

Protected plant species of forest, lakes and peatbogs in the Western Part of the Drawskie Lakeland

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Abstract: A floristic study of forest communities, lakes, and peatbogs of the western part of the Drawskie Lakeland was carried out in 2006-2008. The study revealed the presence of numerous valuable plant species. More than 400 floristic lists were compiled. Plant surveys were conducted with the aid of the ATPOL square grid system. To increase the accuracy of the surveys, the basic ATPOL squares (10x10 km) were additionally subdivided into smaller ones of 1x1 km. The area of study was found to support 416 plant species, including protected ones: 17 species strictly protected (e.g., *Blechnum spicant*, *Dactylorhiza incarnata*, *Drosera rotundifolia*, *Lycopodium annotinum*, *Utricularia intermedia*) and 12 under partial protection (e.g., *Frangula alnus*, *Menyanthes trifoliata*, *Ononis spinosa*, *Ribes nigrum*, *Viburnum opulus*). The list of protected plants contains one species (*Lobelia dortmanna*) included in the Polish Red Book of Plants.

Key words: protected species, forest communities, lakes, peatbogs, Drawskie Lakeland

1. Introduction

The contemporary vascular flora of the western Part of the Drawskie Lakeland (central part of Western Pomerania) (Fig. 1) has been affected by the processes associated with anthropogenic changes. Human beings

have influenced the natural environment for centuries. They have altered the water regime in numerous areas, including lakes and peatbogs, planted monoculture pine forests which replaced very old agroecosystems and turned unique floral communities into farm fields.

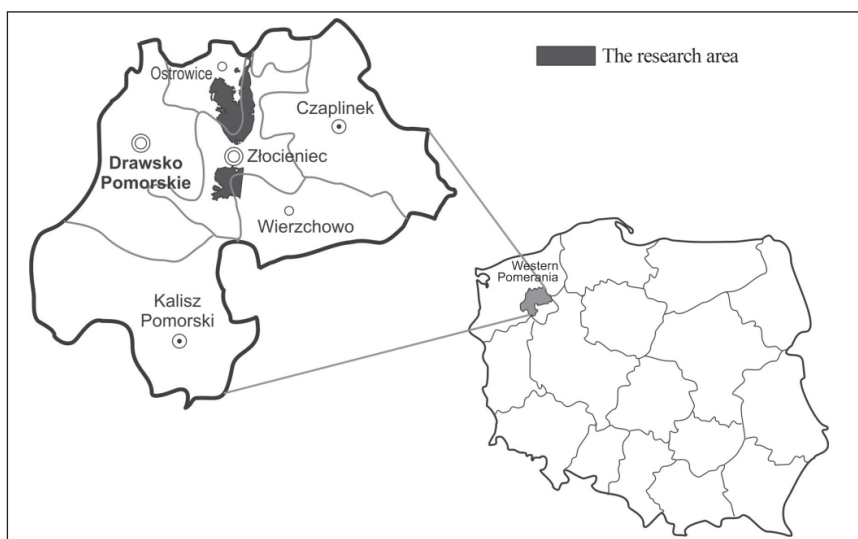


Fig. 1. The map of the surveyed area

In the forest communities of the western part of the Drawskie Lakeland, lakes and peatbogs play a dominant role in maintaining biological diversity. They are valuable habitats for countless species of both plants and animals, many of which are protected or threatened by extinction in Poland. Although the area in question is known for its exceptional floristic qualities, its flora has never been surveyed so that comprehensive floristic lists could never be compiled. Only a small part of the region has been described (Ławrynowicz 1959; Żukowski & Michna 1964; Wołejko 1983) and few habitats, e.g. small mid-field ponds, have received some attention (Młynkowiak & Kutyna 1999, 2002). The literature contains descriptions of the Drawski Landscape Park (Wołejko 1983; Brzeg *et al.* 1995, 1996; Jasnowska *et al.* 1997; Florek & Florek 1999) which cover only a small part of the area studied in this work.

The area of study (40 km²) features forests and arable fields which cover 55% and 35% of it, respectively. The remaining part comprises peatbogs (2%) and 15 lakes (8%), including Lake Siecino, the largest one (7.3 km²), and two Lobelia-type lakes: Czarnówek and Kapka. The area features two floral reserves: "Lake Czarnówek" and "Peatbog over Lake Morzysław Mały".

