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## SHORT COMMUNICATION

# Epitypification of the name *Epipactis purpurata* Sm. (Orchidaceae, Neottieae)

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**Abstract**

The identity of the holotype of *Epipactis purpurata* Sm. is shown to be demonstrably ambiguous because all its flowers are at the budding stage (pre-anthesis); thus, no crucial diagnostic characters are visible, i.e., gynostemium morphology and undulations of margins of the labella and their shape and color. This way, the specimen is almost identical with several species of *Epipactis* genus (*E. purpurata* group) and including morphologically variable *Epipactis helleborine*, as many plants of the latter species can have similar combinations of characters like the holotype (i.e., small leaves and a robust stem even in the inflorescence). Thus, an epitype for the name *Epipactis purpurata* Sm. is proposed (M 257866) in order to enable its precise taxonomic interpretation and achieve nomenclatural stability.

**Keywords**

*Epipactis purpurata*; epitype; Orchidaceae; typification

**Introduction**

*Epipactis purpurata* Sm. [1] is a nomen conservandum [2] for a widely distributed, cross-pollinated orchid confirmed from many sites in Western and Central Europe, where it occurs across a large elevational range (50–1500 m a.s.l.). In spite of the extensive distribution, it is considered a rare and threatened species [3–5] and included in the *European red list of vascular plants* [6] and national red lists of many European countries. The first name of the taxon was *Epipactis viridiflora* Krock., nom. rej. However, when this name was published, no type was designated and no illustrations were cited; moreover, the original material related to the protologue of *E. viridiflora* was lost [7] because Krock's collections were destroyed by fire during World War II at WRS� [8]. Its neotype was designated and the name was thus resolved to be a heterotypic synonym of *E. purpurata* [9]. However, the obscurity of the name *Epipactis viridiflora* Krock. brought it to rejection in favor of the more established *E. purpurata* [2].

*Epipactis purpurata* is often confused with *E. helleborine* (L.) Crantz. Our studies show that many herbarium sheets borrowed from selected herbaria (i.e., BR, BRNU, FR, G, KTU, M, MA, S, STU, WRS�, ZT, Z) and supposed to be *E. purpurata* are misidentified, even though the species is fairly easy to recognize [10]. In our opinion, these specimens belong to *E. helleborine*. The reverse situation is also common, i.e., some *E. helleborine* specimens are labeled as *E. purpurata*. Revision of herbarium specimens seems to be problematic in many cases as we found a wide variability in morphological characters of both taxa. Contemporary literature indicates differentiating features of these species but solely for specimens in full blooming stage. In living plants, an important diagnostic feature is the color of particular parts of the plant; however, the colors fade in herbarium specimens.

During our investigations, we noticed that the holotype of *Epipactis purpurata* (Herb. Smith 1395.7, LINN) is a specimen without open flowers, which therefore cannot be reliably identified. The holotype does not also possess any other distinguishing characters that could confirm that it certainly belongs to *E. purpurata* s. str. In Europe, (especially in the southern part) and in the Middle East (the northern part of Iran), there are several species morphologically similar and closely related to *E. purpurata*, i.e., *E. halacsyi* K. Robatsch, *E. rechingeri* Renz, and *E. bithynica* K. Robatsch, of which the latter is also included by some botanists in the *E. helleborine* group [3]. All these species are characterized by the red lilac, purple or reddish color of the shoot and main veins, and have a similar morphology of flowers [1,4]. Unfortunately, to distinguish them from *E. purpurata* (both in field conditions and in herbarium sheets) at the budding stage, i.e., before anthesis, is absolutely impossible.

According to Article 9.8 of the Melbourne Code [11], “when the holotype is demonstrably ambiguous and cannot be critically identified for purposes of the precise application of the name to a taxon”, an epitype (a specimen or illustration) should be selected to serve as an interpretative type. Thus, the aim of our work was to analyze the protologue of this name and to designate an appropriate epitype of *E. purpurata*, in order to remove doubts over the application of this name. Our choice is based on a comprehensive morphological study which included ca. 600 herbarium specimens of *E. purpurata* (ca. 450) and *E. helleborine* (ca. 150). The material stored in the following herbaria: BR, BRNU, FR, G, KTU, M, MA, S, STU, WRSL, ZT, Z.

