

CHARACTERISTICS OF THE LOCALITY  
OF *Hammarbya paludosa* (L.) O. Kuntze  
ON THE ŁĘCZNA-WŁODAWA PLAIN (WEST POLESIE)<sup>1</sup>

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**Summary.** *Hammarbya paludosa* (L.) O. Kuntze is one of the rarest species in the Polish flora. The investigations involved its population inhabiting a transitional moor on the Łęczna-Włodawa Plain. The newly discovered locality is interesting due to the unusual abundance of flowering specimens of the species. *Hammarbya paludosa* occurred in the locality in communities from the associations *Rhynchosporion albae* and *Caricion lasiocarpae* from the class *Scheuchzerio-Caricetea nigrae*, and less frequently in patches of communities from the association *Sphagnetum magellanici* from the class *Oxycocco-Sphagnetea*. The analysis of the shoots and the number of flowers produced by the investigated *Hammarbya paludosa* specimens has demonstrated that they were larger than specimens described by other authors. Localities of other rare and legally protected vascular plant species were found in the moor; these included *Betula humilis*, *Salix myrtilloides*, *Carex chordorrhiza*, *Carex limosa*, *Dactylorhiza incarnata*, *Drosera rotundifolia*, *Drosera intermedia*, *Epipactis palustris*, *Ledum palustre*, *Liparis loeselii*, *Pedicularis sceptrum-carolinum*, *Scheuchzeria palustris*, *Utricularia intermedia*, and *Menyanthes trifoliata*.

**Key words:** *Hammarbya paludosa* (L.) O. Kuntze, habitat conditions, Łęczna-Włodawa Plain (West Polesie)

INTRODUCTION

*Hammarbya paludosa* is a small perennial plant (rhizomatous geophyte) reaching the height from 5 to 20 cm. Its bulbs overwinter among peat moss turf. Every year a young bulb (pseudobulb) develops over the old bulb together with the growth of peat moss cushions [Bróz *et al.* 2001]. The overall distribution range of *Hammarbya paludosa* includes Eurasia and North America [Baumann *et al.* 2010] with the centre of occurrence in northern and central Europe [Hulten and Fries 1986]. *Hammarbya paludosa* is one of the rarest species in the Polish

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flora and therefore it is under strict species protection. Given its rare occurrence and the narrow ecological and phytocoenotic range, it is regarded as the most endangered orchid species in Poland and neighbouring countries [Bróz *et al.* 2001]. Its localities have been most frequently reported from northern Poland [Herbichowa *et al.* 2000, Markowski and Fałtynowicz 2000, Bróz *et al.* 2001, Zając A. and Zając M. 2001, Bloch and Cwiklińska 2002, Olszewski and Markowski 2005, Szlachetko 2009], and less frequently from other regions, e.g. the Białe Ługi Reserve in the Świętokrzyskie Mountains [Bróz *et al.* 2001]. There are also localities of *Hammarbya paludosa* in the Lublin Province: a peatbog near Obradowskie Lake [Karczmarz and Sokołowski 1988] and near Mytycze Lake [Łuczycka-Popiel *et al.* 1997]. This small sized orchid occurs on transitional moors and in wet interdune depressions [Szlachetko and Skakuj 1996]. According to Bróz *et al.* [2001], it inhabits live peat moss cushions on treeless transitional moors and raised bogs, and reaches the phytocoenotic optimum in communities from the association *Rhynchosporion albae*. Less frequently, it grows in the *Eriophoro angustifolii-Sphagnetum recurvi* phytocoenosis [Jasnowska and Jasnowski 1977].

The aim of the study was to determine the conditions of occurrence of *Hammarbya paludosa* on mid-forest peatbog on the Sobiborski Landscape Park. The species is extremely rare both in Poland and in the Lublin Province. The locality described in the present paper is one of the most abundant localities in Poland.

