Current Status of Botanical Recording in Britain and Ireland

Richard Bateman

Britain and Ireland are small countries that, despite being geologically diverse, share a flora that is impoverished compared with that of the Mediterranean, largely as a consequence of having been a glacial (in the north) and periglacial (in the south) landscape as little as 11,700 years ago. Consequently, we currently host only between 52 and 54 truly native orchids (Bateman 2022a) whereas, for example, a recent paper on Italian orchids claimed an ambitious total of 113 supposed species and subspecies for the Gargano Peninsula alone.

Nonetheless, HOS members will surely have invested in protecting and encouraging what remains of the orchid flora of these smallish and comparatively crowded islands, particularly in the face of an undeniably accelerating climate crisis. Are orchid species that were until now exclusively Continental currently renewing their past enthusiasm for invading the British Isles? As a corollary to such positivity, will the more cold-loving among our native orchid species eventually meet lonely ends at the peaks of our highest mountains? Will the more moisture-loving among our orchid species finally wither away under the intense sun that has become only too familiar during recent summers? Before we can even begin to address such fundamental questions, we need to determine precisely where our orchid populations are located and how they are behaving.

Botanical recording in the British Isles has relied primarily on the network of local coordinators established long ago by the Botanical Society of Britain and Ireland (BSBI). They divided the British Isles into 153 “vice counties” of broadly similar area, each overseen by a local superintendent, to whom members would submit records for eventual centralisation. Also important were several local records centres, typically run by local government, which became increasingly coordinated by the national Biological Records Centre. The BRC was established in 1964 at the (since deceased) Monks Wood Experimental Station in Huntingdonshire, but now resides at the UK Centre for Ecology and Hydrology (CEH) in Oxfordshire. In the latter half of the 20th century, Britain could boast that it possessed the best understood flora of any in the world, thanks to the combination of the unusually rigorous recording networks and the comparatively high density of field botanists constantly plucked from the bosom of “a nation of gardeners.”

I have prepared this article because I am aware that many members of HOS invest much time and effort in finding and identifying our native orchids (though often tending to repeatedly visit a small number of famous orchid localities). I am also aware that there is a growing inclination among members to offer practical support to increasingly popular schemes referred to in the broadest sense as “rewilding” (Bateman 2024). It will be essential that all such deliberate (re)introductions of orchid species are adequately documented, to allow them to be distinguished from natural colonisation events. In short, I believe that, given better organisation, the HOS could contribute much more to vegetational mapping in Britain and Ireland.

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Increased resolution through time

Botanical recording in the British Isles has long been based on square areas delimited by the Ordnance Survey’s national grid. The precision with which typical records are submitted has increased through time, from initial tetrads (2 × 2 km squares) through monads (1 × 1 km squares, i.e. four-figure grid references) to hectares (100 × 100 m, usually reported as six-figure grid references). Increasingly widespread use of GPS devices by field botanists from the late 1990s onwards further strengthened potential precision to at least eight-figure grid references, accurate to within 10 m. However, far coarser resolution has been used to summarise records when generating species distribution maps for publication – typically, tetrads are used at a local level and hectads (10 × 10 km squares) at a national level. Arguably the most prominent outcome of the increasingly intensive field recording has been a series of plant atlases of the British Isles that are based on the presence or absence of species at hectad resolution. The first plant atlas was published in the early 1960s (Perring & Walters 1962), and new atlases are released from captivity approximately every 20 years.

The latest atlas

Although still based on the traditional hectad grid maps, Atlas 2020 (Stroh et al. 2023) – weighing in at two volumes totalling 1524 pages and 8.3 kg – is a significant improvement on previous atlases in terms of presentation (Fig. 1). Hectad records are, as in Atlas 2000, divided into multiple time-slices denoted by contrasting shades of blue, whereas known non-native occurrences are presented in red. A new innovation, borrowed from recent county floras, is that the coloured dots are given a backdrop of altitudinal slices presented as various shades of green. As before, the accompanying text consists of one paragraph describing distribution and habitat preferences, a second paragraph that summarises long-term changes in these properties, and finally a skeletal bibliography. The text is supported by novel graphics that summarise altitudinal distributions from south to north, distributions of both vernation and flowering time, and simple arrows that indicate long-term and short-term trends in frequency, given separately for Great Britain and for Ireland.

