

Population explosion of *Hypochaeris glabra* L. on the Sefton Coast, Merseyside in 2007

PHILIP H. SMITH

9 Hayward Court, Watchyard Lane, Formby, Liverpool L37 3QP

ABSTRACT

Hypochaeris glabra has been historically scarce and recently rare in South Lancashire (v.c. 59) and is poorly represented in North-west England. In 2007, 28 populations supporting over 5200 plants and occupying about 2.4 ha were found on the Sefton Coast sand-dunes. The typical habitat is rabbit-grazed fixed-dune with a short, open sward, often with a substantial cover of mosses and lichens. The composition of associates suggests a neutral to somewhat acidic substrate at most sites. It is surmised that unusual weather conditions contributed to this apparent population explosion.

KEYWORDS: Climate, grazing, habitat, *Hypochaeris glabra*, population, sand-dunes, Sefton Coast, v.c. 59.

INTRODUCTION

Hypochaeris glabra L. (Smooth Cat's-ear) is a native annual of open, summer-parched grasslands and heathy pastures, on usually acidic, nutrient-poor, sandy or gravelly soils, also occurring in dune grassland or on sandy shingle. It was formerly widespread as a weed of arable fields and as a wool-shoddy alien (Preston *et al.* 2002). Rodwell (2000) includes *H. glabra* as a component of the SD19 *Phleum arenarium* – *Arenaria serpyllifolia* dune annual community.

This plant is of European southern temperate origin but is widely naturalised outside its native range (Preston *et al.* 2002). Thus, in parts of North America and Australia it is classed as a “problem weed” on sandy soils.

STATUS IN THE BRITISH ISLES

H. glabra is scattered throughout Britain from the Channel Islands to Scotland where, however, there are only four recent records. It is mainly concentrated in the East Anglian Breckland and Sandlings, the Surrey heaths and the Welsh Borders (Wilson & King 2003). The plant is declining in semi-natural habitats, having disappeared in many areas as a result of agricultural improvement or loss of grazing.

However, it is easily overlooked, particularly as the flowers close in the afternoon (Preston *et al.* 2002). The species has a Change Index (1930–1999) of -1.01, its conservation status is given as “vulnerable” and it is a U.K. Species of Conservation Concern (Cheffings & Farrell 2005). Confined to Ulster in Ireland, *H. glabra* is Red Listed and protected under the Wildlife (N.I.) Order, 1985.

In North-west England, the plant is notified as a Species of Conservation Importance (Regional Biodiversity Steering Group 1999). It is poorly represented in most vice-counties in this region. There are no modern records for Cheshire (v.c. 58). Thus, Lord de Tabley (1899) states that *H. glabra* has been found in three stations in fields and on banks on a sandy soil but Newton (1971) lists the plant as apparently extinct in the county. It has never been found in West Lancashire (v.c. 60), perhaps because the only likely habitat on the coastal golf courses is difficult of access (E. F. Greenwood pers. com.). *H. glabra* has been recorded from 13 tetrads in Cumbria (v.c. 69, v.c. 69b, v.c. 70), where it is rare on acid, sandy ground and sand-dunes from South Walney to Ravenglass (Halliday 1997). The plant is also known from the Ayres' dunes (three hectads) in the north of the Isle of Man (v.c. 71).

HISTORY IN SOUTH LANCASHIRE (V.C. 59)

The earliest relevant floras (Hall 1839; Dickinson 1851) do not mention *H. glabra*. Twenty-six records for South Lancashire before 2007 are listed in Table 1. The first for the vice-county is given in Savidge *et al.* (1963) as “Moseley Common” (undated, pre-1900). For this record, the *New Flora of South Lancashire Project* cites the Grid Reference SD7201 and the date 1859. Moseley Common still exists, situated between Tyldesley and Worsley in Greater Manchester. There are only two other records away from the Sefton Coast, both in 1975 for Gorse Wood, Westthroughton (SD6506) (*New Flora Project*).

