

The occurrence of *Dactylorhiza traunsteineri* (Sauter) Soó in Britain and Ireland

R. H. ROBERTS

51 Belmont Road, Bangor, Gwynedd, LL57 2HY

ABSTRACT

A recent study of morphological variation in *Dactylorhiza* has indicated that *Dactylorhiza traunsteineri* (Sauter) Soó does not occur in Britain or Ireland. Further sampling of some morphological characters in a putative population of this species on Anglesey has been carried out in an attempt to clarify the matter, and a comparison of data from this population with data derived from Alpine plants suggests that *D. traunsteineri* does occur in these islands.

INTRODUCTION

The marsh-orchid with which British and Irish botanists have become familiar over the last 30 years as *Dactylorhiza traunsteineri* (Sauter) Soó was first found in Ireland by H. W. Pugsley. He recognized it as a new plant from herbarium specimens in the National Herbarium (DBN) and from living material sent to him later from two localities in Co. Wicklow. Although he noticed the close similarity of the plant to *Orchis traunsteineri* Sauter ex Reichenb. (*D. traunsteineri*), which he had seen in southern Bavaria in 1934, he decided that it was not identical with that species, but, like another marsh-orchid, *O. majalis* Reichb. var. *occidentalis* Pugsley (*D. majalis* (Reichb.) Hunt & Summerhayes subsp. *occidentalis* (Pugsley) P. D. Sell) which had recently been found in Ireland (Pugsley 1935), was yet another entity allied to *D. majalis*. He consequently named it *O. majalis* subsp. *traunsteinerioides* (Pugsley 1936), but after seeing the plant in the field decided that it was not after all closely allied to *D. majalis* and ultimately raised it to the rank of species.

Heslop-Harrison (1953) made a critical study of this plant and as a result assigned it to *O. traunsteineri*, his only reservation being that a biometric study of Alpine plants might eventually enable the British and Irish variant to be segregated as a subspecies.

Bateman & Denholm (1983) have recently come to a different conclusion. They point out that a comparison of biometric data from British and Irish populations of *D. traunsteineri*, collected by themselves and others (Heslop-Harrison 1953; Lacey & Roberts 1958; Roberts & Gilbert 1963; Roberts 1966), with the descriptions of Alpine plants by Vermeulen (1949) and Nelson (1976) reveals several discrepancies. "True Alpine *D. traunsteineri* is reported to have narrower leaves (<1 cm wide), longer, more lax inflorescences, smaller labella with poorly-developed sinuses, shorter central lobes, and smaller spurs. They also flower later." (Bateman & Denholm 1983). From this they have concluded that the British and Irish plants have been wrongly assigned to *D. traunsteineri* and have reduced them to the rank of subspecies, as *D. majalis* subsp. *traunsteinerioides*.

Bateman & Denholm's data for *D. traunsteineri* were taken from three populations, one in Co. Kildare, Ireland (Pollardstown Fen) and the other two in Anglesey (Cors Erddreiniog and Rhos-y-gad). Biometric data for some morphological characters were already available from the Anglesey populations and it was therefore possible to compare the two sets of values. When this was done large discrepancies were found between them, particularly in the data from the Rhos-y-gad population, where the means for labellum length (7.9 versus 8.91 mm), labellum width (10.2 versus 12.1 mm) and spur width (3.5 versus 4.0 mm) are found to be so widely at variance as to raise doubts about the reliability of the procedures used in Bateman & Denholm's study.

In view of these widely different results, the Rhos-y-gad population was sampled again for some

of the morphological characters in 1984 and a number of the observations were repeated two years later in 1986.

MATERIALS AND METHODS

Morphological characters were recorded in 1984 from a randomly selected sample of flowering plants. Counts of the total number of leaves, number of non-sheathing leaves, number of flowers in the inflorescence and measurements of the width of the second leaf from the base of the stem and the length of the inflorescence were made in the field. A single flower, taken from halfway along the spike, was removed from each plant, and labella and spurs from the sample were mounted separately on card. The width of the labellum was measured at its widest part, together with its length from the spur opening to the tip of the central lobe. Spur dimensions were taken from the flattened, mounted specimens, spur width being measured at the entrance, and spur length from the entrance to the apex.