Undoubtedly the most fundamental innovation associated with Atlas 2020 is the release of the first ever online version, which has been made freely accessible. It mirrors the aesthetics of the printed version but in addition offers a limited degree of interactivity; readers are offered choices of time-slices and of presence/absence versus frequency data per hectad. You can also zoom in on particular regions of the British Isles, simultaneously switching to a higher-resolution tetrad grid. You

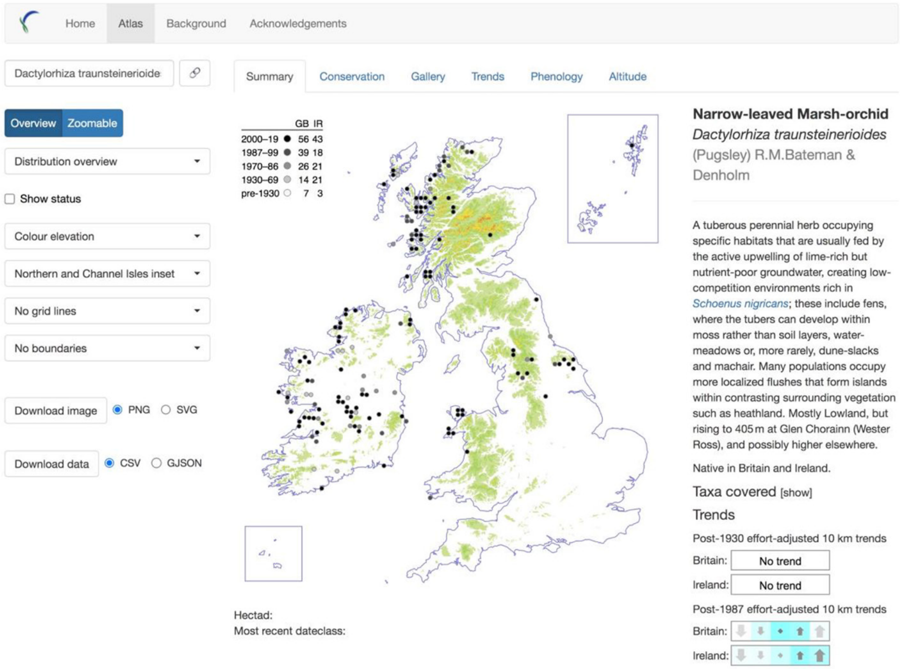

Fig. 1: Typical initial page of BSBI's online Atlas 2020 (Stroh et al. 2023), illustrating the number of records of Pugsley's Marsh-orchid represented in GB and Ireland for each of five time-slices. The site offers a degree of interaction and layering, but will not be constantly updated.

can create and save distribution maps prepared to your own specifications, while presentation of flowering times (adjusted for latitude) and especially trends of change in frequency is more sophisticated and statistically rigorous. Supporting data fields include conservation status and an image gallery (albeit a gallery currently populated with images that are often mediocre and occasionally wrongly identified). One controversial decision, viewed by some observers as a wasted opportunity, has been to freeze the underlying data between the publication of successive Atlases, rather than constantly updating the data to aid the innumerable people who will consult the database in the interim. This decision places greater emphasis on gaining access to the underlying database(s), which are updated frequently.

Why invest effort into recording distribution data?

What use are distribution data? Viewed from the static perspective of a single atlas (i.e. a single 20-year time-slice), they tell you whether that species is widespread or localised, though they do not allow you to easily determine the number of populations

or especially their typical size. You can overlay categories of extrinsic data, such as altitude, geology/soil type and land use, aiming to identify preferred habitat, though at resolutions coarser than 100 × 100 m such interpretations are invariably crudely averaged, being obliged to overlook critical but highly localised factors such as soil moisture, slope and aspect. Species distributions can also be compared with climate data, albeit on the basis of worryingly coarse grid rectangles of at least five arc minutes of longitude and latitude (an area a little smaller than a hectad). And from a conservation perspective, knowing which particular species grow where obviously assists people aiming to select, and subsequently prioritise, areas competing for various kinds of conservation status.

However, the power of being able to access distribution data gathered through almost a century becomes most clear when distributions are compared for successive time-slices, thereby revealing dynamic trends through time. Admittedly, interpretation of the resulting trends is both complicated and weakened by the need to somehow adjust for considerable fluctuations through time in overall levels of field effort expended (e.g. Trudgill 2022a, 2022b). For example, in the case of the example of Pugsley's Marsh-orchid, the perceived post-1987 increase in frequency (Figure 1, bottom right) is presumably due primarily to identification skills improving through time. Nonetheless, setting aside these concerns, the six selected trends abstracted from the BSBI Online Atlas for use here as Figure 2 do collectively reveal an intriguing set of contrasting behaviours.