This study was aimed at getting knowledge on the protected vascular flora species occurring in the forest communities, lakes and peatbogs of the western part of the Drawskie Lakeland. A list of species, complemented with their localities and characteristics, was compiled.

2. Material and methods

The floristic surveys were carried out in 2006-2008. Data collected by the authors from forest communities, lakes and peatbogs were used in the analysis of protected species. The floristic surveys were aided by the ATPOL square grid system (Zajac 1978). To increase the accuracy, the ATPOL squares were additionally subdivided into smaller ones (1 x 1 km).

The floristic documentation is summarised in the Table 2. The nomenclature of vascular plants follows that of Mirek *et al.* (2002). The species that have been granted legal protection were listed by the Ministry of

Environment Protection (Regulation... 2004); some of the taxa were listed in the "Polish red book of plants" (Kaźmierczakowa & Zarzycki 2001).

Threat categories to the flora of Western Pomerania and Poland were specified according to Żukowski & Jackowiak (1995). Raunkiaer's life forms (Zarzycki *et al.* 2002) were used. The geographical-historical groups were distinguished following the conceptions of Jackowiak (1990). The frequency of occurrence of the taxa found in the area of study was calculated on the basis of the determined range of the frequency coefficient (Table 1), according to the following formula (Chmiel 1993):

$$\text{Frequency coefficient (F)} = \frac{\text{number of sites occupied by taxon}}{\text{total number of sites}} \times 100\%$$

The frequency of occurrence of the taxa in Poland was determined using the scale developed by Zarzycki *et al.* (2002).

The herbarium materials were deposited in the collection of the Department of Plant Taxonomy and Phytogeography, University of Szczecin.

3. Results

The study of forest communities, lakes, and peatbogs revealed the presence of 29 protected species (i.e., 7% of a total 416 vascular plant species recorded): 17 species (4%) belong to those under strict protection and 12 (3%) are under partial protection (Table 2).

Most of the species found belong to very rare, rare and fairly rare taxa (Fig. 2); on the other hand, species such as *Convallaria majalis*, *Frangula alnus*, *Galium odoratum*, *Helichrysum arenarium*, *Polypodium vulgare* and *Viburnum opulus* can be regarded as the most abundant ones (Table 2). They are mostly common and widespread throughout the whole country (Fig. 3). On the other hand, one species (*Lobelia dortmanna*) is known only from a very few localities in Poland (Table 2). This species is listed on the Polish red list.

The charts illustrate the occurrence of the taxa characterized by a very low frequency of occurrence: *Blechnum spicant*, *Dactylorhiza incarnata*, *Huperzia*

Table 1. Frequency coefficients used to characterize species presence according to the classes of occurrence

Classes of occurrence	Taxon presence	Frequency coefficient (F) [%]	Number of localities
I	very rare	≤ 0.50	1-2
II	rare	0.51-2.00	3-8
III	fairly rare	2.01-5.00	9-21
IV	widespread	5.01-10.00	22-41
V	fairly frequent	10.01-20.00	42-83
VI	frequent	20.01-35.00	84-145
VII	common	35.01-50.00	146-208
VIII	very common	≥ 50.01	≥ 209