TABLE 1. PRE-2007 RECORDS OF *H. GLABRA* IN SOUTH LANCASHIRE

Year	Locality	Recorder	Herbarium sheet
1859	Moseley Common	Anon.	
1866	Half-a-mile north of Crosby	Lord de Tabley	
1869	Freshfield	G. E. Hunt	
1870	Formby	H. S. Fisher	MANCH
1873	Formby	H. S. Fisher	
1875	Hightown	R. Brown	LIV
1876	Hightown	J. H. Lewis	
1878	Ainsdale	J. C. Melvill	Melvill
1879	Ainsdale	J. H. Lewis	
1879	Southport, Ainsdale	J. H. Lewis	MANCH
1880	Birkdale	C. T. Green	
1881	Southport	C. T. Green	
1907	Freshfield	W. G. Travis	LIV
1909	Freshfield	W. G. Travis	LIV
1926	Ainsdale	J. N. Frankland	LIV
1933	Birkdale Cemetery	F. W. Holder	LIV
1950	SD31	Anon.	
1950	SD20	Anon.	
1953	Ainsdale	F. W. Holder	LIV
1953	Freshfield	F. W. Holder	LIV
1953	Freshfield	V. Gordon	LIV
1956	Formby	M. H. Bigwood	
1975	Gorse Wood, Westthroughton	M. E. Martin	
1975	Gorse Wood, Westthroughton	E. H. Hancock, E. G. & M. E. Martin	
2000	Ainsdale Sand Dunes N.N.R.	P. H. Smith	
2003	Ainsdale Sand Dunes N.N.R.	S. Taylor	

Sources: *New Flora of South Lancashire* Project, Liverpool Museum Herbarium (**LIV**), Manchester Museum Herbarium (**MANCH**)

The first record of *H. glabra* on the Sefton Coast was by Hon. J. L. Warren (Lord de Tabley) who found the plant in 1866 on sandhills half-a-mile north of Crosby (Brown 1875). The next sighting was by G. E. Hunt: "Sandy ground, Freshfield in 1869" (Brown 1873; Wheldon 1909). There are also records for Formby in 1870 and 1873, Hightown in 1876, Ainsdale in 1878 and 1879 and Birkdale in 1880 (Table 1). Melvill (1909) had a sheet of *H. glabra* in his herbarium labelled "Very scarce on sandhills at Ainsdale, S.W. Lancashire August 24th 1878". Some of these early records are represented by sheets in **LIV** and **MANCH** (Table 1).

Green (1933) summarises the status of *H. glabra* in the Liverpool district as: "Sand dunes. Rare. Hightown to Birkdale." Travis's *Flora of South Lancashire* (Savidge *et al.* 1963) describes the occurrence of the plant as: "Occasional on sand-dunes, rare elsewhere",

and cites records thus: "Sand-dunes from Freshfield to Ainsdale; by Birkdale Cemetery; sand-dunes, Crosby to Hightown."

Prior to the present study, the only Sefton Coast records in the last 50 years are for Ainsdale Sand Dunes National Nature Reserve in 2000 and 2003. The Ainsdale records were from Phase 1 of the Dune Restoration Area where pine plantations were felled in 1992, followed by winter sheep-grazing. However, a *Wildflower Society* meeting on 9 July 1994, led by Mrs Shirley Brown, reports finding *H. glabra* near the National Trust carpark at Victoria Road, Formby Point, some 2 km to the south.

The above observations strongly suggest that *H. glabra* has historically been a scarce plant in the vice-county, but particularly rare over the last half-century and largely confined to the sand-dunes of the Sefton Coast. Before 2007, I had only seen it once (Ainsdale N.N.R., 2000) in nearly 40 years of recording.