Burnt Orchid (*Neotinea ustulata*) undoubtedly reveals a constant rate of precipitous decline, as the species has retreated to three core areas in Britain (Bateman 2022a). The rise of Southern Marsh-orchid (*Dactylorhiza praetermissa*) has been gradual, albeit less profound, reflecting increases in both numbers of populations and the northward expansion of its distribution. Arguably of greater interest are those curves that proved to be non-linear. I would have expected the main decline in Early Marsh-orchid (*Dactylorhiza incarnata*) to occur between 1950 and 1990, due to drainage of its preferred wetland habitats. However, there appears to have been a steady decline only *after* 1990, possibly caused less by drainage than by the drier summers that reflect longer-term climate change. These same drivers may have caused the Bee Orchid (*Ophrys apifera*) to show a converse curve, its main increase in adjusted frequency occurring post-1990 and incorporating the effects of a 21st century northward expansion even more rapid than that of *D. praetermissa*.

Other curves shown in Figure 2 are more complex and intriguing. Lizard Orchid (*Himantoglossum hircinum*) is a species whose distribution was greatest in the 1930s and 1940s, before declining back to its Kentish strongholds, but during the 21st century it has bounced back, greatly increasing in frequency. For example, my former recording territory of Hertfordshire was bereft of Lizards from the 1930s until

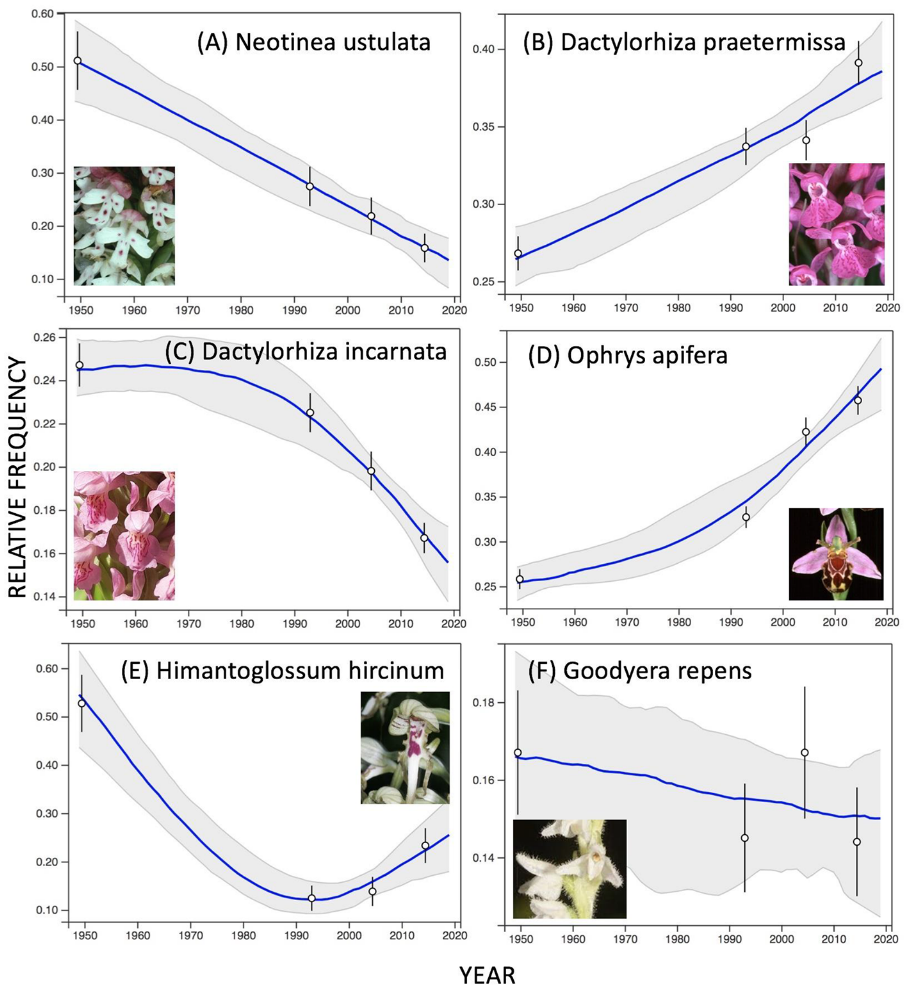

Fig. 2: Set of six frequency curves abstracted from the online Atlas (Stroh et al. 2023) for six selected native orchid species that show contrasting trends through the last 70 years. All trends share the same four data-points; the greyed zone indicates uncertainty.

