

THE STATUS OF *ORCHIS LATIFOLIA* VAR. *EBORENSIS*
GODFERY IN YORKSHIRE

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ABSTRACT

The Yorkshire dactylorchids formerly known as *Orchis traunsteinerioides* var. *eborensis* are shown to be referable to *Dactylorchis traunsteineri*, the separate populations showing extreme divergence in certain characters such as stature, leaf length, and the size and shape of the labellum. This is, apparently, the result of a high degree of genetic isolation, combined in some instances with the effect of the extremely small size of the populations.

INTRODUCTION

In his classic work on British Orchids, Godfery (1933) described plants from some Yorkshire and Durham localities as a new variety under the name '*Orchis latifolia* var. *eborensis*.' According to him their salient features were dwarf stature (± 12 cm), very narrow, usually spotted leaves and a short, few-flowered spike. This new variety was also said to be early flowering, the only other orchid in flower at the same time being *Orchis mascula*.

Three years later Pugsley (1936) described two Irish marsh orchid forms as new subspecies of the Continental *Orchis majalis* Rchb. One of these, based on plants from Co. Wicklow, he named subsp. *Traunsteinerioides*, thereby recognizing its close resemblance to the Continental *Orchis traunsteineri* Saut. Despite this, however, he decided that these plants were more closely allied to *Orchis majalis* Rchb., under which the new subspecies was therefore placed.

The following year Pugsley (1939) examined a colony of Godfery's var. *eborensis* near Hellifield, Yorkshire, and decided to place this variety under his subsp. *Traunsteinerioides*, from which it was distinguished by its dwarf habit, and rather smaller flowers with a less distinctly deltoid labellum. Pugsley also recognized that in this latter feature these plants showed an approach to typical *O. majalis*.

Following the elevation by Wilmott (1938) of *O. majalis* subsp. *occidentalis* to the rank of full species as *Orchis occidentalis*, Pugsley (1940) raised the subsp. *Traunsteinerioides* also to species rank under the name *Orchis traunsteinerioides*. Subsequently, further colonies of it were discovered both in Ireland and in England (Pugsley 1946), and a biometric study of four of them by J. Heslop-Harrison (1953) showed beyond any doubt that all belong to the Continental species *Dactylorchis traunsteineri* (Saut.) Vermln. The var. *eborensis*, however, was not studied by Heslop-Harrison, who suggested that further field work on the Yorkshire and Durham plants was desirable.

Since the publication of Heslop-Harrison's paper, further finds of *D. traunsteineri* have been made in Wales, Ireland and eastern England (Lacey 1955; Heslop-Harrison 1956; Lacey & Roberts 1958; Roberts 1960; Bellamy and Rose, undated; Heslop-Harrison, *in litt.*). Subsequent studies of the Welsh populations have shown that in two of the Anglesey colonies a proportion of the plants have labella which are not sub-deltoid or obcordate, and have their lateral lobes angled and notched. In addition, the majority of the plants in these two colonies are very small. In both these features they strongly recalled the description of the var. *eborensis*.

pression in a damp meadow. Here again there are extensive *Schoenus* flushes. At both localities the community in which the orchids occur is very similar (Table 1), the soil being strongly flushed with calcareous ground water, and the habitat kept in a fairly open condition as a result of water-logging and trampling by cattle – conditions which are also met with in the Anglesey locality at Pentraeth.

RESULTS

The sample data for vegetative characters in the Hellifield and Rievaulx colonies are given in Table 2, together with those from one of the Anglesey colonies with features recalling the description of var. *eborensis*. The sample numbers are small and may seem inadequate for a biometric comparison. It is, perhaps, relevant therefore to point out that they represent all that could be found in the course of one season. The colonies, particularly that at Rievaulx, are very small ones, so that even the small samples we have been able to examine embrace a high proportion of the total populations.

Stature

Basing his description mainly on plants from near Helmsley, Yorkshire, Godfery (1933) gave the stature of var. *eborensis* as ± 12 cm. However, five specimens from the Helmsley locality, collected by T. J. Foggitt (1455, 1456 (BM)), have statures from 19.5 cm to 25.5 cm. For the Hellifield plants Pugsley (1936) gave the range 15–25 cm, but the four plants gathered by him from this locality (BM) vary in stature from 16.0 to 31.5 cm.

TABLE 2
Sample data for vegetative characters

Locality	N	Stature (cm)		Total number of leaves		Leaf length (cm)		Leaf width (cm)		Incidence of leaf marking (%)
		mean	s.e.m.	mean	s.e.m.	mean	s.e.m.	mean	s.e.m.	
Hellifield	22	18.1	0.69	3.9	0.11	9.2	0.23	1.2	0.03	36
Rievaulx	9	9.5	0.41	2.7	0.18	6.7	0.54	1.0	0.08	67
Pentraeth	50	14.5	0.60	3.7	0.08	8.4	0.22	1.0	0.03	30

The data obtained from Hellifield and Rievaulx (Table 2) show that the mean stature in the two populations differs considerably, that of the Rievaulx plants being extremely small. Four specimens from the Rievaulx locality, gathered by Miss C. M. Rob in 1948 (K), show a similar range of stature. It can be seen that the mean stature of the Anglesey colony of *D. traunsteineri* quoted here is practically intermediate between those of the two Yorkshire colonies.