TABLE 2. SUMMARY OF *H. GLABRA* POPULATION DATA

Site	Locality	Grid reference	Area (m ²)	No. of plants	No. of vascular associates
1	Blundell Avenue, Formby Point	SD2809707780	1	2	14
2	Blundell Avenue, Formby Point	SD2799707925	1300	c.500	35
3	Blundell Avenue, Formby Point	SD2794507920	4500	c.100	25
4	Blundell Avenue, Formby Point	SD2780408094	5	c.50	17
5	Blundell Avenue, Formby Point	SD277076	700	c.500	40
6	Victoria Road Formby Point	SD2791408565	50	30–50	10
7	Victoria Road, Formby Point	SD2785608830	350	c.500	19
8	Victoria Road, Formby Point	SD2786408544	120	c.500	20
9	Victoria Road, Formby Point	SD2785408603	375	100+	21
10	Victoria Road, Formby Point	SD2778108576	64	100+	16
11	Victoria Road, Formby Point	SD2789208522	26	c.20	12
12	Lifeboat Road, Formby Point	SD2782706883	200	c.500	24
13	Lifeboat Road, Formby Point	SD2778406844	32	c.30	15
14	Lifeboat Road, Formby Point	SD2779806811	4	c.10	10
15	Lifeboat Road, Formby Point	SD2763706878	10,000	c.100	17
16	Formby Golf Course	SD2765309013	850	1000+	22
17	Formby Golf Course	SD2780009020	2850	c.500	22
18	Formby Golf Course	SD2778909247	1100	c.20	20
19	Formby Golf Course	SD2776009242	300	100+	22
20	Ainsdale Sand Dunes N.N.R.	SD2914610822	116	c.20	13
21	Ainsdale Sand Dunes N.N.R.	SD2915510820	36	c.50	13
22	Ainsdale Sand Dunes N.N.R.	SD2916910817	30	c.20	19
23	Ainsdale Sand Dunes N.N.R.	SD2917110769	104	c.50	20
24	Ainsdale Sand Dunes N.N.R.	SD2916510752	227	200+	16
25	Ainsdale Sand Dunes N.N.R.	SD2917510702	18	c.50	16
26	Ainsdale Sand Dunes N.N.R.	SD2913410720	12	c.30	21
27	Ainsdale Sand Dunes N.N.R.	SD2913810702	288	c.100	18
28	Ainsdale Sand Dunes N.N.R.	SD2905610691	175	c.50	21
Total			23,833	5242+	

THE 2007 SURVEY – METHODS

On 19 June 2007, while surveying a colony of *Pyrola minor* on National Trust land north of Victoria Road, Formby Point, with Pat Lockwood, I came across two colonies of *H. glabra* on heavily Rabbit-grazed, acid grassland (National Grid Reference SD2708). Then, on 5 July 2007, we found more populations on similar habitat near Blundell Avenue, Formby about 500 m south of the first discovery (SD2807, SD2707, SD2708). These initial sightings led to a more systematic search of the dune system during July, August and early September, with the result that additional colonies were found on the National Trust property and also at Sefton Council's Lifeboat Road site (SD2606, SD2706), at Natural England's Ainsdale Sand Dunes National Nature Reserve (SD2910) and on Formby Golf Course (SD2709). Visits were also made to potentially suitable habitat at Ravenmeols dunes (SD2705, SD2706), Birkdale Common

(SD3114), Liverpool Road Cemetery, Ainsdale (SD3213) and the southern half of Southport & Ainsdale Golf Course (SD3112, SD3113) but no *H. glabra* was found.

For each site with *H. glabra*, associated vascular plants were listed, their relative abundance being assessed using the DAFOR scale. Locations were determined using a hand-held Garmin Etrex GPS, the approximate areas of colonies were measured by pacing and an estimate made of the number of *H. glabra* plants in each. Notes were also made on habitat characteristics.