2018, but today the county boasts three separate occurrences. Lastly, the trend for Creeping Lady's-tresses (*Goodyera repens*) is more difficult to interpret. Averaging out its historical records to a slight gradual decline masks the perturbations affecting each of the four data-points, as evidenced by the relatively large error bars. Although this species appears stable in overall frequency, I suspect that the modest decline from the 2000s to the 2010s largely reflects the (again, possibly climate-driven) loss

of several of the more southerly populations, including those of uncertain origin that formerly graced Norfolk pine plantations (Bateman 2022a).

Also, as I've discussed previously (Bateman 2022a, 2022b), generating trends for the past and present from multiple time-slices opens opportunities for mathematical modellers to project distributions of these species into the future (e.g. Charitonidou et al. 2022). Predicting the behaviour of orchids in the face of various models of climate change has become a popular academic pastime, though for the models to accommodate migration adequately their source data must be at least Europe-wide. In an ideal world, all other European countries would have been subjected to the same intensity of botanical exploration, for the same period of time, and using the same species circumscriptions, as Britain – desires that cannot possibly be fulfilled.

Modelling projects may appear unrealistically ambitious, but they are not wholly divorced from reality. In particular, the more dynamic modern approach to conservation relies heavily on establishing migration corridors – routes intended to assist native species seeking more appealing locations as their current habitats fall victim to the myriad causes of degradation. You cannot construct such corridors without both knowing where the relevant species are located and possessing enough understanding of both their biology and the landscape to predict their future behaviour under particular scenarios of environmental change.

How has native plant recording become structured?

I have attempted to represent the current structure of British (and, to a lesser extent, Irish) botanical recording as Figure 3, which is arguably best summarised as two broadly parallel systems that are nucleated around the BSBI and CEH respectively. The two systems interconnect repeatedly as individual plant records pass through the system. BSBI records are likely to be input into MapMate 2 software and to pass through vice-county recorders, sometimes via taxonomic referees such as myself, before entering their DDb centralised database. In contrast, CEH increasingly encourage direct entry of information into their BRC database through online input using iRecord. Admittedly, DDb and BRC are interlinked, and their content then feeds into other overarching schemes developed to encompass greater taxonomic and/or geographic scope. Happily, both DDb and BRC also permit, at least in theory, much of the accumulated data to flow in the opposite direction (green arrow in Fig. 3) – as field botanists, we can learn a great deal about our beloved orchids by interrogating these databases.

What can you retrieve from the distribution databases?

I have chosen to focus my discussion of "what your databases can do for you" on DDb more than iRecord, as at present the underlying data are more reliable. The initial DDb interface is illustrated in Figure 4. The obvious temptation is to begin

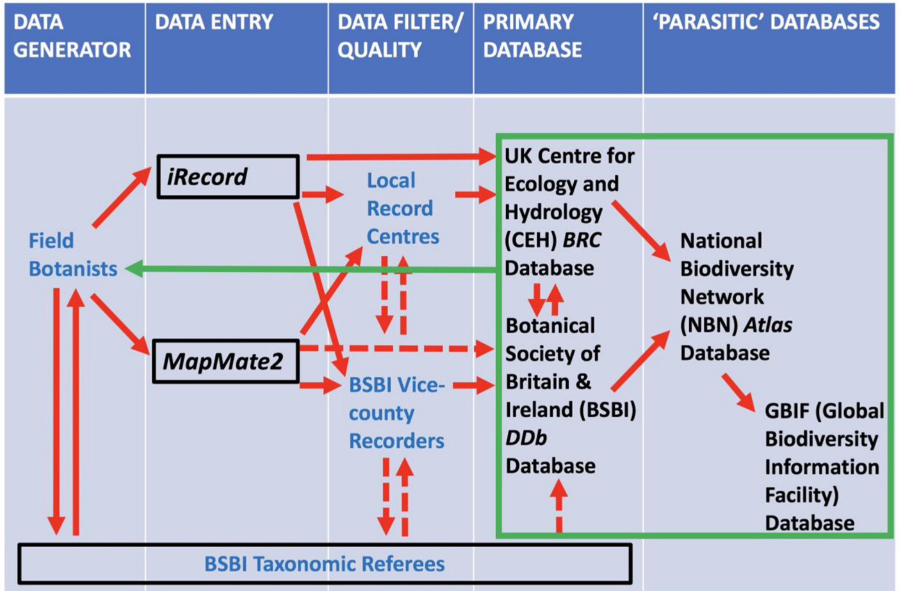

Fig. 3: Hierarchy of core databases relevant to botanical recording in Britain and Ireland, highlighting the two main routes currently employed for data entry: BSBI's DDb database via MapMate2, and CEH's BRC database via iRecord.