Leaf dimensions

Leaf-length, like stature, is a very variable character in *D. traunsteineri* and cannot be used to separate it from other species of marsh orchids. It is worth noting, however, that while the mean leaf-length of the Rievaulx colony is smaller than that of any other for which data are available, that of the Hellifield plants falls within the range of values found elsewhere in the British Isles for *D. traunsteineri*.

Leaf-width, on the other hand, has been shown to be one of the most important characters for discriminating *D. traunsteineri* from other tetraploid marsh orchid species (Heslop-Harrison 1953). Both the mean and range of leaf-width in the Hellifield and

Rievaulx colonies are in close agreement with those of the Anglesey colony (Tables 2 and 3) and with all the Britannic populations for which data are available (Heslop-Harrison 1953, Lacey and Roberts 1958). Moreover, examination of herbarium material of var. *eborensis* from other Yorkshire localities and of *D. traunsteineri* from several Continental ones, including the type locality, has shown a remarkable uniformity in this character among all of them (Table 3).

Leaf-number

It was shown by Heslop-Harrison that the vegetative characters of leaf-number and leaf-width, taken together, completely distinguish the colonies of *D. traunsteineri* from those of the other tetraploid marsh orchids; later studies have fully confirmed this. It can be seen that in both the mean and range of leaf-number the Hellifield colony agrees very closely with that at Pentraeth, and indeed with all the other colonies previously studied. In the Rievaulx sample the mean number of leaves per plant is even smaller, but the range falls within that of the Pentraeth colony.

TABLE 3
Ranges of variation of characters in populations of *D. traunsteineri*
(The numbers in brackets were found only in single instances)

<i>Locality</i>	<i>Total number of leaves</i>	<i>No. of non-sheathing leaves</i>	<i>Leaf width (cm)</i>	<i>No. of flowers in inflorescence</i>
Hellifield	3-5 (6)	0-1 (2)	0.8-1.5	5-14
Rievaulx	2-4	0-1	0.6-1.3	5-10
other Yorks. localities taken together*	3-5		0.6-1.3	
Pentraeth, Anglesey	2-5 (6)	0-1 (2)	0.7-1.5	2-14
Continental localities*	3-5		0.5-1.5	

* Data from herbarium specimens

Again, examination of herbarium specimens of var. *eborensis* from other localities in Yorkshire shows that the range of leaf-number in these also corresponds closely both with that in the Pentraeth colony and in all the herbarium material from Continental stations (Table 3).

Leaf marking and shape

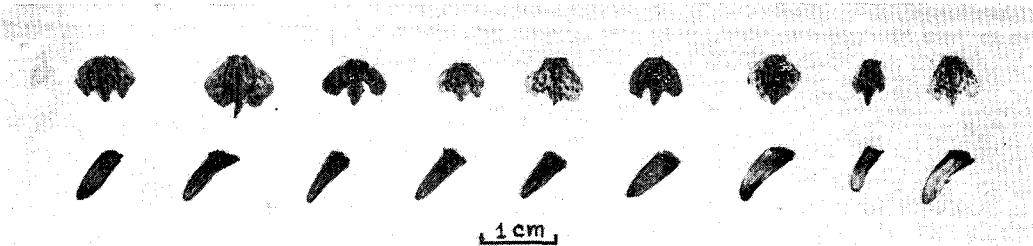
The incidence of leaf marking in *D. traunsteineri* shows considerable variation from one locality to another and is completely lacking in some populations (Heslop-Harrison 1953, Lacey and Roberts 1958). In the Hellifield colony 36% of the plants have leaf marking either in the form of a few small dots or transverse bars in the apical half of the leaves; in the Rievaulx colony 67% of the plants had leaf marking consisting of a combination of narrow bars and dots. Both the form and incidence of leaf marking in these two populations agree well with those found elsewhere in colonies of *D. traunsteineri* (Heslop-Harrison 1953).

The leaves at both localities are narrowly lanceolate, in many cases linear-lanceolate, the lower leaves widest usually just below the middle, with an acute, slightly hooded tip.