RESULTS

A total of 28 populations of *H. glabra* was recorded, five at Blundell Avenue and six at Victoria Road on National Trust property, four at Lifeboat Road, four at Formby Golf Course and nine at Ainsdale Sand Dunes National Nature Reserve. These cover an area of about 23,800 m² (2.4 ha) and are estimated to contain



Figure 1. Locations of Smooth Cat's-ear *Hypochaeris glabra* on the Sefton Coast

over 5200 plants (Table 2, Map 1). The largest single colony is at site 16 on the western edge of Formby Golf Course, and supports over 1000 plants. This is a large (850 m²) site which

has been recently turf-stripped, providing an open habitat that has been colonised by ruderal vegetation, including *H. glabra*. Other large populations were found at sites 2 and 5 near

Blundell Avenue, Formby Point. Site 2 is a transitional zone between a former *Asparagus* field and a conifer plantation, while site 5 is part of a disused *Asparagus* field next to the National Trust site office. In recent years, the latter site has been mowed annually but, like site 2, has recently been planted up with young conifers. Both localities support hundreds of *H. glabra* plants at relatively high density in a plant community dominated by *Carex arenaria* and *Agrostis capillaris*. The largest number of colonies (nine) was found on Ainsdale N.N.R. in Phase 1 of the Dune Restoration Area. Plants were largely confined to an eastern zone of open, more consolidated, dune within about 200 m of the existing conifer woodland. These populations have a relatively low density of *H. glabra* plants. A scattering of isolated individuals was noted between the main colonies and also on the adjacent access track which is used by Land Rovers.

Species-richness of sites is generally low, ranging from a mean of 16.3 at Victoria Road to 26.2 at Blundell Avenue, the overall average being 19.2 vascular taxa per site (Table 2).

A total of 83 vascular taxa was recorded as associates of *H. glabra* (Table 3). *Agrostis capillaris* and *Carex arenaria* are each absent from only two sites, while *Senecio jacobaea*, *Erodium lebelii*, *Crepis capillaris*, *Sedum acre*, *Centaureum erythraea*, *Arenaria serpyllifolia* and *Lotus corniculatus* also have high rates of occurrence. The species composition suggests a neutral to somewhat acidic substrate at most sites.

The habitat at almost all sites was described as fixed-dune with a short, open sward, often with a substantial cover of mosses and lichens. Except on Formby Golf Course, there is invariably evidence of heavy rabbit-grazing. The Ainsdale N.N.R. sites are also winter-grazed by sheep. Moderate human trampling is a factor at some localities, but heavy recreational pressure seems to result in an absence of *H. glabra*.

DISCUSSION

It is apparent that, on the Sefton Coast, *H. glabra* is associated with a rather specific habitat type; sparsely vegetated, short open turf, usually rabbit grazed, with a high frequency of mosses and lichens and a low species-richness of vascular plants, many of which are indicative of neutral to moderately acidic soil conditions. The plant seems to be

absent from areas heavily disturbed by trampling, or sand-blow, preferring a more consolidated substrate. Few individuals were found in more luxuriant, grassy swards or where fresh sand was being deposited.

As Sefton Coast dune sand is initially high in calcium, the plant tends to be found in older parts of the dune system where prolonged leaching has washed out much of the calcium carbonate (Smith 1999). Several colonies are on the edges of pine plantations or in areas cleared of pines, where the presence of needle litter may have increased levels of acidity. The Formby Golf Course colonies are nearer the sea than the others, the substrate appearing less acid than elsewhere. However, these dunes are actually quite old, their proximity to the shore being due to over 400 m of marine erosion since the early twentieth century (Smith 1999). All these golf course sites have recently been turf-stripped, *H. glabra* being part of ruderal vegetation recolonising the disturbed areas which, in this case, shows no evidence of rabbit grazing.

These observations accord with habitat characteristics described in the literature, namely impoverished sandy grasslands and abandoned arable fields on non-calcareous soils (Wilson & King 2003).

Although samples were not taken to determine N.V.C. communities, the associated species list (Table 3) suggest that most of the sites accord with the SD12 *Carex arenaria*-*Festuca ovina*-*Agrostis capillaris* dune grassland, though some stands may be closer to, or include patches of, SD19 *Phleum arenarium*-*Arenaria serpyllifolia* dune annual community (Rodwell 2000). Of the commoner associates, *Agrostis capillaris* and *Carex arenaria* are listed by Rodwell (2000) as major components of SD12, while *Arenaria serpyllifolia*, *Carex arenaria*, *Centaureum erythraea*, *Crepis capillaris*, *Sedum acre* and *Senecio jacobaea* are similarly listed for SD19.