### Diagnostic characters in the protologue of *Epipactis purpurata*

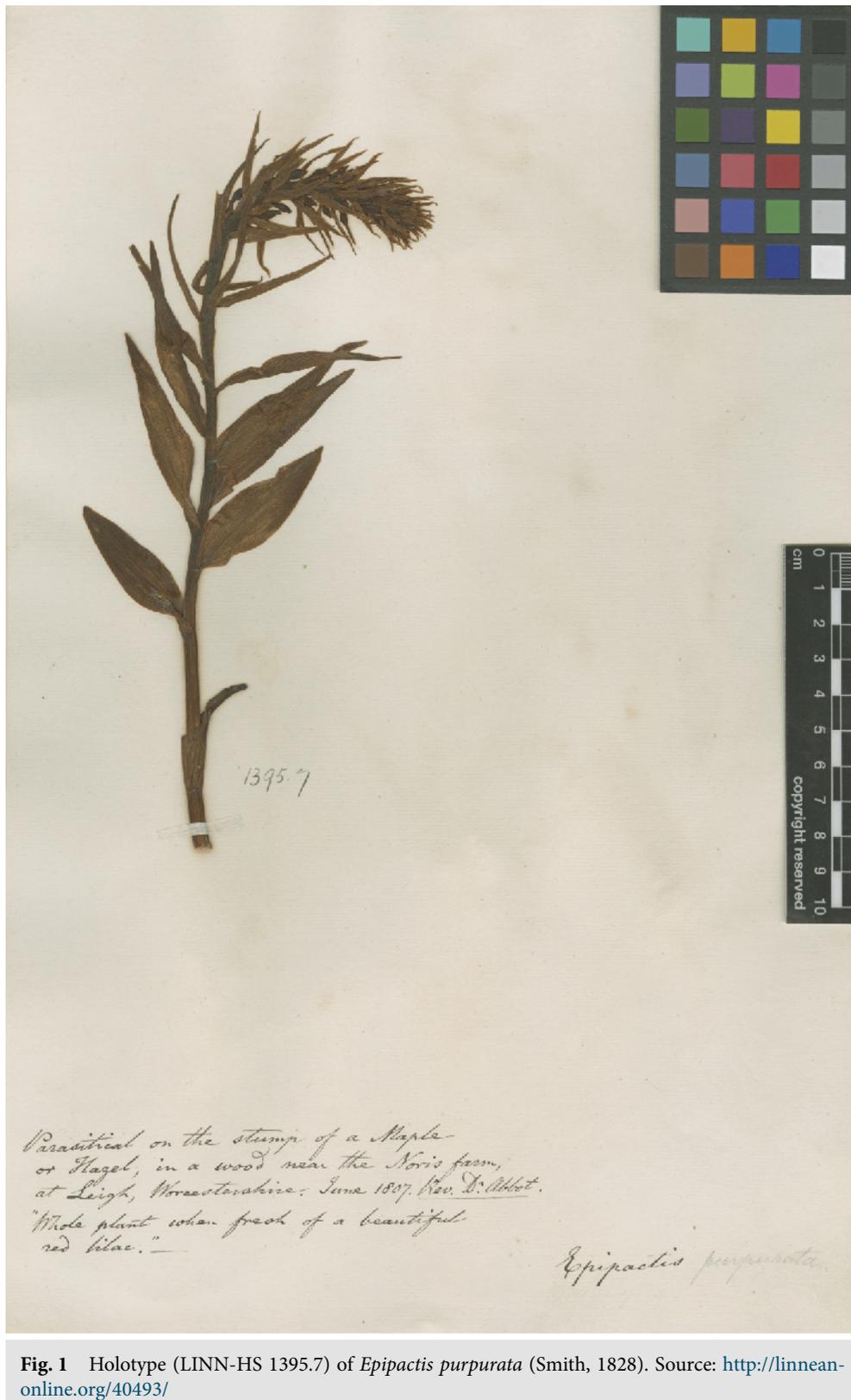
The Smith's protologue [1] provides the following diagnostic characters of *E. purpurata*:

Leaves ovate-lanceolate. Bracteas linear, all twice as long as the flowers. Lip shorter than the calyx, entire. Germen downy [...]. Root certainly parasitical. Whole plant, when fresh, glowing with a beautiful red lilac color; changed in drying to a tawny, not dark or black, brown, which it has since retained unaltered. Stem about a foot high, round, finely downy, clothed with alternate, sessile, many-ribbed, flat, not plaited, leaves, about 2 inches long, their ribs and margins minutely rough; the lower ones ovate-lanceolate; upper linear-lanceolate as they approach the flowers. Cluster a little drooping, at least before the flowers expand, cylindrical, dense. Bracteas solitary under each partial stalk, nearly erect, linear, acute, straight, long and narrow, being more than twice the length of the unexpanded flowers. The latter are numerous, crowded, mostly full-grown, but not yet expanded. On immersion in boiling water, they prove to have all the characters of an *Epipactis*, with a lip like the foregoing species, quite entire at the margin, and somewhat pointed. The calyx is externally downy, as well as the germen.

