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# Ecological and biological aspects of new locality of *Drosera anglica* Huds. near Końskie (District of Central Poland)

SUMMARY

*Drosera anglica*, unlike *Drosera rotundifolia*, rarely reproduces vegetatively. The sustainability of the *D. anglica* population depends on the production of a large amount of seeds. However, in the conditions of strong eutrophication or mechanical devastation of habitats, a large number of seeds is not sufficient for the survival of the English sundew in the natural conditions. There are situations where *D. anglica* appears in unusual conditions. An example is the site described in this study. It can be initially assumed that this species has some adaptive abilities to live in untypical habitats. Studies of plant material from many sites should be conducted to determine the resistance threshold of *D. anglica* to some chemical factors, including e.g. heavy metals.

The results of the analysis concerning the presence of heavy metals, pH values, CaO content, C:N ratio in the collected soil samples and the variability of selected morphometric features presented in this paper have signal and informative values. Determining whether and to what extent the morphometric traits of English sundew correlate with the variability of the analyzed edaphic features would require the inclusion into studies of *D. anglica* populations.

**Keywords:** *Drosera anglica*, ecological aspects

## INTRODUCTION

A total of 15 species belong to the genus *Drosera* (11). Most of the species were found in Australia and in Southern Africa. In Poland, in addition to the three sundews: *Drosera anglica* Huds., *Drosera intermedia* Hayne and *Drosera rotundifolia* L., there are also hybrids of these species. *Drosera anglica* occurs in the central and northern parts of Europe as well as North Asia and North America. It is a circumboreal species. The locations of *D. anglica* Huds., reach up to 1,279 m

above sea level (19). Unlike *D. rotundifolia*, it rarely reproduces vegetatively. The sustainability of the *D. anglica* population depends on the production of a large amount of seeds (18). However, in conditions of strong eutrophication or mechanical devastation of habitats, this trait is not sufficient for the survival of the species. There are situations where *D. anglica* appears in unusual conditions. An example is the site described in this study. It can be assumed that this species has some adaptive abilities to live in untypical habitats. Studies involving more extensive plant material from many sites should be conducted to determine the resistance threshold of *D. anglica* to some chemical factors, including e.g. heavy metals.

The presented results concern the presence of heavy metals, pH values, CaO content, C:N ratio in soils in the *D. anglica* sites and the variability of selected morphometric features.

## LOCALITY AND RESEARCH

The mire with the locality of the English sundew is located some south of the town of Końskie, in the Stąporków municipality on the border of the Łódź and Świętokrzyskie provinces (N 51˚8'30'', E 20˚34'24''). Kondracki (9) includes this area to Opoczyńskie Hills. The area is crossed by the Czarna Konecka River, a tributary of the Pilica. The *D. anglica* location found was just a single patch, located in an ecotone with a low number of plant species. Observations presented here were made on 23rd July, 2017 and were accidental, and it was not possible to perform such studies in numerous repetitions as recommended by Faliński (2).

## MATERIALS AND METHODS

There is a lot of information about the locations of rare species in the literature. Certainly, most of it is only of historical value today. Hence, there is a need to verify, whether the given rare species still occurs in their natural habitats. This short note fits this part of research trends. There are many important issues connected with endangered species. Each newly found or formerly identified species, in particular endangered one, has significance for its position in the ATPOL (20). *D. anglica* is such a taxon, with an endangered status in Poland (8). It is included in the red list of plants of Central Poland (5, 6) and hence, every single location thereof should be monitored.

In addition to estimation of the number of *Drosera anglica* specimens per square meter of randomly selected patch, we also performed an inventory of co-existing plant species using the Braun-Blanquet method (17). The nomenclature of vascular plant species is consistent with Mirek et al. (16), and for mosses with Frahm and Frey (3). The syntaxonomic nomenclature was adopted according to Matuszkiewicz (13).

As part of chemical research, the following analyses were carried out, using the following methods:

- Methodology: pH – Pr PN-ISO 10390;
- C, N, S total – analysis with the LECO infrared TruMac device (for carbon and sulfur) and determination of exhaust heat conductivity (for nitrogen);
- trace elements (content close to the total) – analysis of samples wet-mineralized in 60% $HClO_4$ using the AAS method;
- ash content – heat treatment of the sample at 550°C and determination of the weight loss;
- CaO – determination of the calcium content in extracts in 1N ammonium acetate using the AAS method and conversion into CaO.