In view of the paucity of previous records for the Sefton Coast and the nationally declining status of the species, the abundance of *H. glabra* on the Sefton Coast sand-dunes in 2007 is extraordinary. It should also be noted that extensive areas of potentially suitable habitat on parts of Ainsdale N.N.R. and several golf courses were not visited. As the plant is small and rather shy of flowering, it could have been overlooked in the past. However, the intensity of botanical recording over many years in this area, and the large size of the populations found, make this unlikely.

TABLE 3. OCCURRENCE AND FREQUENCY OF *H. GLABRA* AND VASCULAR ASSOCIATES ON 28 SITES

Taxon	English name	No. of occurrences	Modal frequency
<i>Acer pseudoplatanus</i>	Sycamore	2	r
<i>Achillea millefolium</i>	Yarrow	2	r
<i>Aesculus hippocastaneum</i>	Horse-chestnut	1	r
<i>Agrostis capillaris</i>	Common Bent	26	a
<i>Aira caryophyllea</i>	Silver Hair-grass	2	o
<i>Aira praecox</i>	Early Hair-grass	2	o
<i>Ammophila arenaria</i>	Marram	8	o
<i>Anagallis arvensis</i>	Scarlet Pimpernel	1	o
<i>Anchusa vulgaris</i>	Bugle	5	r
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	2	r
<i>Anthyllis vulneraria</i>	Kidney Vetch	1	r
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort	16	o
<i>Arrhenatherum elatius</i>	False Oat-grass	1	r
<i>Asparagus officinalis</i>	Garden Asparagus	2	r
<i>Betula pendula</i>	Silver Birch	2	r
<i>Bromus hordeaceus</i>	Soft Brome	3	o
<i>Carex arenaria</i>	Sand Sedge	26	a
<i>Centaurea nigra</i>	Common Knapweed	1	r
<i>Centaureum erythraea</i>	Common Centaury	17	r
<i>Cerastium fontanum</i>	Common Mouse-ear	7	o
<i>Chamerion angustifolium</i>	Rosebay Willowherb	15	o
<i>Cirsium arvense</i>	Creeping Thistle	5	o
<i>Conyza canadensis</i>	Canadian Fleabane	5	r
<i>Crataegus monogyna</i>	Hawthorn	1	r
<i>Crepis capillaris</i>	Smooth Hawk's-beard	19	o
<i>Cynoglossum officinale</i>	Hound's-tongue	10	o
<i>Echium vulgare</i>	Viper's-bugloss	1	f
<i>Epipactis dunensis</i>	Dune Helleborine	2	r
<i>Equisetum arvense</i>	Field Horsetail	1	o
<i>Erigeron acer</i>	Blue Fleabane	1	r
<i>Erodium cicutarium</i>	Common Stork's-bill	11	o
<i>Erodium lebelii</i>	Sticky Stork's-bill	21	o
<i>Erodium xanaristatum</i>	Hybrid Stork's-bill	2	o
<i>Euphorbia portlandica</i>	Portland Spurge	3	o
<i>Festuca ovina</i>	Sheep's Fescue	6	f
<i>Festuca rubra</i>	Red Fescue	11	f
<i>Fragaria vesca</i>	Wild Strawberry	4	f
<i>Galium verum</i>	Lady's Bedstraw	4	o
<i>Geranium molle</i>	Dove's-foot Crane's-bill	7	o
<i>Holcus lanatus</i>	Yorkshire-fog	14	o
<i>Hypochaeris glabra</i>	Smooth Cat's-ear	28	o
<i>Hypochaeris radicata</i>	Cat's-ear	9	o
<i>Leontodon saxatilis</i>	Lesser Hawkbit	15	o
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	16	o
<i>Luzula campestris</i>	Field Wood-rush	7	f
<i>Oenothera glazioviana</i>	Large-flowered Evening-primrose	1	o
<i>Oenothera xfallax</i>	Intermediate Evening-primrose	2	o
<i>Ononis repens</i>	Common Restharrow	9	f
<i>Ornithopus perpusillus</i>	Bird's-foot	1	r
<i>Phleum arenarium</i>	Sand Cat's-tail	1	r
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	3	o