### Examination of the holotype

In the protologue of *E. purpurata* [1], a single specimen collected in 1807 by Rev. Charles Abbot (ca. 1761–1817) is directly cited, which is stated to have been the only specimen in possession of Smith and therefore has the status of holotype (Herb. Smith 1395.7, LINN; Fig. 1).

The three floral diagnostic characters mentioned in the protologue are not immediately visible in the holotype specimen but were observed by the author on immersion of immature flowers in boiling water [1]: (i) lip shorter than the calyx, (ii) entire, and (iii) germen downy. As evident from the specimen, Smith did not preserve the prepared floral parts. Without further dissection of its immature flowers, the holotype of the name is not a correct specimen for identification of *E. purpurata*; therefore,



**Fig. 1** Holotype (LINN-HS 1395.7) of *Epipactis purpurata* (Smith, 1828). Source: <http://linnean-online.org/40493/>

it is not possible to attribute the holotype to the species based on the characters of gynostemium and perianth segments, especially the details of the lip that are crucial diagnostic characters of *E. purpurata* [3–5,12,13]. Nevertheless, even if such dissection of its immature flowers is possible, there will still be no possibility of estimating the details and proportions of ripe gynostemium (column) and perianth segments. This way of distinguishing the holotype specimen from other similar species, e.g., of the *E. purpurata* group, remains impossible.

Only three of six Smith's diagnostic characters are visible in the holotype: (i) ovate-lanceolate leaves as well as (ii) linear bracts and (iii) bracts twice as long as the flowers [1]. Such characters are not sufficient for distinguishing between current concepts of *E. purpurata* and *E. helleborine*, as both species can have the same ovate-lanceolate leaves and also linear bracts [3–5,13,14]. Therefore, the shapes of leaves and bracts of the holotype cannot be the only characters that confirm that the specimen really belongs to *E. purpurata*. Additionally, Smith's description (after diagnosis of the new species) also provides the distinguishing character connected with the color of the plant. Namely, the specimens of *E. purpurata* are particularly characteristic: “whole plant, when fresh, glowing with a beautiful red lilac color”. However, in identifying spirit collection and old herbarium material, this feature is completely irrelevant for two reasons: (i) the purple color can disappear completely and (ii) the color of the dried plants (“changed in drying to a tawny, not dark or black, brown” [1]) is encountered in dried ramets of other species, and is similar due to the method of drying the material. In addition, the same color occurs in fresh ramets of other species of the *E. purpurata* group, i.e., they are also “glowing with a beautiful red lilac color”.

Importantly, the purple color of the stem, leaves, and major veins, although clearly visible on fresh plants, is very rarely visible on *E. purpurata* herbarium sheets. Moreover, the red color is also clearly visible on the sheets of species from other groups within the *Epipactis* genus, i.e., *E. atrorubens* (Hoffm.) Besser and *E. kleinii* M. B. Crespo, M. R. Lowe & Piera [3,5], which confirms that the color of the stems and leaves is not a good diagnostic character. Other features of Smith's description, i.e., appearance of clusters, bracts, lip, and calyx are purely descriptive and are not diagnostic for *E. purpurata* s. str., because simultaneously they are included within the range of variation of other closely related species.

We also found that many specimens of *E. helleborine* (L.) Crantz can have similar combinations of characters like those visible in the holotype (i.e., small leaves and a robust stem even in the inflorescence). This way, the holotype of *E. purpurata* is almost identical to many plants of different taxa at the budding stage, especially for species from the *E. purpurata* group, i.e., *E. bithynica*, *E. halacsyi*, and *E. rechingeri*, as well as the morphologically variable *E. helleborine*.