Table 2. Characteristic of the protected plant species in the research area

Name of species	Life-form	Geographic-historical status	Number of sites in the research area	Frequency in Poland	Type of rotection	Category of threat	
						Western Pomerania	Poland
<i>Aquilegia vulgaris</i>	H	D	2	4	!!	V	o
<i>Blechnum spicant</i>	H	Sn	1	3	!!	E	o
<i>Convallaria majalis</i>	G	Sn	50	5	!	o	o
<i>Dactylorhiza incarnata</i>	G	Sn	1	4	!!	o	o
<i>Digitalis grandiflora</i>	H	Sn	3	4	!!	o	o
<i>Drosera rotundifolia</i>	H	Sn	13	4	!!	I	R
<i>Frangula alnus</i>	N	Sn	159	5	!	o	o
<i>Galanthus nivalis</i>	G	Kn	1	3	!!	I	o
<i>Galium odoratum</i>	H	Sn	22	5	!	o	o
<i>Hedera helix</i>	N, Ch	Sn	4	4	!	o	o
<i>Helichrysum arenarium</i>	H	Ap	24	4	!	o	o
<i>Hepatica nobilis</i>	H	Sn	3	4	!!	o	o
<i>Huperzia selago</i>	C	Sn	1	4	!!	V	o
<i>Ledum palustre</i>	Ch, N	Sn	19	4	!!	o	o
<i>Listera ovata</i>	G	Sn	2	4	!!	o	o
<i>Lobelia dortmanna</i>	Hy	Sn	2	2	!!	V	V
<i>Lycopodium annotinum</i>	C	Sn	18	4	!!	o	o
<i>Matteucia struthiopteris</i>	H	D	1	3	!!	V	o
<i>Menyanthes trifoliata</i>	G, Hy	Sn	10	4	!	o	o
<i>Nuphar lutea</i>	Hy	Sn	20	4	!	o	o
<i>Nymphaea alba</i>	Hy	Sn	8	4	!	o	o
<i>Ononis spinosa</i>	H, N	Sn	1	3	!	o	o
<i>Polypodium vulgare</i>	H	Sn	24	4	!!	o	o
<i>Primula veris</i>	H	Sn	17	4	!	o	o
<i>Ribes nigrum</i>	N	Sn	9	4	!	o	o
<i>Scheuchzeria palustris</i>	G	Sn	3	3	!!	V	o
<i>Utricularia australis</i>	Hy	Sn	2	3	!!	V	o
<i>Utricularia vulgaris</i>	Hy	Sn	2	4	!!	o	o
<i>Viburnum opulus</i>	N	Sn	24	5	!	o	o

Explanations: C – not-ligneous chamaephyte, Ch – ligneous chamaephyte, G – geophyte, H – hemicryptophyte, Hy – hydrophyte, helophyte, N – nanofanerophyte; Ap – apophyte, D – diaphyte, Kn – kenophyte, Sn – native species (non-synanthropic sponthaneophyte); Frequency in Poland, 1 – a few sites, 2 – up to 100 sites, 3 – numerous sites in the area, 4 – numerous sites in many regions, 5 – common throughout the country; !! – strict protection; ! – partial protection; E – critically endangered, V – endangered, R – rare, I – indeterminate, K – threat insufficiently known, o – not endangered

selago, *Listera ovata*, *Lobelia dortmanna*, and *Ononis spinosa* (Fig. 5).

The number of protected species occurring in the habitats surveyed was found to range from 5 to 16; 5 species occurred in peatbogs, 8 in lakes and on their

shores, and 16 in various forest communities (listed alphabetically in the Table 2).

The five protected species occurring in the peatbogs are: *Dactylorhiza incarnata*, *Drosera rotundifolia*, *Ledum palustre*, *Menyanthes trifoliata* and *Scheuchzeria*

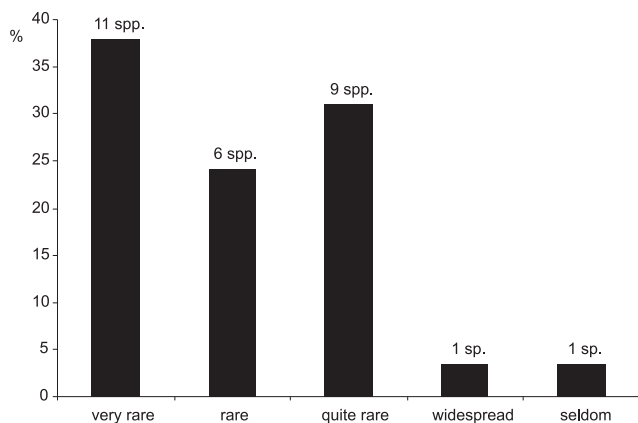


Fig. 2. Frequency of occurrence of the protected plant species in the research area

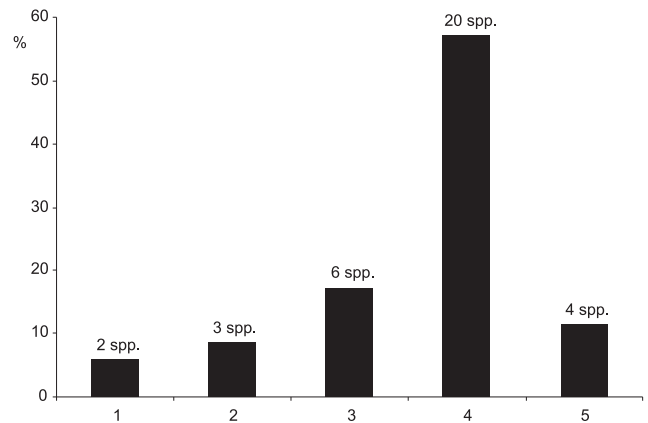


Fig. 3. The division of protected species according to the overall number of localities in Poland

