DOI: 10.1111/curt.12576

ORIGINAL ARTICLE

CURTIS'S
Botanical Magazine

British and Irish orchids in a changing world – an update

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With just over 50 native orchid species in Britain, of which approximately 30 occur in Ireland, the orchid floras of Britain and Ireland are not as rich as those of most other countries in Western Europe (Italy, for example, has >200 native orchid species), although they include representatives of all three subfamilies found in Europe: Cypripedioideae (just in Britain), Orchidoideae and Epidendroideae. Exact numbers of species vary depending on the taxonomic system followed, but Bateman (2022), for example, stated that 53 native species occur in Britain and Ireland. The numbers are also in flux as long-term natives go extinct or new species arrive from the Continent; for example, *Spiranthes aestivalis* (Poir.) Rich. (SUMMER LADIES' TRESSES) was last seen in England in the 1950s, and *Epipogium aphyllum* Sw. (GHOST ORCHID) may also be regionally extinct, whereas species of *Serapias* L. (TONGUE ORCHIDS) are among recent newly recorded orchids in Britain (see discussion in Bateman, 2022).

Despite (or maybe because of) the relatively low number of species, British and Irish orchids are well studied, and the data available from these studies provide useful information relating to the effects of habitat loss and climate change. This is important, because due to their complex life histories (including their pollination syndromes and their dependence on mycorrhizal fungi for nutrition for at least a part of their life cycle), orchids have been suggested to be at particular risk to environmental change by authors including Dixon & Swarts (2009), who wrote that "it is likely that orchids, more than any other plant family, will be in the front-line of species to suffer large-scale extinction events as a result of climate change". More recently, Fay (2022, p. 9) wrote that "orchids are a fascinating group of plants, but they can also be seen as the plant equivalent of the 'canary in the coalmine' – due to their complex interactions with fungi and pollinators, many may be among the first casualties of declines in ecosystem health.

An important long-term study studying the effect of climate change on orchids was published by Hutchings et al. (2018). The authors used data on flowering time for an amazing 356 years in *Ophrys sphegodes* Mill. (EARLY SPIDER ORCHID) in England and equivalent data on bee emergence time to demonstrate that the pollination mechanism in this species is vulnerable to climate change, with the phenology of the partners (the orchid and the pollinator) changing

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in different ways in response to warmer springs; the results of this study led the authors to conclude that "continuing warming will increase the frequency of years in which this rare orchid suffers complete reproductive failure".

Climate change could also have a severe impact on the capacity of orchids to form the mycorrhizal associations on which their continued existence depends. The fungi that form mycorrhizal associations with orchids are (mostly) capable of surviving as free-living organisms, but if climate change leads to the environment no longer being suitable for the orchids in question or that the appropriate fungus no longer co-occurs with the orchids, then there is a potential for collapse of populations of the orchids or even extinction. In addition to affecting plants, climate change can lead to shifts in the geographical range of fungi, affecting their diversity and abundance and influencing their interactions with plants, and we know little, if anything, about the effect of climate change on the mycorrhizal fungi with which orchids associate. In one of our current projects ('FORECAST - Quantifying the impact of climate change on orchid mycorrhizal symbiosis in Mediterranean biodiversity hotspots'), we are examining the potential effect of climate change on orchids and their mycorrhizal fungi under a range of climate change models, and the data from this project could be used to direct assisted migration or appropriate *ex situ* conservation activities for the orchids.

In 2015, Fay (2015) summarised information about the status of British and Irish orchid species, in a themed issue of *Curtis's Botanical Magazine* (Vol. 32, Part 1, with eight species accounts), identifying (potential) 'winners' and 'losers' in response to climate change and other threats. Here we publish accounts for a further ten native species, including six and four representatives of subfamilies Orchidoideae and Epidendroideae, respectively; the sole member of Cypripedioideae (*Cypripedium calceolus* L., LADY'S SLIPPER ORCHID) was one of the species featured in the 2015 issue (Fay & Taylor, 2015).