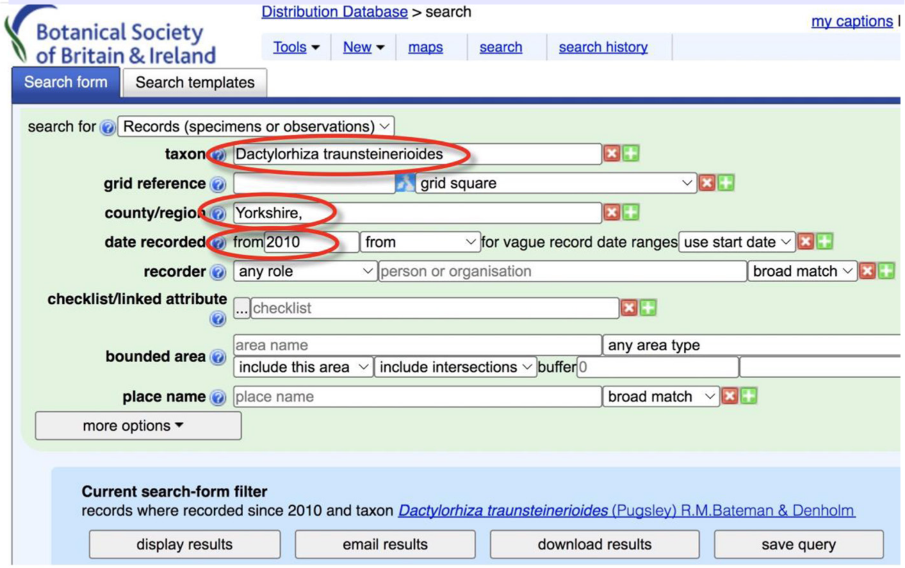

Fig. 4: Primary search interface of the DDb, here shown requesting all post-2010 records of Pugsley's Marsh-orchid from the administrative county of Yorkshire (specific hectads could alternatively have been selected, as in Fig. 5).

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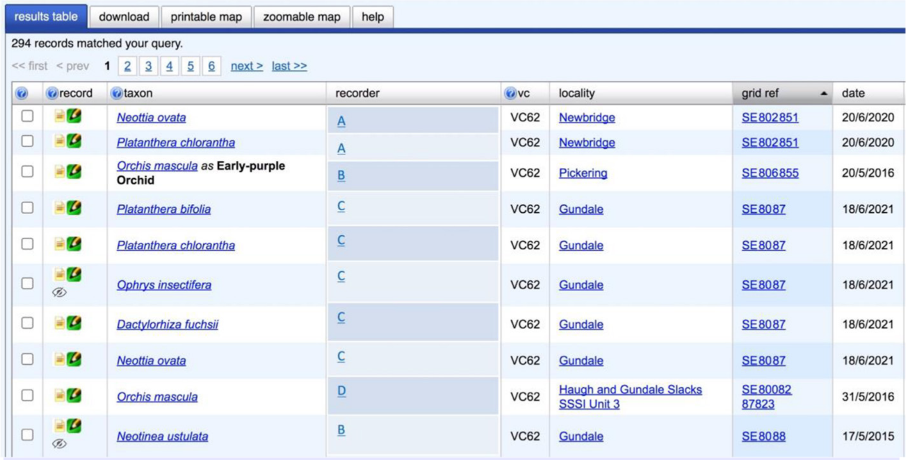
a search by specifying individual species in the "taxon" box, though it is worth remembering that you can also specify a genus or the entire family Orchidaceae. You can narrow a search geographically, either through specifying particular vice-counties or national grid squares, and you can narrow a search temporally, either in order to divide records into selected time-slices or to focus your search on recent records most likely to represent populations that remain extant. For example, by searching for "Orchidaceae" records more recent than say 2010 and specifying a particular monad, you can easily assess what is currently known about the orchid flora of a particular nature reserve present in the chosen monad.


results table | download | printable map | zoomable map | help

294 records matched your query.