Counts of the total number of leaves, number of non-sheathing leaves and data for labellum and spur dimensions were repeated in 1986. In addition, the length of the central lobe of the labellum was measured.

RESULTS

Sample means for labellum and spur dimensions are given in Table 1, in which the data of Bateman & Denholm (1983) for these characters are included for comparison. They are also compared graphically in Figs 1a and 1b, from which it can be seen that while the three sets of data obtained by the present writer show good agreement for all four characters, those of Bateman & Denholm (1983) only agree with them for the character of spur length; their means for labellum length, labellum width and spur width differ from them by large and statistically significant amounts.

TABLE 1. SAMPLE MEANS AND STANDARD DEVIATIONS FOR LABELLUM AND SPUR DIMENSIONS FROM THE RHOS-Y-GAD POPULATION OF *D. TRAUNSTEINERI*, TAKEN DURING FOUR SEPARATE SEASONS

Sample	n	Labellum length (mm)		Labellum width (mm)		Spur length (mm)		Spur width (mm)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
R.H.R., 1963	40	7.9	0.89	10.2	1.14	8.3	1.27	3.5	0.63
R.H.R., 1984	34	8.1	0.79	9.9	1.31	8.5	1.02	3.4	0.42
R.H.R., 1986	30	8.2	0.84	10.5	1.29	8.9	0.90	3.4	0.43
1983 ¹	10	8.9	0.78	12.1	1.95	9.0	1.39	4.0	0.82

¹Data of Bateman & Denholm (1983).

Similarly their mean value of 1.0 for the number of non-sheathing leaves differs from the mean of 0.6 from a sample of 50 in 1963, while means of 0.7 and 0.66 were obtained by the writer from samples of 35 and 30 in 1984 and 1986 respectively. Thus, while the present writer's values differ at most by only 16.6%, Bateman & Denholm's estimate differs from the largest of them by 42.9%.

DISCUSSION

Repeated sampling of the Rhos-y-gad population during different flowering seasons has shown that the very large mean values for labellum dimensions and spur width obtained by Bateman & Denholm are not readily repeatable. The possibility was considered that the small size of their sample may account for the poor estimates of population means. However, an independent biometric study of the Rhos-y-gad population of *D. traunsteineri* by Jenkinson (1986) is also based