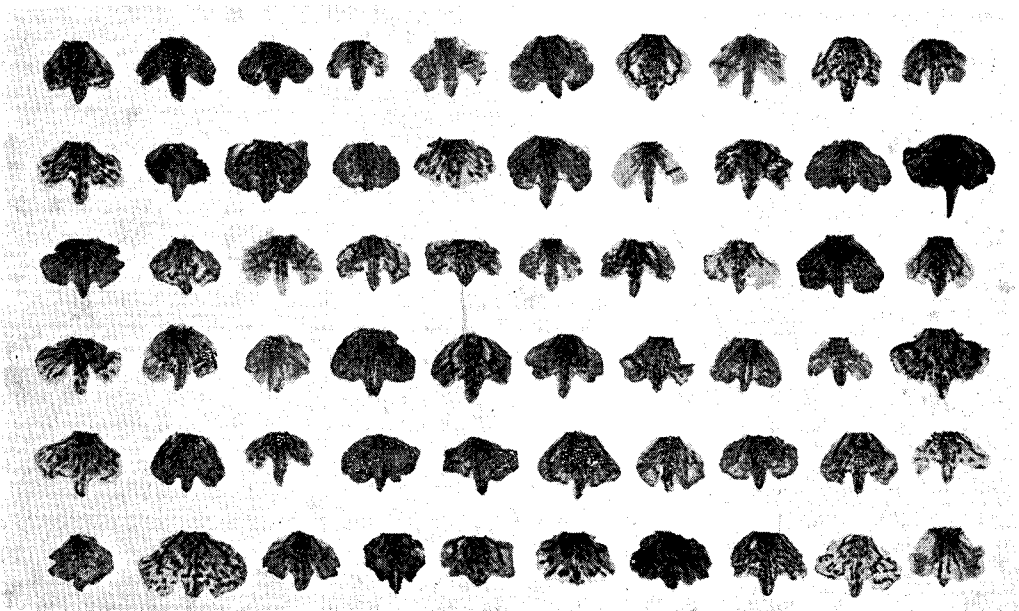
PLATE 13



a



b



c

Random samples of flower dissections from the three populations: (a) labella of 16 plants and spurs of 15 plants from the Hellifield colony; (b) labella and spurs of 9 plants from the Rievaulx colony; (c) labella of 60 plants from the Pentraeth, Anglesey, colony. All $\times 1$.

Floral characters

According to Pugsley (1939) the plants of var. *eborensis* were distinguished from *O. traunsteinerioides* by their rather smaller flowers in which the labella were less distinctly deltoid.

A study of the Welsh colonies has shown that there is considerably greater variation in labellum and spur dimensions between separate populations of the species than was apparent from Heslop-Harrison's original study. Mean labellum-shape also varies from one colony to another. The sample data (Table 4) show that in both labellum and spur dimensions the differences between the Hellifield and Pentraeth populations are very small and statistically not significant. This is an unexpected and striking result.

TABLE 4
Sample data for labellum and spur dimensions

Locality	N	Labellum length (cm)		Labellum width (cm)		Spur length (cm)		Spur width (cm)	
		mean	s.e.m.	mean	s.e.m.	mean	s.e.m.	mean	s.e.m.
Hellifield	16	0.80	0.022	0.96	0.025	0.85	0.018	0.34	0.008
Rievaulx	9	0.66	0.028	0.73	0.046	0.81	0.033	0.30	0.010
Pentraeth	40	0.79	0.014	1.02	0.018	0.83	0.020	0.35	0.010

On the other hand the fact emerges that the Rievaulx population differs from the others in both labellum-length and labellum-width by large and statistically significant amounts. It also differs significantly from them in spur-width, but the small differences in spur-length fail to be significant.

The position with regard to labellum shape is rather different. By assuming that the Hellifield plants represented 'the normal condition of var. *eborensis*' Pugsley (1939) erroneously concluded that the labellum shapes found there are also those prevailing in the other colonies of var. *eborensis*. The present study has shown that this is not so. While it is true that, on the whole, the labella in all of the Yorkshire colonies are less deeply tri-lobed than in most other localities, these Yorkshire populations are evidently not homogeneous with respect to labellum shape. The Hellifield plants appear to deviate more from the typical labellum shape of *D. traunsteineri* than those at Rievaulx, where the labella, though small, clearly display the sub-deltoid shape more characteristic of this species (Plate 13).

As far as may be inferred from herbarium specimens the situation among the other Yorkshire colonies seems to be much the same: some, like the Helmsley plants, showing greater, and others, like those from Masham and Carperby, less deviation from the more typical labellum shapes (Fig. 1).

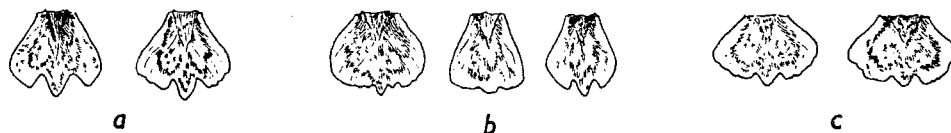


Fig. 1. Labellum shapes of 'var. *eborensis*' from other Yorkshire localities: (a) Masham; (b) Helmsley; (c) Carperby. All drawn from herbarium specimens.