Explanations: 1 – a few localities, 2 – up to 100 localities, 3 – a lot of localities in one area, 4 – a lot of localities in many regions, 5 – common in the whole country

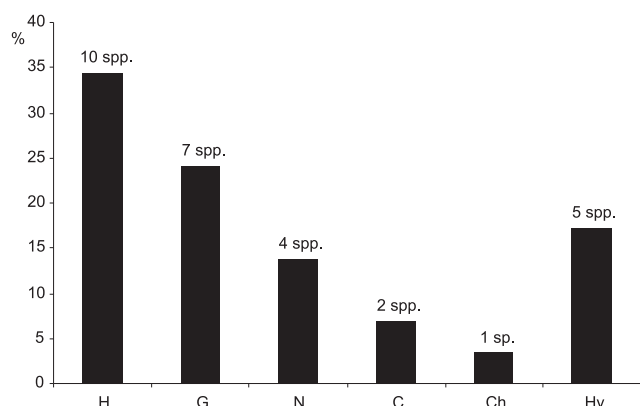


Fig. 4. The participation of particular Raunkiaer's life forms in the research area

Explanations: C – not-ligneous chamaephyte, Ch – ligneous chamaephyte, G – geophyte, H – hemicytrophite, Hy – hydrophyte, helophyte, N – nanofanerophyte

palustris; *Menyanthes trifoliata* occurred also in rush and sedge communities of the class *Phragmitetea*.

The lakes surveyed were found to support the following 5 protected species: *Lobelia dortmanna*, *Nuphar lutea*, *Nymphaea alba*, *Utricularia australis* and *U. vulgaris*. Except for the water lilies, the taxa listed above were present only in one (the two *Utricularia* species in Stawno) or two (*Lobelia* in Czarnówek and Kapka) lakes. The other three species (*Matteucia struthiopteris*, *Ononis spinosa* and *Ribes nigrum*) were found on lake shores. Interestingly, *M. struthiopteris* was observed growing on the shore of a small mid-forest lake in the vicinity of the daffodil (*Narcissus jonquilla*), a common cultivated plant.

Various forest communities were found to support the highest number of protected species: a total of 15 taxa were found in the area of study. Four species (*Blechnum spicant*, *Hedera helix*, *Hepatica nobilis* and *Lycopodium annotinum*) were recorded in a typical pine forest. The other two taxa: *Huperzia selago* and *Listera ovata*, were found in humid alder forests. *Helichrysum arenarium* was recorded growing on the edges of a xerothermic forest. *Aquilegia vulgaris* was observed only on the edges of woods and *Digitalis grandiflora* occurred in mixed woods only. The remaining 6 species (*Convallaria majalis*, *Frangula alnus*, *Galium odoratum*, *Polypodium vulgare*, *Primula veris* and *Viburnum opulus*) occurred, in addition to forest communities, also on lake shores and were occasionally found on forest roads.

Among Raunkiaer's life forms discerned (Table 2), the highest number of the species found represent hemicytrophites (10 taxa) and geophytes (7 taxa). The Fig. 4 shows the contribution of individual life forms to the flora in the area of study.

The protected species found in the area of study are, in most cases, native (non-synanthropic spontaneo-

