

# New data on the apophytic occurrence of *Epipactis helleborine* (L.) Crantz and *Cephalanthera longifolia* (L.) Fritsch in *Populus ×canadensis* plantation in Lower Silesia (south-western Poland)

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**Abstract:** In the course of the research, two species of orchids, i.e. *Cephalanthera longifolia* (L.) Fritsch and *Epipactis helleborine* (L.) Crantz have been found to appear in large quantities in poplar monoculture *Populus ×canadensis* in the Krzyżowe Hills (Lower Silesia, Poland). No data on sword-leaved and broad-leaved helleborine occurrence in such habitats in Lower Silesia have been published so far. Based on the list of species accompanying *Cephalanthera longifolia* and *Epipactis helleborine*, the habitat analysis has been conducted by means of Ellenberg's ecological indicator values. For the first time *Cephalanthera longifolia* is reported in *Populus ×canadensis* monoculture in Poland.

**Key words:** Orchidaceae, apophyte, poplar monoculture, Lower Silesia, Poland

## 1. Introduction

Former researches on the Orchidaceae occurrence in poplar monoculture showed presence of several species, e. g. *Epipactis helleborine*, *Platanthera bifolia* and *Dactylorhiza incarnata* in such habitat (Adamowski 1995, 2002, 2004). According to Adamowski & Conti (1991), poplar plantations seem to be a suitable habitat for colonisation by orchids because of the habitat requirements of poplar.

The existence of *Populus ×canadensis* monoculture in the Krzyżowe Hills (Lower Silesia, Poland) made us undertake extensive research into the flora of this area, and particularly into species of Orchidaceae family.

## 2. Material and methods

The research has been carried out in the Krzyżowe Hills in Lower Silesia, Poland. The 6.5 km long Krzyżowe Hills lie in the heart of Przedgórze Sudeckie (the Sudeten Foothills) and are the furthest part in the west of the Niemczańsko-Strzelińskie Hills. They surround the Dzierżoniowska Valley from the northern-

east side (Fig. 1). Their main component are gneisses from the Sowie Mountains (Kondracki 1994) on which mostly acidic brown soil has developed (Czuba 1997). The subject of the research are populations of *Cephalanthera longifolia* (L.) Fritsch and *Epipactis helleborine* (L.) Crantz in Canadian poplar *Populus ×canadensis* monoculture. The poplar plantation was formed on the soil formerly cultivated by man. The trees grow there at regular 5 metre intervals, and as the treetops rather do not touch, the plants growing under the trees acquire a lot of sunshine. In some places, small trees and bushes, especially *Betula pendula* and *Crataegus laevigata*, appear.

The research was conducted in the growing season in the year 2005. The eight phytosociological relevés were taken using the Braun-Blanquet's method. The names of syntaxonomic units were given using Matuszkiewicz's (2001) terminology and the names of taxa were used after Mirek *et al.* (2002). Based on the list of species accompanying *Cephalanthera longifolia* and *Epipactis helleborine*, a habitat analysis has been carried out using Ellenberg's ecological indicator values (Ellenberg *et al.* 1992).

### 3. Results

In the examined 2.5 ha poplar monoculture, two species of orchid family have been found to grow abundantly. *Cephalanthera longifolia* grew and bore fruit there from 13th May to 15th June. The size of its population was large, estimated at 1000 specimens.

Soon after the bloom fell off and the sword-leaved helleborine withered, the other orchid species, i.e. *Epipactis helleborine*, started its vegetation period. At the end of June, when it was in full bloom, over 1000 flowering shoots were discovered. It has been found that 90% of the specimens of the two researched species bear fruit. Both species grew exactly in the same place, the only thing that differentiated them was phenology.

The floristic analysis indicated that taxa of the *Quercetea roburi-petraeae* class are the most common in this area and move there from the neighbouring acidophilic oak woods. Plants from *Quercus-Fagetea* class are the second significant group. Other sizeable, although diminishing, groups are meadow species of the *Molinio-Arrhenatheretea* class and those related to nitrophilous habitats of *Artemisietea vulgaris* with their characteristic feature, i.e. specific light requirements, which stop being satisfied in the course of progressive succession (Jakubska *et al.* 2005).