Eight of the ten species are illustrated with plates based on plants growing on the island of Lindisfarne by the artist Reinhild Raistrick, and these paintings are part of set illustrating all the orchids native to the island. *Spiranthes spiralis* (L.) Chevall. (AUTUMN LADY'S TRESSES) is painted by Joanna Langhorne, based on material from Devon, and *Platanthera chlorantha* (Custer) Rchb. (GREATER BUTTERFLY ORCHID) is illustrated with an historical plate from *Flora Danica*.

Pollination mechanisms in the illustrated species vary, with some being food deceptive (e.g. *Dactylorhiza incarnata* (L.) Soó, EARLY MARSH ORCHID, and *D. purpurella* (T.Stephenson & T.A.Stephenson) Soó, NORTHERN MARSH ORCHID) and some being rewarding (e.g. *Platanthera chlorantha* and *Neottia ovata* (L.) Hartm., TWAYBLADE). *Ophrys apifera* Huds. (BEE ORCHID) is unusual in being (at least predominantly) self-pollinating, in contrast to other species of *Ophrys* L. which are sexually deceptive.

Ease of cultivation also varies, and most should be regarded as subjects for specialist collections. Some like *D. purpurella* and *O. apifera* can make good garden subjects, whereas others, notably *Corallorhiza trifida* Châtel., are (almost) impossible to cultivate; in the case of *C. trifida*, this is a result of its obligate mycoheterotrophy (it is dependent on a fungal associate for much of its nutrition). For most readers, the species included here should be considered as species to be enjoyed in nature.

Biodiversity in general is currently subject to an unprecedented range of threats, and orchids are a group of plants on which these threats are likely to have a great impact. Current red listing activity shows that a higher proportion of orchids are under threat of extinction than plants in general (e.g. Fay, 2022), and we hope that by bringing attention to these charismatic plants and the threats to which they are exposed, we will contribute to their conservation, safeguarding them for future generations to enjoy.

Jacopo Calevo was funded by a European Commission Marie Skłodowska-Curie Global Fellowship (grant agreement No. 101031324 "FORECAST"). We thank the artists Reinhild Raistrick and Joanna Langhorne for the new artwork, and Julia Buckley (Royal Botanic Gardens, Kew) for her assistance in sourcing illustrations including the black-and-white drawings of Stella Ross-Craig. Our co-authors made contributions to the texts that have

improved the quality of the accounts. We thank Maarten Christenhusz for granting permission to use some of his photographs We also thank our collaborators Kingsley Dixon, Karl Duffy, Maarten Christenhusz and Mark Chase for useful discussions. Finally, we acknowledge the major contribution that Martyn Rix has made as Chief Editor of *Curtis's Botanical Magazine* over so many years.

REFERENCES

Bateman, R. M. (2022). Systematics and conservation of British and Irish orchids: a "state of the union" assessment to accompany Atlas 2020. *Kew Bulletin* 77(2): 355–402. https://link.springer.com/article/10.1007/s12225-022-10016-5.

Fay, M. F. (2015). British and Irish orchids in a changing world. *Curtis's Botanical Magazine* 32(1): 3–23. https://doi.org/10.1111/curt.12097.

Fay, M. F. (2022). Introduction. In: Fay, M. F. & Fullerlove, G. *Kew pocketbooks: Orchids*. Kew Publishing, Kew, pp. 5–9.

Fay, M. F. & Taylor, I. (2015). 801. *Cypripedium calceolus*. Orchidaceae. *Curtis's Botanical Magazine* 32(1): 24–32. https://doi.org/10.1111/curt.12090.

Hutchings, M. J., Robbirt, K. M., Roberts, D. L. & Davy, A. J. (2018). Vulnerability of a specialized pollination mechanism to climate change revealed by a 356-year analysis. *Botanical Journal of the Linnean Society* 186(4): 498–509. https://doi.org/10.1093/botlinnean/box086.

Swarts, N. D. & Dixon, K. W. (2009). Terrestrial orchid conservation in the age of extinction. *Annals of Botany* 104(3): 543–556. https://doi.org/10.1093/aob/mcp025.

How to cite this article: Fay, M.F. & Calevo, J. (2024) British and Irish orchids in a changing world – an update. *Curtis's Botanical Magazine*, 41(2), 177–179. Available from: https://doi.org/10.1111/curt.12576