TABLE 3 continued

Taxon	English name	No. of occurrences	Modal frequency
<i>Pinus nigra</i>	Austrian Pine	1	o
<i>Plantago coronopus</i>	Buck's-horn Plantain	4	f
<i>Plantago lanceolata</i>	Ribwort Plantain	5	f
<i>Poa annua</i>	Annual Meadow-grass	4	o
<i>Poa humilis</i>	Spreading Meadow-grass	1	o
<i>Polygala vulgaris</i>	Common Milkwort	1	r
<i>Populus alba</i>	White Poplar	2	r
<i>Prunella vulgaris</i>	Selfheal	4	o
<i>Quercus</i> sp.	Oak	1	r
<i>Ranunculus bulbosus</i>	Bulbous Buttercup	1	r
<i>Rosa canina</i> agg.	Dog-rose	2	r
<i>Rubus caesius</i>	Dewberry	15	o
<i>Rumex acetosella</i>	Sheep's-sorrel	7	f
<i>Sagina apetala</i>	Annual Pearlwort	6	o
<i>Salix repens</i>	Creeping Willow	2	a
<i>Sedum acre</i>	Biting Stonecrop	19	o
<i>Senecio jacobaea</i>	Common Ragwort	23	o
<i>Senecio vulgaris</i>	Groundsel	1	r
<i>Solanum dulcamara</i>	Bittersweet	1	r
<i>Sonchus asper</i>	Prickly Sow-thistle	9	r
<i>Sonchus oleraceus</i>	Smooth Sow-thistle	1	r
<i>Spergula arvensis</i>	Corn Spurrey	1	r
<i>Taraxacum officinale</i> agg.	Dandelion	6	r
<i>Trifolium arvense</i>	Hare's-foot Clover	12	f
<i>Trifolium campestre</i>	Hop Trefoil	1	r
<i>Trifolium dubium</i>	Lesser Trefoil	5	o
<i>Trifolium repens</i>	White Clover	5	o
<i>Veronica officinalis</i>	Heath Speedwell	4	o
<i>Vicia lathyroides</i>	Spring Vetch	1	r
<i>Viola canina</i>	Heath Dog-violet	6	r
<i>Vulpia bromoides</i>	Squirreltail Fescue	2	r
<i>Vulpia fasciculata</i>	Dune Fescue	1	r
84 taxa			

Being an annual, this species may be susceptible to adverse environmental conditions, especially at time of germination and establishment of seedlings. Spring and summer 2007 were characterised by wholly exceptional weather conditions, specifically a warm, dry April followed by the wettest early summer (May to July inclusive) since records began. The habitat occupied by *H. glabra* is particularly susceptible to spring and summer drought and it is possible that 2007 provided ideal conditions for a population explosion. Thus, Rodwell (2000) points out that, in a number of annual species, both viability and germination rate have been shown to decline markedly with decreasing soil moisture, desiccation often arresting establishment.

However, Wilson & King (2003) state that germination of *H. glabra* occurs mainly in the autumn and that seed is relatively short-lived. The inference is that, despite the paucity of recent records, there must have been sufficient plants on the dunes to provide a seed-bank and that the weather conditions of autumn 2006 were important, as well those of spring and summer 2007.

Contrary to statements in the literature (e.g. Wilson & King 2003) that *H. glabra* closes its flowers in the afternoon, it was noted that fully open flowers were usually to be found from about 11.00 to 15.00 hrs BST in sunny or partly cloudy conditions. At these times, the plants were easy to find but, even when closed, inflorescences could readily be recognised by

the tapering shape and characteristic pattern of purple-edged involucre bracts. There was, however, a remarkable variation in the height of mature plants, from about 2 cm to 30 cm. The spiky pappus-heads were identifiable from a few metres away and often led to the discovery of a colony, which was also assisted by the characteristic appearance of the preferred habitat.