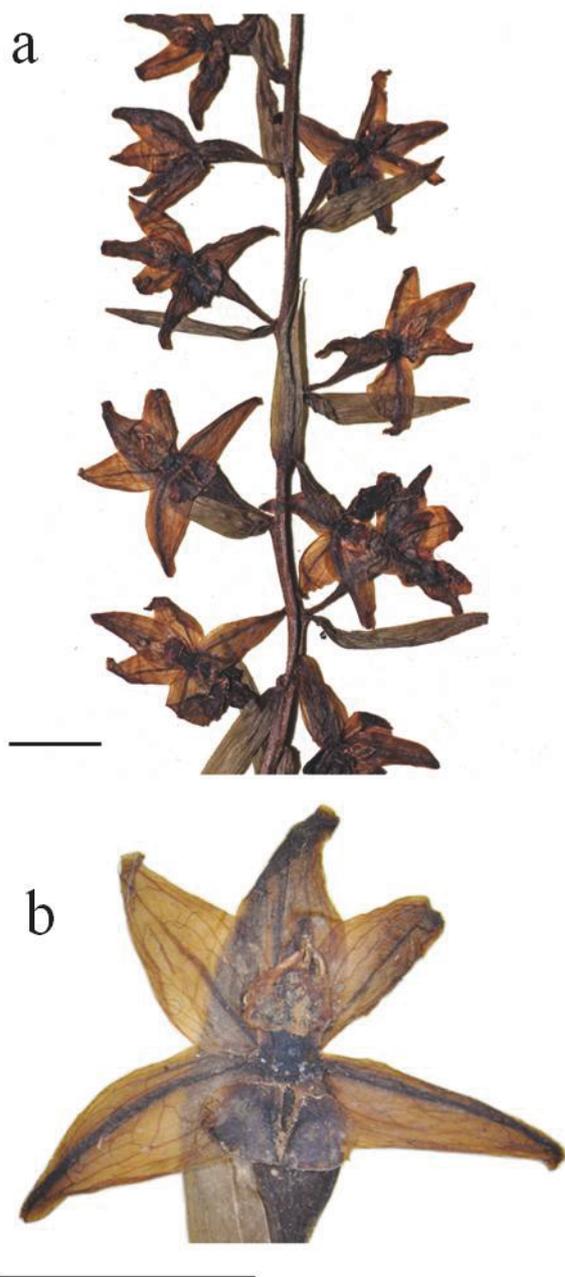
## Epitypification

Smith's diagnosis and description do not give enough detailed information on species characters relevant to discrimination of *E. purpurata* s. str., which, together with the holotype being an immature specimen possessing no more distinguishing characters, makes the use of the name ambiguous. Due to such extensive variability of the two *Epipactis* species and the risk of being easily mistaken (as found by us in many collections), and because the type specimen was collected not at the flowering stage (i.e., considering the demonstrated ambiguity of the holotype), we propose to select an epitype (Art. 9.8 in McNeill et al. [11]) in order to enable the precise application of the name *Epipactis purpurata* Sm. s. str. and achieve the nomenclatural stability.

Based on the analysis of 600 herbarium sheets, we have chosen the most representative sheet (M 257866) for this purpose. The proposed epitype is composed of two ramets (two shoots) at the full flowering stage (Fig. 2, Fig. 3). The flowers are wide open, which allows to perform biometric measurements or to look at the details of sepal and petal morphology as well as the lip. Additionally, traits given by Smith (1828) as diagnostic (i.e., shape of leaves – ovate-lanceolate, germen – downy, lip – entire, shorter than the calyx and bract length, which should be twice as long as the flowers) they all occur within the specimen. Thus, it has characteristics consistent



Fig. 2 Epitype specimen of *Epipactis purpurata* Sm. (M 257866). Photo: P. Jarzembowski. Scale bar: 5 cm.



**Fig. 3** Inflorescence (a) and flower (b) of the epitype of *Epipactis purpurata* Sm. (M 257866). Photo: E. Żołubak and P. Jarzembowski. Scale bars: 1 cm.

with diagnosis, but the trait given by the author with respect to the bracts is valid only for specimens in the pre-anthesis stage and thus it does not refer to the epitype. Specifically, in the lower part of inflorescences, flowers shown are species-specific, but usually the upper bracts are equal to or only slightly shorter than the flowers as a result of the ontogeny and developmental process, which is the most common for the species [13]. Our data are confirmed by analysis of many individuals from different parts of Europe [13]. In addition, the trichomes are also well preserved on the stems of both epitype plants. The shape of conical cells (papillae) on main leaf margins and veins is typical for *E. purpurata* and can be clearly seen as well. This is a very well preserved herbarium sheet, and the traits of the plants are consistent with the protologue. Thus, the formal typification and synonymy can be summarized as follows:

***Epipactis purpurata*** Sm., Engl. Fl. 4: 41. 1828, nom. cons.  $\equiv$  *Epipactis latifolia* var. *purpurata* (Sm.) Nyman, Consp. Fl. Eur.: 688. 1882  $\equiv$  *Epipactis latifolia* subsp. *purpurata* (Sm.) K. Richt., Pl. Eur. 1: 284 (1890)  $\equiv$  *Helleborine purpurata* (Sm.) Druce, J. Bot. 47: 28. 1909. Holotype: England, Worcestershire, Parish of Leigh, a wood near Norris Farm, Jun. 1807, *Abbot s.n.* (Herb. Smith 1395.7, LINN). **Epitype (designated here)**: Germany, Bayern, Siegertshofen, Rand einer Firstenwalder, 560m, September 1, 1912, *A. Fuchs 54* (M 257866!).

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