

Pedicle colour does not separate *Epipactis dunensis* (Dune Helleborine) from *E. 'sancta'* (Lindisfarne Helleborine) (Orchidaceae)

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Abstract

The characters which supposedly differentiate the narrow endemic *Epipactis sancta* (Delforge) Delforge on Lindisfarne (north-east England) from 'Tyne' and west coast (type) populations of *Epipactis dunensis* (T. & T.A. Stephenson) Godfrey are examined. Lindisfarne plants vary for purple staining of the pedicel, while 'Tyne' populations and at least some west coast plants lack this character. There is no significant difference between 'Tyne' and Lindisfarne populations for the relative length of the inflorescence (position of uppermost leaf). It is shown that other supposed differences are apparently trivial. It is considered that minor differences in sequence in chloroplast DNA between the populations do not in themselves suggest that *E. sancta* deserves specific rank. It is concluded that the Lindisfarne population is best regarded as *E. dunensis*.

Key words: *Epipactis leptochila*; *Epipactis peitzii*; orchid systematics

Introduction

My recent purchase of the 'Concise Flora of the British Isles' (Stace, 2022) helped me to catch up, belatedly, with the many taxonomic and nomenclatural changes enshrined in the fourth edition of 'The New Flora of the British Isles' (Stace, 2019). Despite these updates, I was surprised to see that the supposed narrow endemic *Epipactis sancta* (Delforge) Delforge (Lindisfarne Helleborine) had survived in the new editions, despite its demotion to subspecific rank (*E. dunensis* (T. & T.A. Stephenson) Godfrey subsp. *sancta*) by Kreutz (2007), and doubts raised as to its credibility by Richards & Squirrel (2009) and Bateman (2020) amongst others.

A 'Dune Helleborine' has been known on Lindisfarne, on the north-east coast of England (v.c.68) since 1958 (Swan, 1993). The endemic *Epipactis dunensis* is not otherwise known from the east coast of Britain. Nevertheless, the identity of this population was originally considered to be *E. dunensis* (or *E. leptochila* (Godfrey) Godfrey var. *dunensis*), (Richards, 1993).

This identification was first challenged by Delforge (2000) who named this population *E. peitzii* H. Neumann & Wucherpfennig var. *sancta* (*E. peitzii* is now treated as a synonym of *E. leptochila*). Delforge also visited some of the inland, so-called 'Tyne' populations of *E. dunensis* and noted that both these plants and those on Lindisfarne differed from west coast (type) populations of *E. dunensis* in several

characters, namely: colour of the pedicel (yellowish rather than stained pink or purple) structure of the gynoecium (lacking a clinandrium and narrowing towards the base); the denticulation of the leaf margin; and the pilosity of the rachis (Delforge, 2002).

In the latter publication, Delforge also refers to Squirrel *et al.* (2002) who compared nine isozyme loci, and a chloroplast DNA gene sequence (*trnL*) between individuals of the Lindisfarne, Tyne, and western type *E. dunensis* populations of Dune Helleborine (amongst others). They found that these populations did not differ for the isozymes examined, but that the Lindisfarne population lacked a duplication in *trnL* present in the other populations, and shared a single basepair difference with Tyne plants, compared with west coast *E. dunensis*. As Squirrel *et al.* (2002) and Richards & Squirrel (2009) point out, these findings are liable to various interpretations regarding the origin of the Lindisfarne population, but they do not in themselves suggest that this population deserves specific recognition. Nevertheless, Delforge (2002) invokes these results when raising *E. sancta* to specific rank.

Morphological distinction of *Epipactis 'sancta'*

I have never seen the point of 'species' that can only be differentiated by cryptic characters such as DNA sequence, seed proteins, ultrastructure, chromosome number *etc.* For me, the species is a linguistic handle used to describe a discrete set of organisms which can be readily identified using morphological (or behavioural) characteristics.

So, are there any morphological characters that safely distinguish '*E. sancta*' from *E. dunensis*? Stace (2022) uses just two, pedicel colour, and position of uppermost leaf. However, Delforge (2002 and 2006 (p.69)) states correctly that 'Tyne' populations of *E. dunensis* have yellowish pedicels, which together with his other distinctions (above) would make these populations *E. sancta*. I have examined photographs of 42 separate individuals from eight different 'Tyne' populations; all have yellowish pedicels.

With regard to the position of the uppermost leaf, I accept some blame. In Squirrel & Richards (2009), I wrote "the 'Lindisfarne Helleborine' (has) a less dense inflorescence with fewer flowers, which is relatively longer in relation to the leafy part of the stem. This contention requires detailed analysis....". Some years after writing this, in 2019, I did in fact measure the ratio of the length of the stem from the ground to the insertion of the top leaf relative to the length of the inflorescence above the top leaf when in full flower for two different 'Tyne' populations and for the Lindisfarne population (Table 1). Differences in the average ratio between populations were not significant (t test, $P > 0.25$), but in fact the Lindisfarne population had a shorter average relative inflorescence length compared to the Tyne plants, not a longer one.