<< first < prev 1 2 3 4 5 6 next > last >>

	record	taxon	recorder	vc	locality	grid ref	date
☐		*Neottia ovata*	A	VC62	Newbridge	SE802851	20/6/2020
☐		*Platanthera chlorantha*	A	VC62	Newbridge	SE802851	20/6/2020
☐		*Orchis mascula* as **Early-purple Orchid**	B	VC62	Pickering	SE806855	20/5/2016
☐		*Platanthera bifolia*	C	VC62	Gundale	SE8087	18/6/2021
☐		*Platanthera chlorantha*	C	VC62	Gundale	SE8087	18/6/2021
☐		*Ophrys insectifera*	C	VC62	Gundale	SE8087	18/6/2021
☐		*Dactylorhiza fuchsii*	C	VC62	Gundale	SE8087	18/6/2021
☐		*Neottia ovata*	C	VC62	Gundale	SE8087	18/6/2021
☐		*Orchis mascula*	D	VC62	Haugh and Gundale Slacks SSSI Unit 3	SE80082 87823	31/5/2016
☐		*Neotinea ustulata*	B	VC62	Gundale	SE8088	17/5/2015

Fig. 5: Partial output from search of DDb for all post-2010 records (presently totalling 294) of Orchidaceae for hectad SE88 in the North York Moors. I have replaced with letters the names of the original recorders. The eye symbol present at two locations under "record" denotes restricted access to Fly Orchid and Burnt Orchid data – species categorised by DDb as "sensitive". Note the contrasts in dates of records and level of resolution of grid references.

The results of your search can be presented in either tabular or map format. For those users given unrestricted access, tables immediately give the recorder's identity, the locality, the date and – admittedly with a wide variety of precision – the grid reference. A single click on the grid reference conjures up a map of the relevant area, to which you can apply a range of overlays describing various aspects of the landscape. By digging a little deeper you can discover whether there has been expert verification of the record, and a minority of records also carry an estimate of plant numbers, habitat description and/or infraspecific identification. Some records will prove to be duplicated; duplicates of the same site at different times and/or deposited by different botanists constitute useful confirmation, whereas precise duplicates are mere irritants to be filtered out. By clicking on the column headers you can re-sequence the records according to date or location.

An alternative approach is to begin with the "maps" and "zoomable map" options, which allow you to focus in on grid squares of particular interest. For example, in order to generate Figure 6, I divided records for Pugsley's Marsh-orchid (*Dactylorhiza francis-drucei traunsteinerioides*) in north-east Yorkshire into pre- and post-2000 time-slices before clicking on the square representing hectad SE88. This yielded the yellow box summarising the number of records for each of the two prescribed time-slices at three contrasting levels of resolution (hectad, tetrad, monad). Clicking on any one of the six figures highlighted in blue within the yellow box would immediately generate a table detailing all of the enumerated records. Once a search is completed, the results can then be downloaded in a range of file formats.

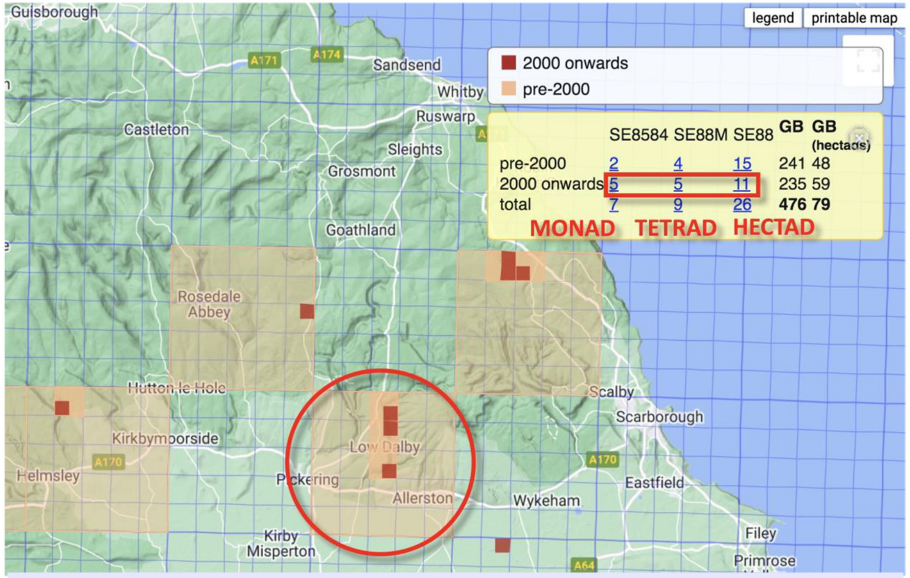


Fig. 6: "Zoomed" map generated via DDb for all Pugsley's Marsh-orchid records in the North York Moors, shown simultaneously as hectads, tetrads and monads. Hectad SE88 is ringed; figures shown in blue in the inset indicate the number of records held at three different scales for two different time-periods.