## RESULTS

Floristic composition of the patch with *D. anglica* presents the following phytosociological relevé (the surface – 10 m²): coverage of shrubs (5%), coverage of herbs (60%), coverage of bryophytes (40%); *Drosera anglica* (1), *Agrostis canina* (1), *Comarum palustre* (+), *Rhynchospora alba* (4), *Lysimachia thyrsiflora* (+), *Peucedanum palustre* (1), *Phragmites australis* (+), *Betula pubescens* (b) (+), *Drosera rotundifolia* (+), *Frangula alnus* (b) (+), *Salix aurita* (b) (+), *Deschampsia flexuosa* (1), *Aulacomnium palustre* (d) (1), *Sphagnum fallax* (d) (3).

The estimated number of specimens of the English sundew per 1 m² was 10. Only specimens in the fruiting stage were found. Score of 1 on the Braun-Blanquet scale also indicates low coverage of the English sundew. We can also suspect the presence of overwintering seedlings under the snow, which would significantly accelerate vegetation in the next growing season (similar to our own observations of *D. rotundifolia*). The patch where the inventory was performed is poor in plant species. The probable cause of the species poverty is its high water level (9 cm). An interesting observation is the quite large share of the rare *Rhynchospora alba*. However, specimens of this plant species were not found in the surrounding patches. Hence, it was advisable to take a floristic inventory of the patch where *D. anglica* was found.

In favourable conditions the high level of groundwater does not allow the formation of trees and shrubs layer to form. *D. anglica* population can be probably limited by the competitiveness of other species, namely *Rhynchospora alba*, a species considered somewhat recessive in Poland. There were just single specimens of *Phragmites australis* observed, and its expansion is possible. In this study some physicochemical soil properties in *D. anglica* sites were determined (Table 1). The pH is the most often quoted value, and the remaining ones quoted here are usually omitted. They are indispensable for the assessment of soil condition during observation and in subsequent years. In considering these types of issues, comparison of soil and the presence of *D. anglica* forms an important issue from the point of view of the presence and protection of this species.

The physicochemical soil properties indicated that it is the acidic soil with an average CaO content, and ash content which puts it near to transition mires, similarly to the C:N ratio (of approx. 22). The content of heavy metals is normal and does not indicate substrate toxicity (7). The amounts of the remaining elements are aligned. The exception here is the Cr content, where the minimum and maximum values demonstrated greater differences.

Table 1. Physicochemical properties of soil where *D. anglica* grew

| Soil sample | pH | CaO (%) | N (%) | C (%) | S (%) | Ash content (%) | Cd- (mg $kg^{-1}$) | Cr (mg $kg^{-1}$) | Ni (mg $kg^{-1}$) | Pb (mg $kg^{-1}$) | Zn (mg $kg^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.0 | 0.6810 | 1.383 | 30.70 | 0.552 | 22.30 | 2.7 | 7.8 | 12.3 | 63.8 | 167.3 |
| 2 | 4.8 | 0.7148 | 1.342 | 30.50 | 0.541 | 21.94 | 2.9 | 11.0 | 12.5 | 68.7 | 175.2 |
| 3 | 4.9 | 0.6977 | 1.357 | 31.29 | 0.538 | 18.94 | 2.8 | 9.4 | 12.4 | 65.4 | 169.1 |

## DISCUSSION

The *Drosera anglica* is a rare and dying species in Central and Eastern Poland, on its border with the eastern territories, yet in the past it was found in locations near the Widawka and Warta rivers (4, own observations). In the recent years, this species was not present there. The reason for the disappearance of London *D. anglica* can be attributed to the operation of the "Bełchatów" lignite mine. In areas distant from the exploitation sites of lignite, for example in South-Eastern Poland, the English sundew is also a rare species, but one that is still recorded from time to time (1, 12). In short, it is concluded that *D. anglica* may exist in communities which have a large variation of accompanying species (10, own observations). Kurzac and Kucharski (10) observed this species together with calciphilous flora representatives, such as *Eleocharis quenquiflora*, *Liparis loeselii*, and sometimes with *Drosera rotundifolia*, which is a rare species for the resulting ecotones (15, 16). Issues related to the plant communities where *D. anglica* was found, are quite problematic but possible, just because the species in question can adopt to different phytocoenoses (own observations).

## CONCLUSION

1. The studied *Drosera anglica* site is characterized by a small number of individuals and very poor floristic composition of the plant community, and in the near future *D. anglica* will need protection and constant monitoring of the habitat.
2. The presence of *Phragmites australis* can contribute to gradual overgrowing of the studied surface, but spread of this species depends on the hydrological conditions. Succession can proceed towards complexes of the *Scheuchzerio-Caricetea nigrae* class, while at a constant high water level it may suddenly switch towards the *Phragmitetea* class.
3. The measured values of the C:N ratio indicate a slight deterioration of the bioaccumulation phenomenon, whereas the pH value a slight acidification of the soil where *D. anglica* was recorded. The concentration of heavy metals is acceptable, as evidenced by the analysis of soil samples.

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