#### STUDY AREA, MATERIALS AND METHODS

In terms of administration, the peatbog inhabited by *Hammarbya paludosa* is situated in Włodawa County, Włodawa District, Lublin Province. According to the physical-geographical division developed by Kondracki [2002], it is located on the Łęczna-Włodawa Plain (Łęczna-Włodawa Lakeland), a mezoregion of West Polesie. It is a part of the „Trzy Jeziora” Nature Reserve, Natura 2000, „Lasy Sobiborskie”, and „West Polesie” Biosphere Reserve. The peatbog is situated in the area of state forests administered by the Sobibór Forestry. It is a transitional moor located north of Brudno Lake.

The peatland under study has emerged through lake overgrowing. The bottom of the basin contains gyttja with a maximum thickness of 2.00 m (average 1.70 m). The upper layer is composed of sedge and alder peat characterised by the average ash content of 11.4% and the average degradation degree of 25%. The maximum thickness of the peat is 3.20 m, with an average of 1.73 m. The top layer is formed of transitional peat.

The *Hammarbya paludosa* locality was found in 1996 [Urban 1996–1998]. Detailed investigations were conducted in 2011–2012. In 2011, 40 phytosociological relevés were recorded in the localities *Hammarbya paludosa* using the Braun-Blanquet method [1964]. The phytosociological classification and nomenclature of plant communities were based on the paper by Matuszkiewicz

[2005], and the nomenclature for vascular plants followed Mirek *et al.* [2002]. In summer 2012, soil and water was sampled from sites with the greater abundance of *Hammarbya paludosa*. Parameters assessed in the water and soil samples included reaction (pH) determined with the potentiometric method; the organic matter content and the content of the total forms of P, Ca, Mg, K, Na, Fe in the soil samples assessed with flame atomic absorption spectrometry (FAAS); and conductivity determined in the water samples.

Flowering specimens were analysed for the following individual traits: the length of shoots, the number of flowers per inflorescence, and the number of leaves.

## RESULTS AND DISCUSSION

During the field study carried out in 2011, 180 flowering *Hammarbya paludosa* shoots were found in an area of c.a. 3.0 ha. Investigations conducted by other authors [Herbichowa *et al.* 2000, Markowski and Fałtynowicz 2000, Bróz *et al.* 2001, Bloch and Ćwiklińska 2002, Olszewski and Markowski 2005] show small numbers of specimens in most known localities, ranging from several to several tens of specimens.

Phytocoenoses in which *Hammarbya paludosa* occurred most commonly were classified as associations *Rhynchosporion albae* and *Caricion lasiocarpae* from the class *Scheuchzerio-Caricetea nigrae*. Patches of these communities were usually located in the transition zone of communities dominated by *Rhynchospora alba*, *Carex limosa*, and *Carex lasiocarpa*. Less frequently, *Hammarbya paludosa* occurred in patches of the association *Sphagno-Caricetum rostratae*. In terms of physiognomy, they had a form of moss-sedge communities with poorly developed micro-relief. Single specimens of *Hammarbya paludosa* were also found in patches of communities from the association *Sphagnetum magellanici* from the class *Oxycocco-Sphagnetea*. Vascular plant species from the class *Scheuchzerio-Caricetea nigrae* were usually represented by *Menyanthes trifoliata*, *Comarum palustre*, *Carex limosa*, *Carex lasiocarpa*, *Carex chordeorrhiza*, and less frequently *Scheuchzeria palustris*, *Eriophorum angustifolium*, *Carex nigra*, and *Epipactis palustris*. Species characteristic of Central European bogs from the association *Sphagnion magellanici*, dominated by *Oxycoccus palustris*, were also found. *Andromeda polifolia* and *Drosera rotundifolia* constituted a smaller proportion. Additionally, rush species from the association *Magnocaricion*, e.g. *Carex rostrata* and *Equisetum fluviatile* were present. Sporadic occurrence of *Lysimachia thyrsiflora*, *Peucedanum palustre*, and *Galium palustre* was reported. Some patches comprised scarce scrubs (*Salix cinerea*) and saplings (*Betula pubescens* and *Pinus sylvestris*). The moss layer (80–100% cover) was dominated by peat moss *Sphagnum fallax*, *Sphagnum fimbriatum*, *Sphagnum fuscum*, and *Sphagnum teres*, accompanied by *Aulacomium palustre* and *Polytrichum strictum*. Similar habitats were indicated by investigations of peatbogs in Sarbska Spis [Markowski and Fałtynowicz 2000], Kaszubskie