Of course, life is not quite this simple. At present, the DDb is not freely available – access is achieved through individual request to the database managers. Moreover, permission is also given at two levels, the lower of which removes the identities of recorders, and also limits resolution to tetrads for some vice-counties. Moreover, lower-level access universally restricts details available for those 16 of Britain and Ireland's 54 putatively native orchid species that BSBI consider particularly vulnerable. The BSBI list of sensitive species, summarised here in Table 1, includes 10 of 11 taxa maximally protected by Schedule 8 of the Wildlife and Countryside

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Species with restricted access on DDb	IUCN threat category (UK & Ire)	Schedule 8 protection
Cypripedium calceolus	CR	✓
Cephalanthera rubra	CR	✓
Epipogium aphyllum	CR	✓
Dactylor. incarnata ochroleuca	*CR	✓*
Orchis anthropophora	EN*	✓
Orchis militaris	VU	✓
Orchis simia	VU	✓
Neotinea maculata	NT	
Neotinea ustulata	EN*	
Himantoglossum hircinum	LC*	✓
Himantoglossum robertianum	(?)	
Serapias parviflora	(RE)	
Serapias lingua	CR	
Ophrys insectifera	VU	
Ophrys sphegodes	LC*	✓
Ophrys fuciflora	VU	✓

Table 1: List of species currently awarded restricted access status on BSBI's DDb, including all but one Schedule 8 species but contrasting strongly with the categorisations of threat awarded using the progressive IUCN criteria (recent changes of status are asterisked).

Act (I find inexplicable the omission from the BSBI "sensitive" list of the genuinely vulnerable Fen Orchid, *Liparis loeselii*). Both the Schedule 8 list and BSBI's DDb list make striking contrasts with the rigorous assessments of vulnerability made under the auspices of the International Union for the Conservation of Nature. Every IUCN category of threat is represented in the BSBI list, from Least Concern through Near-Threatened, Vulnerable and Endangered to Critically Endangered (CR). In my opinion, all three of these schemes for conservation categorisation would benefit from review with a fresh eye (Bateman 2022a, 2022b).

How best can you enter data, and into which distribution database?
Assuming that I have persuaded the reader that time would be well-spent entering their hard-won field data into one of the major databases, which currently available method of data entry is recommended? This is where matters become rather more difficult.

Property	Mapmate 2	iRecord
Developer(s)	Private individual sponsored by BSBI	CEH Biological Records Centre plus professional software developer
Cost	£36	Free
User manual	*ca* 250 pages	73 pages
Registration	Obligatory	Optional
Data entry	PC software only	Website and/or smartphone app
Data verification	Taxonomic referees, vice-county recorders, database managers	(Presently unclear)
Data access (DDb vs BRC)	Restricted, multi-level (+ sensitivity option)	Open (+ sensitivity option)

Table 2: Key properties relating to data entry and access of MapMate + DDb compared with iRecord + BRC.

BSBI have long advocated use of MapMate, though support is gradually waning. Data entry is relatively straightforward, but the software must be purchased, has been developed by a single individual, and is available only to PC users (Table 2). MapMate is very much a product of the 20th Century whereas its main competitor, iRecord, is a brash young child of the 21st Century. Developed with substantial funding at the CEH/BRC in collaboration with the rapidly expanding "international" (but US-based) iNaturalist programme (iNaturalist 2023), the iRecord scheme bypasses the need for dedicated computer software by allowing data submission directly through its website or through a smartphone app. This flexible system

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permits submission of data (including GPS coordinates) directly from field sites. The aesthetically appealing, user-friendly interface encourages deposition of a wider range of variables (summarised in Table 3), and multiple species records made at a particular site can readily be entered in batch mode. Data are supported by uploading digital images; supposedly more reliable examples of such images are labelled "research grade" in the database.

Field	Entry
Date	22/06/2022
Recorder Name	Richard M Bateman
Species	Dactylorhiza 'traunsteinerioides'
Certainty (of identification)	Confident
Quantity	50
Sex (of organism)	(NA)
Stage (in life cycle)	Flowering
Identified By	BSBI Orchidaceae co-referee
Photos (upload)	Whole plant + flower head + habitat
Sensitivity (of record)	"Blur record to hectad"
Location	Ellerburn, North Yorkshire
Spatial Reference (or click on map provided)	NGR = SE8---8---
Habitat	Reliable calcareous springline
Comments	Altitude 70 m; population includes albinos and hybrids

Table 3: Data extracted from an entry for Pugsley's Marsh-orchid input by me into the fairly comprehensive list of entry fields offered by iRecord; the only obvious oversight among the specific input fields made available by the online site is the omission of altitude, here relegated to a 'comment.'