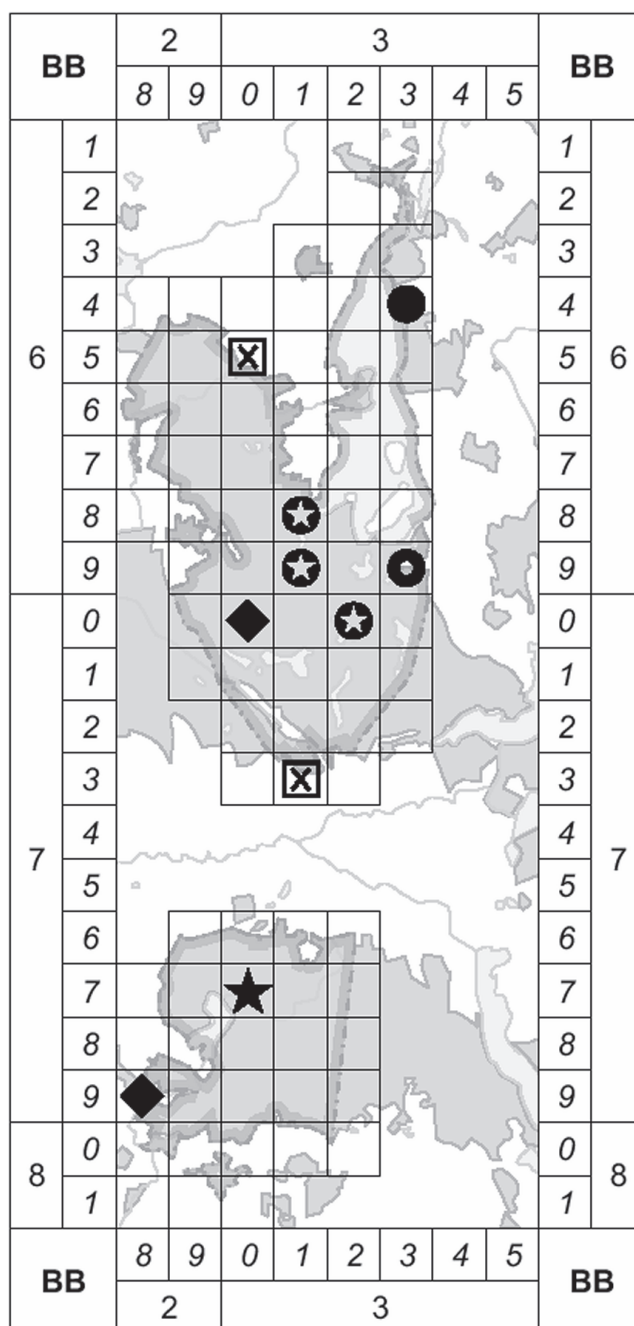


Fig. 5. Distribution of the protected species in the research area

Explanations: ★ – *Blechnum spicant*, ○ – *Dactylorhiza incarnata*, ◆ – *Huperzia selago*, ☒ – *Listera ovata*, ⊙ – *Lobelia dortmanna*, ● – *Ononis spinosa*

phytes). Only three species, protected in the whole country, are of secondary (synanthropic) origin in the area, including one kenophyte (*Galanthus nivalis*) and two diaphytes (*Aquilegia vulgaris*, *Matteucia struthiopteris*). One species (*Helichrysum arenarium*) was considered an apophyte. Because of the low number of alien plant species in the vascular flora of the area of study, the vegetation of the Drawskie Lakeland can still be regarded as possessing high natural values.

4. Final remarks

The forest communities, lakes, and peatbogs in the western part of the Drawskie Lakeland was found to support a total of 36 protected and rare species included in the Polish red list. The highest number of protected species (19 taxa) was found in the forest communities.

The surveys carried out in this study failed to confirm the presence of 7 protected taxa reported by Wołejko (1983). Those species (*Carex chordorrhiza*, *Dactylorhiza maculata*, *Dactylorhiza traunsteineri*, *Eriophorum gracile*, *Lycopodium clavatum*, *Nymphaea candida* and *Utricularia intermedia*) (Table 2) were reported from the "Peatbog over Lake Morzysław Mały" nature reserve. Most of them are plants critically endangered or endangered in the region and even on the scale of the whole country. A change in the water regime during the last 25 years could be responsible for the absence of those taxa on

the floral lists developed in this study. The change might have occurred due to the expansion of the bog belt surrounding the lake. Incidentally, the wide belt of bog around the lake made the access to its water impossible.

The results of this study allow to conclude that the habitats surveyed are refuges of numerous protected vascular plant species. Some of those habitats will probably cease to exist in the near future. Therefore, populations of the valuable species, including the rare protected ones, should be permanently monitored and protected, particularly when their local and countrywide abundance tends to decline. The true protection of those rare and endangered species is possible only if humans focus first on recognizing ecological links between those taxa and subsequently on their protection. Then there will be a chance to stop environmental degradation or at least to slow it down.

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