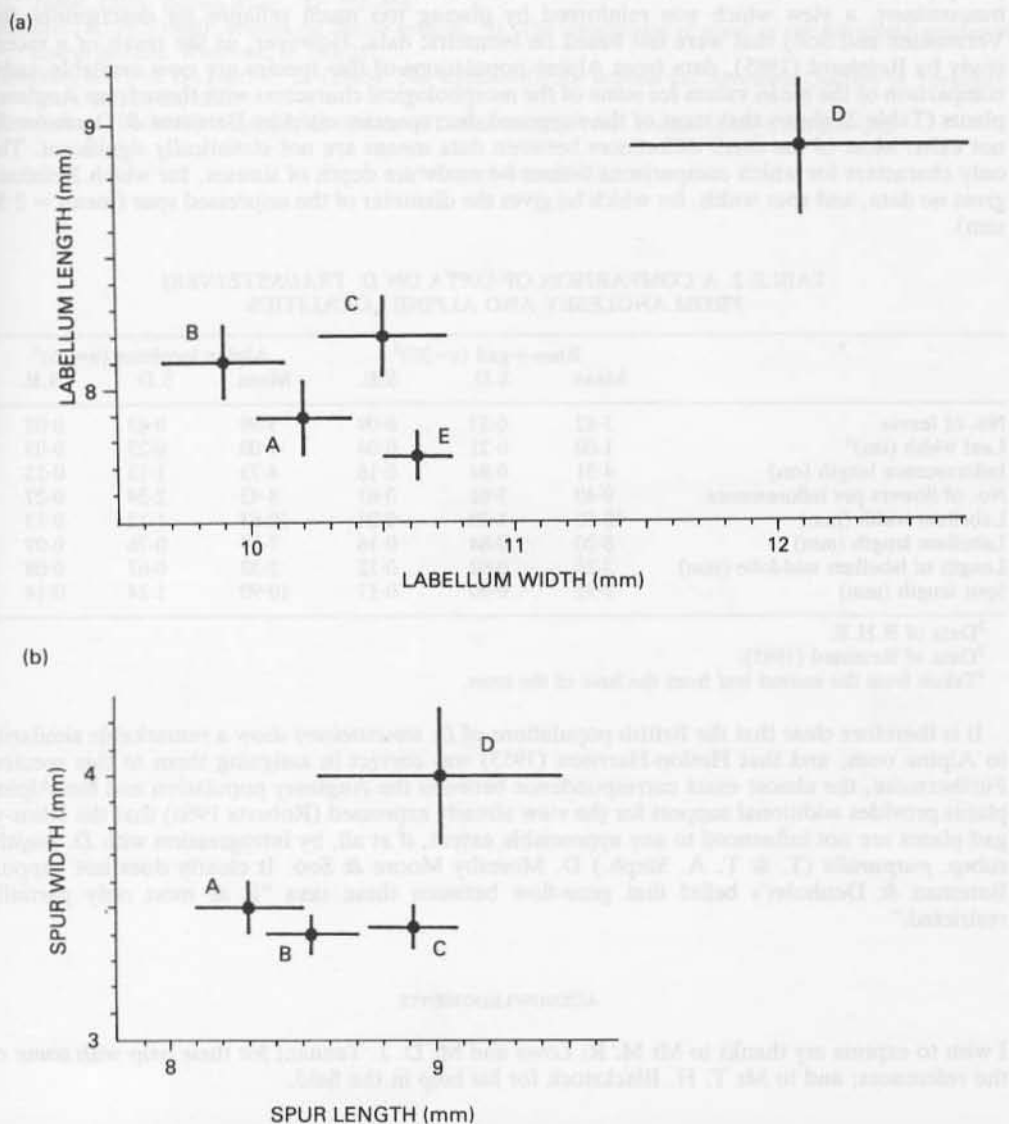


FIGURE 1. (a) Scatter diagram of sample means of labellum dimensions. Bars represent one standard error on either side of the mean. A, B & C, data of R.H.R.; D, data of Bateman & Denholm (1983); E, data of Reinhard (1985). (b) Scatter diagram of sample means of spur dimensions. Legend as in (a).

on a sample of ten flowering plants and his mean values for labellum length (8.0 mm) and labellum width (10.15 mm) show very good agreement with those of the present writer. The other possibility is that Bateman & Denholm have included in their sample hybrids of *D. traunsteineri* with either *D. fuchsii* (Druce) Soó or *D. maculata* (L.) Soó, both of which occur in the same locality. While this could possibly account for the large labellum dimensions, one would expect the mean value for spur width to be smaller (not larger) than the mean from pure *D. traunsteineri*, and this possibility must also be ruled out.

Whatever the explanation for them may be, their large values for floral dimensions may have

partly persuaded these authors that the British and Irish plants are not identical with Alpine *D. traunsteineri*, a view which was reinforced by placing too much reliance on descriptions (by Vermeulen and Soó) that were not based on biometric data. However, as the result of a recent study by Reinhard (1985), data from Alpine populations of this species are now available and a comparison of the mean values for some of the morphological characters with those from Anglesey plants (Table 2) shows that most of the supposed discrepancies cited by Bateman & Denholm do not exist. Most of the small differences between data means are not statistically significant. The only characters for which comparisons cannot be made are depth of sinuses, for which Reinhard gives no data, and spur width, for which he gives the diameter of the unpressed spur (mean = 2.59 mm).