MapMate/DDb versus iRecord/BRC initially appears to be no contest, but only until you attempt to generate distribution maps for taxonomically controversial species from current data held in iNature versus the BSBI's DDb. DDb reports 821 records

(331 post-2000) for *Dactylorhiza traunsteinerioides* (strictly, *D. francis-drucei*), which have recently been vetted by the BSBI's orchid co-referees (including me!). The collective records reflect the genetically-informed knowledge, first published by me as long ago as 2011, that *D. traunsteinerioides* does not occur south of a line linking the Severn to the Humber. In contrast, iRecord offers just 13 records (12 post-2000), six of which are located south of the Severn–Humber threshold. And of 12 images present on the website that are said to represent *D. traunsteinerioides*, at least seven – five of them regrettably labelled "research grade" – have definitely been incorrectly identified.

Also relevant is the field recording app currently in development by BSBI, which is likely to be released by early 2024. It broadly resembles iRecord but offers greater interactivity for the user. For example, when a field botanist inputs a record this will immediately prompt a dropdown menu informing them whether that species already has a post-2010 record for that monad (P. Stroh, pers. comm., 2023). This app could prove to be a game-changer, but will likely be made available only to BSBI members.

Whose data are they anyway?

Arguably the most important differences shown in Table 2 between the two systems lie in which constituencies are permitted to deposit data and whether there exist subsequent verification systems ensuring data quality. Most data that eventually reach DDb pass through BSBI's system of vice-county recorders and, where necessary, taxonomic referees and database managers – a system that often slows data release but filters out most obviously erroneous records. In contrast, iRecord reflects the modern trend of pretending that all expressed views are equally valid; it is not even necessary to register with the organisation in order to submit records, and although a rudimentary verification system reputedly exists, it evidently has not yet addressed the issue of the present chaotic condition of *D. traunsteinerioides*. Both DDb and iRecord offer persons entering data the option of labelling particular records as sensitive, but beyond this constraint, iRecord offers open access. In contrast, anyone wishing to explore the contents of DDb is, at present, required to ask permission of the database managers and/or individual vice-county recorders, who retain much of their historical influence within BSBI.

My overall impression is that botanical recording in Britain and Ireland has reached a major crossroads. There is an urgent need to address the complexities of the network summarised in Figure 3, seeking to achieve not only an optimum balance between quantity and quality of incoming data but also an agreed prioritisation of the goals for further field mapping initiatives. The world may look very different when viewed retrospectively through the lenses of Atlas 2040 and Atlas 2060. It could perhaps be argued that, until these crucial issues are adequately resolved, HOS should hold back from making greater collective efforts to contribute to field mapping of native orchids. On the other hand, an increasing sense of urgency surrounds the many initiatives that ultimately rely on well-populated distribution databases.

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Summary

British and Irish botanical records provide the essential framework for a wide range of research activities, land-use assessments and conservation initiatives. Thanks to both vice-county recorders and database managers, the interconnected BSBI and BRC databases contain exceptional quantities of high-quality, long-term distributional data. However, the present recording system used by BSBI is far from dynamic; casual data verification and slow transfer to core databases reflect overly complex networking that is presently subject to suboptimal information technology. The more modern, flexible iRecord data entry portal is becoming increasingly popular (other than with most BSBI vice-county recorders) but is presently unconstrained, encouraging input of seriously unreliable data. Accepting that data entry via MapMate is passé, it would probably be better if HOS waited for completion of BSBI's forthcoming app and associated online portal before making a concerted attempt to increase its efforts to contribute data.

In terms of accessing rather than depositing data, BSBI's DDb presently operates on a two-tier system of limited versus rarer unfettered access, and currently lacks specific guidelines regarding who is permitted any kind of access. An HOS member would undoubtedly raise an eyebrow if they accessed DDb only to discover that, when fed back to them, their own precious eight-figure records had been anonymised and reduced to tetrad resolution.

Despite such ongoing concerns, depositing reliable British and Irish field data for orchid taxa is surely an area where HOS could, and should, make a more significant contribution than at present. Similarly, it seems likely to me that further monitoring and resampling projects will be established in the near future, perhaps resembling that pursued with considerable success by Braithwaite et al. (2006); these too would surely benefit from HOS involvement. Lastly, I recognise that considerable field efforts are made by HOS members in continental Europe, and believe that we should develop a position on whether, for example, such observations should routinely be contributed to the 'Orchisauvage' initiative (FFO 2023).

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