Lakeland [Bloch and Ćwiklińska 2002], Gdańskie Pomorania [Bloch-Orłowska 2005], and Myśluborskie Lakeland [Jasnowska and Jasnowski 1977]. In the Lublin Province, *Hammarbya paludosa* has been reported from transitional moors near Obradowskie Lake [Karczmarz and Sokołowski 1988] and Mytycze Lake [Łuczycka *et al.* 1997, Bróz *et al.* 2001]. It occurred in patches of the associations *Sphagno-Caricetum rostratae* and *Caricetum limosae*.

The investigated *Hammarbya paludosa* population grows on soil formed on transitional peat. Water sampled from soil pits was characterised by acidic reaction and very low conductivity (Tab. 1). The soil reaction (highly acidic) and the low content of phosphorus, calcium, magnesium, potassium, sodium, and iron were typical of transitional peat soils.

Table 1. Chemical parameters of water and soil sampled from *Hammarbya paludosa* microhabitats

Site	Water		Soil									
	pH	PE μS cm <sup>-1</sup>	Depth cm	pH		Organic matter %	Content g·kg <sup>-1</sup>					
				H <sub>2</sub> O	KCl		P	Ca	Mg	K	Na	Fe
1	–	–	0–10	4.65	3.66	97.20	0.76	2.89	0.89	0.20	0.45	0.15
	5.35	43	10–20	4.59	3.62	96.50	0.45	1.45	0.54	0.37	0.24	0.13
2	–	–	0–10	4.84	3.69	98.30	0.67	1.93	0.74	0.20	0.16	0.55
	4.73	54	10–20	4.42	3.35	97.20	0.32	0.60	0.37	0.29	0.06	0.81

The conducted investigations indicate that the flowering specimens were predominant and constituted 97% of the entire analysed population. The specimens studied usually had two or, extremely seldom, three leaves (3 specimens only). The values of some individual traits are presented in Figures 1 and 2. The maximum shoot length of the analysed specimens was 25.2 cm, minimum 6.9 cm, and the mean was 16.0 cm. Specimens with the length of the shoot of 20.0 cm were predominant. Szlachetko and Skakuj [1996] report that the shoot height varies in the range of 5–20 cm, whereas the range of 7–17 cm is reported by Bauman *et al.* [2010].

The inflorescences were composed of 33 flowers on average, with the maximum number 60 and the minimum 13. The most frequent number was 30. According to Baumann *et al.* [2010], *Hammarbya paludosa* inflorescences comprise 8–40 flowers.

According to Kershaw [1978], plant height, leaf blade size, and the number of flowers can be indicators of plant biotic potential. Falińska [1990] claims that adverse environmental conditions may contribute to poor development of individuals and considerable regulation of the population size, whereas advantageous conditions provide high diversity. The analysis of the shoots and the number of flowers in the analysed *Hammarbya paludosa* specimens showed that they were better developed than those described by other authors [Szlachetko and Skakuj 1996, Baumann *et al.* 2010]. They also exhibited high diversity in the length of shoots and number of flowers.