The habitat analysis conducted by means of Ellenberg's indicator values showed that well sunlit habitats predominate in the studied area. The light-loving plants (Ellenberg's indicator value 7) constitute 42% of all plants. Species of fresh habitats (Ellenberg's indicator values 5) definitely predominate and constitute 58% of all plants. As for the indicator of acidity, no group can be clearly differentiated, however, the species

that prevail are from weakly acid to weakly basic conditions habitats (Ellenberg's indicator value 6 and 7). They account for 55% of all accompanying species. Similarly as in the case of acidity, the nitrogen resources indicator shows no clearly dominant group, those which prevail indicate places from moderately rich to rich in this element (Ellenberg's indicator values 5, 6 and 7). They constitute 58% (Fig. 2).

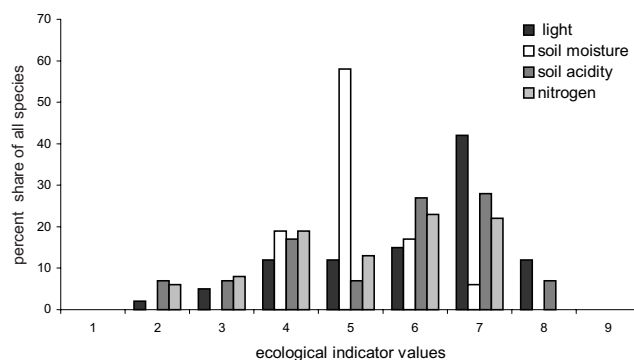


Fig. 2. Habitat analysis by means of Ellenberg's indicator values

### 4. Discussion

It was interesting to discover the existence of a separate mycoheterotrophic species, *Pyrola minor* L. (Pyrolaceae) next to orchids in the researched population of *Populus × canadensis*. The discovered co-occurrence of these species is a confirmation of the Adamowski's thesis about favourable conditions for mycorrhizal fungi growth, which are met in poplar monocultures (Adamowski & Conti 1991).

Numerous papers on mycorrhiza of species within tribe Neottieae show a strong relationship between this group and such fungi species as Basidiomycetes: Sebacinaceae, Thelephoraceae, Russulaceae and Ascomycetes: Helotiales, Pezizaceae (Selosse *et al.* 2004).

According to Arditti (1997), the fungi coexisting with orchids, live on the roots of plants inhabited by orchids, which might explain why some species of orchids are encountered only in specific habitats and in similar soil conditions.

It seems reasonable to conduct thorough mycological research and identify fungi symbionts, as it is likely that the reason for the abundant occurrence of the two orchid species in *Populus × canadensis* poplar monoculture in the Krzyżowe Hills are optimum conditions for the growth of mycorrhizal fungi.

The occurrence of such large populations of orchids in one place is remarkable and interesting from the point of view of biology and ecology of this group. Although they occupy the same area, the examined populations do not compete for pollinating species or the access to

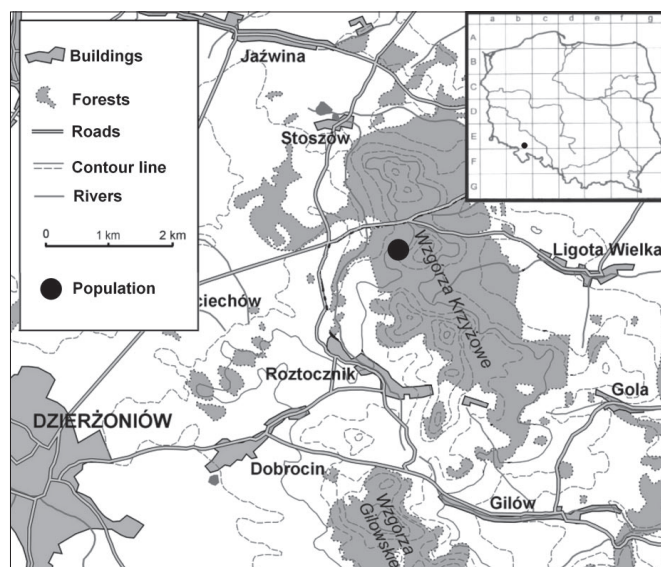


Fig. 1. Location of poplar plantations with *Cephalanthera longifolia* and *Epipactis helleborine*

the light as they differ in terms of the time of appearing and blooming.

An important issue that might influence their existence in the future is the appearance of such expansive species as *Calamagrostis arundinacea*, *Solidago gigantea* and *Rubus* sp. The biology and ecology of these species make it difficult to protect the orchids actively, as they

reproduce vegetatively. *Calamagrostis* sp. and *Solidago* sp. are rhizome plants while *Rubus* sp. has well developed the above ground parts and thus may significantly limit the access of much smaller orchids to the light.

The conducted research is a stimulus to further studies on the phenomenon of orchids occurrence in poplar monocultures.

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