The colour of the flowers in var. *eborensis* was described by Godfery as a dull red-violet. There is clearly some justification for this description, for in a large proportion of the plants of the two colonies examined flower colour is rather darker than in the Anglesey

and Caernarvonshire plants. But there is also a considerable overlap in this, a few individuals in all of the Welsh colonies having dull, deep red-purple flowers exactly matching the deeper shades in var. *eborensis*.

Another characteristic of var. *eborensis* mentioned by Godfery (1933) is that the lateral lobes of the labellum are reflexed, and this is very noticeable in these two populations. It is, of course, a character normally found in *D. traunsteineri*.

Inflorescence

The occurrence in *D. traunsteineri* of some plants with very few flowers in the spike has frequently been emphasized (Pugsley 1946, Heslop-Harrison 1953). In this there is a remarkably close agreement between the two Yorkshire colonies and the Anglesey one: in each of them the number of flowers in the inflorescence is consistently low (Table 3), the mode in all three lying from 9 to 11.

Flowering-time

In the British Isles *D. traunsteineri* is one of the earliest flowering marsh orchids, commencing in mid-May and extending into the middle of June (Heslop-Harrison 1953, Roberts 1961). In a particularly early season a few of the Anglesey plants have been in flower as early as 7 May.

As Godfery had observed, var. *eborensis* is also early flowering. In 1961 both the Hellifield and Rievaulx plants started flowering in the second half of May and reached a peak in the first week in June.

DISCUSSION AND CONCLUSIONS

The results show that there are comparatively large and statistically significant differences between the Hellifield and Rievaulx colonies in both vegetative and floral dimensions. The mean expression of labellum shape also differs to a marked degree in the two populations.

On the other hand, between the Hellifield colony and that of undisputed *D. traunsteineri* at Pentraeth there is a remarkably close agreement in most of the morphological characters, the chief exceptions being stature and the overall expression of labellum shape.

The characters which, according to Pugsley, separated the var. *eborensis* from his *O. traunsteinerioides* are not uniformly represented among the Yorkshire colonies. Evidently the latter have diverged to a greater or lesser extent both from one another as well as from the other populations of *D. traunsteineri* in the British Isles. Despite this the results show conclusively that all these Yorkshire populations should be referred to *D. traunsteineri*.

In numbers of individuals these populations are very small: Pugsley estimated the Hellifield colony at just over fifty plants in 1937; in 1961 a careful search revealed about a half of this number. At Rievaulx only nine plants were found and this seems to be consistent with the numbers occurring in other seasons (Miss C. M. Rob, *in litt.*). Because of their restricted habitat requirements these populations are geographically isolated from one another, as well as from all other populations of the species in the British Isles. Between many of them gene exchange either does not take place, or does so at a very low rate. Under these conditions it is not surprising that some degree of morphological divergence has arisen among the Britannic populations, particularly so among those which, like these in Yorkshire, consist of very small numbers of individuals. In these the range of biotypes is necessarily restricted and the operation of genetic drift has probably been of far greater significance.

As has been shown, these population differences are most apparent in stature and in the size and shape of the labellum; and, it will be recalled, it is the diversity in these particular

characters which in the past has been the main obstacle to the correct identification of these northern colonies.

The recognition of these Yorkshire plants as *D. traunsteineri* considerably broadens our appreciation of the range of variation to be found within this species in the British Isles. This, however, is not unexpected. In Holland, as Vermeulen (1949) has shown, the species shows considerable variation in both stature and shape of labellum; in the Baltic states it displays even greater variation, the regional variants in some instances being sufficiently well-marked to have become the basis of several subspecies (Vermeulen 1947).

LOCALITIES

The known localities of *D. traunsteineri* in Yorkshire and the exsiccatae from them are listed below.

V.c. 62, North-east York. Beckdale, near Helmsley, 1905 and 1922, *T. J. Foggitt* (BM); Ashberry, near Rievaulx, 1937, *T. J. Foggitt* (BM); *ibid.*, 1948, *Miss C. M. Rob* (K).

V.c. 64, Mid-west York. Near Hellifield, 1937, *H.W.P. & W.A.S.* (BM).

V.c. 65, North-west York. Carperby, Wensleydale, 1885, *F. Arnold Lees* (BM); Masham, 1893, *A. B. Sampson* (K); Tanfield, 1906, *T. J. Foggitt* (BM).

The var. *eborensis* was also stated by Godfery to occur in Durham, but there appear to be no herbarium specimens of it from that vice-county. Nevertheless, further exploration may well prove the occurrence of *D. traunsteineri* not only there but in other fen areas in the north of England and in Scotland.

ACKNOWLEDGMENTS

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