TABLE 2. A COMPARISON OF DATA ON *D. TRAUNSTEINERI* FROM ANGLESEY AND ALPINE LOCALITIES

	Rhos-y-gad (n=30) ²			Alpine localities (n=75) ³		
	Mean	S.D.	S.E.	Mean	S.D.	S.E.
No. of leaves	3.82	0.53	0.09	3.99	0.63	0.07
Leaf width (cm) ⁴	1.00	0.21	0.04	1.00	0.23	0.03
Inflorescence length (cm)	4.51	0.84	0.16	4.73	1.13	0.13
No. of flowers per inflorescence	9.40	3.62	0.67	8.43	2.34	0.27
Labellum width (mm)	10.50	1.29	0.24	10.63	1.12	0.13
Labellum length (mm)	8.20	0.84	0.16	7.74	0.76	0.09
Length of labellum mid-lobe (mm)	2.25	0.62	0.12	2.38	0.67	0.08
Spur length (mm)	8.92	0.90	0.17	10.90	1.24	0.14

²Data of R.H.R.

³Data of Reinhard (1985).

⁴Taken from the second leaf from the base of the stem.

It is therefore clear that the British populations of *D. traunsteineri* show a remarkable similarity to Alpine ones, and that Heslop-Harrison (1953) was correct in assigning them to this species. Furthermore, the almost exact correspondence between the Anglesey population and the Alpine plants provides additional support for the view already expressed (Roberts 1966) that the Rhos-y-gad plants are not influenced to any appreciable extent, if at all, by introgression with *D. majalis* subsp. *purpurella* (T. & T. A. Steph.) D. Moresby Moore & Soó. It clearly does not support Bateman & Denholm's belief that gene-flow between these taxa "is at most only partially restricted."

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Dactylorhiza traunsteineri DC. (Orchidaceae), with a chromosome number $2n = 4$ (tetraploid) and 2-20, has been collected on the hill of Tynan, near the N. Atlantic. This is the first record of the species from Scotland.

McNeill (1970) stated that *Dactylorhiza affinis* is 'a very complicated taxonomic group, differently by practically all students of the genus'. The differences are especially due to two factors: (a) the variable cytological conditions from which plants within the same taxon may be derived (Robertson 1965, 1966, 1971a, b, 1973, 1976; Galtsoff & Galtsoff 1971), and (b) growth of the varieties that has been given importance, weight and individuality of genetic characters unique to the complex. It was pointed out in a review of the genus (Robertson 1986).

This variability of the material studied by Galtsoff for genetic diversity was demonstrated and accepted in the literature. In Great Britain, the variety *affinis* and *Dactylorhiza latifolia* species, *D. traunsteineri* DC. has been recorded only from England (e.g. G. 76, 84, 87, 88). My records are the first in Ireland.

The *Dactylorhiza affinis* plant collected in Great Britain in July and August 1986, being material of *Dactylorhiza* was brought to the University of Ulster and examined morphologically and cytologically. It was found to be a British and to be a *Dactylorhiza* plant.

A few other forms of what was supposed to be an inland tetraploid *Dactylorhiza affinis* L. were collected at the following locality:

Northwich, Cheshire, 10.5 miles N.W. of Stone, South Cheshire, near Lake Country, 800 m. alt. (G. 76, 84, 87, 88). Date July 1986. (Material deposited in the Herbarium of the University of Ulster).

Small plants had specimens that have material in a greenhouse at the University of Ulster. The plants were collected and kept under the same conditions. They were then grown and given under similar conditions a physical analysis at 10°C day temperature and 12°C night temperature with 16 hours light and 8 hours darkness. The plants produced leafy material and three flowers after being put in the plants were covered in a completely dark chamber at 10°C for three months in darkness under artificial light. Then they were returned to the original growth conditions to produce flowers.

Material prepared in the form of a flower of a young flower from the University of Ulster. They were kept at -20°C for about 24 hours, then prepared in a dark chamber. The preparations were made according to the method.

The plants were collected in small quantities of a fairly steep, shaded slope. The plants were collected in