Although two of the largest sites contain recently planted pine trees, most of the habitat of *H. glabra* on the Sefton Coast dunes appears to be self-sustaining, requiring little active management. At most sites, present levels of rabbit-grazing and human trampling seem sufficient to maintain the open, sparsely vegetated communities favoured by the plant. However, the recently noted trend towards denser swards, perhaps influenced by aerial nitrogen deposition (Gateley & Michell 2004), could represent a long-term threat to this

species. Thus, Wilson & King (2003) specify increases in nitrogen applied to nutrient-poor soils and agricultural improvement of sandy arable and pasture land as among the reasons for a national decline of *H. glabra*.

ACKNOWLEDGMENTS

I am extremely grateful to Pat Lockwood for assistance in the field and to Alice Kimpton for drawing attention to colonies at Formby Golf Course and Ainsdale N.N.R., which I would not otherwise have found, and for transport to the Dune Restoration Area. Steven Cross very kindly looked up old records and references in the World Museum Liverpool library and LIV, while Dave Earl provided records from the *New Flora of South Lancashire* Database. Eric Greenwood made helpful comments on an early draft of the manuscript.

REFERENCES

- BROWN, R. (1873). *Appendix to the Flora of Liverpool*. Notes of additions to the Flora of Liverpool. Liverpool Naturalists Field Club.
- BROWN, R. (1875). *Second Appendix to the Flora of Liverpool*. Liverpool Naturalists Field Club.
- CHEFFINGS, C. M. & FARRELL, L. (eds.) (2005). *The Vascular Plant Red Data List for Great Britain*. Joint Nature Conservation Committee, Peterborough.
- DICKINSON, J. (1851). *The Flora of Liverpool*. Deighton & Laughton, Liverpool.
- GATELEY, P. S. & MICHELL, P. E. (2004). Sand Dune Survey of the Sefton Coast. Report by TEP, Warrington to Sefton Metropolitan Borough Council, Bootle.
- GREEN, C. T. (ed.) (1933). *The Flora of the Liverpool District*. Second edition. Buncle & Co., Arbroath.
- HALL, T. B. (1839). *The Flora of Liverpool*. Whitaker & Co., London.
- HALLIDAY, G. (1997). *A Flora of Cumbria*. Centre for North-West Regional Studies, University of Lancaster.
- LORD DE TABLEY (1899). *The Flora of Cheshire*. Longmans, Green & Co., London.
- MELVILL, J. C. (1909). *Hypochoeris glabra* in Lancashire. *Journal of Botany* **47**: 355.
- NEWTON, A. (1971). *Flora of Cheshire*. Cheshire Community Council, Chester.
- PRESTON, C. D., PEARMAN, D. A. & DINES, T. D. (eds.) (2002). *New Atlas of the British and Irish Flora*. Oxford University Press, Oxford.
- REGIONAL BIODIVERSITY STEERING GROUP (1999). *A Biodiversity Audit of North West England*. 2 vols.
- RODWELL, J. S. (ed.) (2000). *British Plant Communities volume 5. Maritime communities and vegetation of open habitats*. Cambridge University Press, Cambridge.
- SAVIDGE, J. P., HEYWOOD, V. H. & GORDON, V. (eds.) (1963). *Travis's Flora of South Lancashire*. Liverpool Botanical Society, Liverpool.
- SMITH, P. H. (1999). *The Sands of Time. An introduction to the sand-dunes of the Sefton Coast*. National Museums & Galleries on Merseyside, Liverpool.
- WHELDON, J. A. (1909). *Hypochoeris glabra* L. in Lancashire. *Journal of Botany* **47**: 386.
- WILSON, P. & KING, M. (2003). *Arable Plants – a field guide*. Wild Guides, Old Basing, Hants.

(Accepted February 2008)