Table 1. Ratio of stem length from ground to uppermost leaf, relative to length from uppermost leaf to apex in three populations of *Epipactis dunensis* agg.

Location	Date	n	Ratio
Williamston, River S. Tyne	18/7/2019	48	2.01
Close House, Wylam, R. Tyne	20/7/2019	42	1.87
Lindisfarne	27/7/2019	16	2.24

With regard to pedicel colour, I took photographs of 23 individuals on Lindisfarne on July 23rd, 2019. Of these, 15 have clearly yellowish (to green) pedicels (Fig. 2), but in 8 the pedicels are slightly discoloured, particularly where they join the stem (Fig. 1). However, this feature is much less marked than in some *E. helleborine* (Fig. 3). There are two implications from this finding: if Delforge (2006) is correct in stating that west coast *E. dunensis* have pink to purple-stained pedicels (but see below) and are thus according to him part of the *E. helleborine* (L.) Crantz complex rather than the *E. leptochila* complex as he claims *E. 'sancta'* is, then at least some plants on Lindisfarne might be classified as *E. dunensis* on his criteria. However the fact that the majority of plants I have examined lacked this feature and had purely yellowish pedicels suggest that this character is inconsistent and of little value. (I should add in parenthesis that having informally examined pedicel colour in many *E. helleborine*, I find that this character is inconsistent in that species as well).



Figure 1. *Epipactis 'sancta'* at Lindisfarne, Northumberland, showing pure yellowish pedicels (left) and slight discoloration to the base of the pedicel (right)



Figure 3. *Epipactis helleborine*, Gosforth Park, Northumberland, showing strong purple discoloration to the pedicel

Unfortunately, as yet I do not have comprehensive evidence regarding the pedicel colour and position of the uppermost leaf in west coast *E. dunensis*. However, I have examined photographs I took of six individuals at Sandscale, v.c.70. These all have pure yellowish pedicels, so it is untrue that all west coast ('type') *E. dunensis* have pink or purple-stained pedicels. Whether some have pinkish pedicels, as at Lindisfarne, remains to be seen.

Conclusions

I conclude that Lindisfarne plants (*E. 'sancta'*) cannot be separated from either 'Tyne' *E. dunensis*, or west coast *E. dunensis* using either of the two characters used in Stace (2019, 2022). There remain the other characters listed by Delforge (2002) which he said differentiate *E. 'sancta'* from *E. dunensis*. He does not describe how character states differ between the populations in that publication, but I am assuming that the fuller descriptions in Delforge (2006) can be substituted.

Delforge (2002) contends that *E. dunensis*, as part of his *E. helleborine* group possesses a clinandrium, that is a depression on the top of the gynandrium onto which the pollinia fall. However, Delforge (2006) states 'clinandrium +/- developed, sometimes almost absent' for *E. dunensis*, and for *E. 'sancta'* (under *E. muelleri* Godfrey) 'clinandrium near absent'. With regard to the denticulation of the leaf margin, Delforge (2006) states for *E. dunensis* "fine regular serrations 0.03-0.06 mm high". This character is not mentioned for *E. 'sancta'* or *E. muelleri*, but under *E. leptochila*, to which group he supposes *E. 'sancta'* belongs, Delforge (2006) states "with either fine, regular serrations similar to *E. helleborine*, or irregular hyaline projections...", the inference being that this is not a constant character. Finally, for the pilosity of the upper stem (rachis), Delforge (2006) states "densely hairy (hairs grey) towards tip" for *E. dunensis*, and for *E. 'sancta'* (under *E. muelleri*) "tip greyish, pubescent".

I conclude that Delforge (2006) provides no clear, quantifiable distinctions between *E. dunensis* and *E. 'sancta'*, except pedicel colour, and with regard to that character he is clearly mistaken. Lindisfarne plants (*E. 'sancta'*) can have pedicels which are either yellowish or pink-stained, while not all west-coast 'type' *E. dunensis* have pink-stained pedicels. As for the 'Tyne' populations of *E. dunensis*, the pedicels are uniformly yellowish. In short, there appear to be no morphological characters which safely separate Lindisfarne populations from west-coast or 'Tyne' *E. dunensis*.

The most straightforward inference from sequence differences in the *trnL* gene in chloroplast DNA would be that the *E. dunensis* complex originated on the north-east coast of England, migrated westwards down the Tyne Valley and spread from here down the west coast of England and Wales. There are other possible interpretations, but this is the most straightforward. In any case, none need to be taken as evidence that *E. 'sancta'* should be regarded as a separate species.

In one sense, I regret having to suggest that my adopted home of Northumberland should lose its only endemic species of higher plant (and an orchid to boot!). However, I have been uneasy in my mind ever since *E. sancta* was described new to science and feel certain that the Lindisfarne population should be re-classified as *E. dunensis*.

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