Hitchin.
LESLIE, A. (2006). Vascular plant records. *Nature in Cambridgeshire* **48**: 91–96.
PERRING, F. H., SELL, P. D., WALTERS, S. M. & WHITEHOUSE, H. L. K. (1964). *A Flora of Cambridgeshire*, p. 225. Cambridge University Press, Cambridge.
PRESTON, C.D. (2008). The aquatic plants of the River Cam and its riparian commons, Cambridge, 1660–1999. *Nature in Cambridgeshire* **50**: 18–37.
PLUKENET, L. (1696). *Almagestum botanicum*, p. 304. London.
RAVEN, C. E. (1942). *John Ray naturalist: his life and works*, p. 93. Cambridge University Press, Cambridge.
[RAY, J.] (1660). *Catalogus plantarum circa Cantabrigiam nascentium*. Cambridge.
RAY, J. (1686). *Historia plantarum. Tomus Primus*, p. 189. London.
RAY, J. (1724). *Synopsis methodica Stirpium Britannicarum*, ed. 3, p. 149. London.
SMITH, J. E. (1797). *Potamogeton compressum*, in *English Botany*, volume 6, t. 418. London.

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