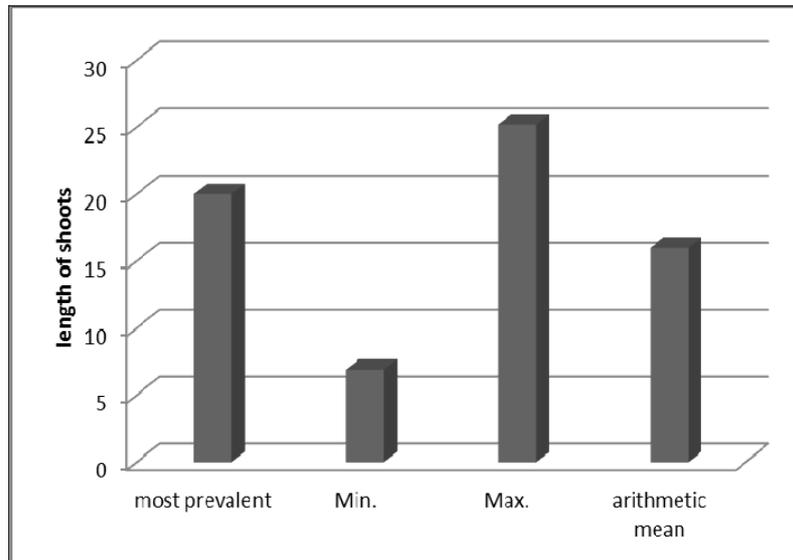


Fig. 1. Height of flowering specimens in the analysed *Hammarbya paludosa* population

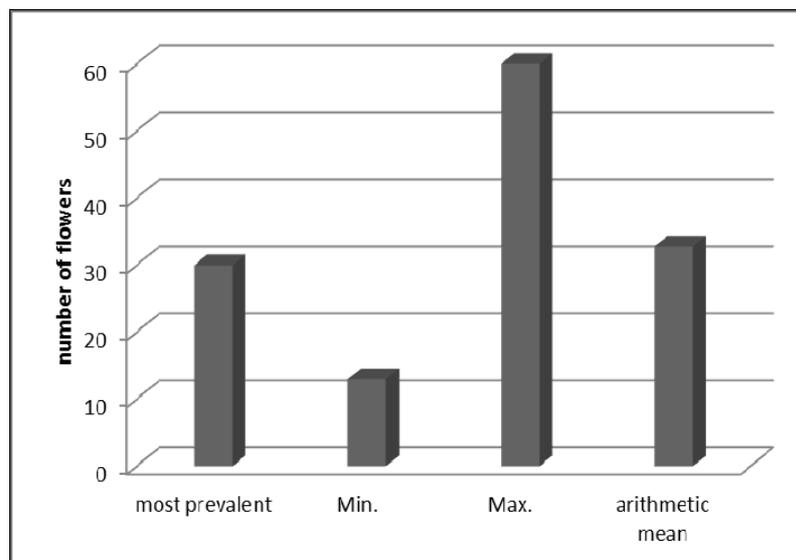


Fig. 2. Number of flowers in inflorescences of the analysed *Hammarbya paludosa* population

Based on the several-year-long observations, it can be assumed that *Hammarbya paludosa* is likely to survive longer in the locality studied, provided the habitat conditions do not change substantially. Given the unique natural values and protection status of the species, the population should be subject to extensive monitoring.

In the peatbog, localities of other rare and legally protected plant species were found besides *Hammarbya paludosa*. These included *Betula humilis*, *Salix myrtilloides*, *Salix lapponum*, *Carex chordorrhiza*, *Carex limosa*, *Dactylorhiza incarnata*, *Drosera rotundifolia*, *Drosera intermedia*, *Epipactis palustris*, *Ledum palustre*, *Liparis loeselii*, *Pedicularis sceptrum-carolinum*, *Scheuchzeria palustris*, *Utricularia intermedia*, *Menyanthes trifoliata* oraz *Aulacomium palustre*, *Sphagnum fallax*, *Sphagnum fuscum*, and *Sphagnum rubellum*.

### CONCLUSIONS

1. The newly discovered locality is interesting due to the unusual abundance of *Hammarbya paludosa* specimens.
2. The analysed *Hammarbya paludosa* population is characterised by larger sizes of the flowering specimens and predominance of plants in the generative developmental stage.
3. The long-term observations indicate that *Hammarbya paludosa* forms an abundant population that should be further monitored.

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#### CHARAKTERYSTYKA STANOWISKA *Hammarbya paludosa* (L.) O. Kuntze NA RÓWNIWIE ŁĘCZYŃSKO-WŁODAWSKIEJ (POLESIE ZACHODNIE)

**Streszczenie.** *Hammarbya paludosa* (L.) O. Kuntze jest jednym z rzadszych gatunków flory Polski. Badaniami objęto populację *Hammarbya paludosa* występującą na torfowisku przejściowym na Równinie Łęczyńsko-Włodawskiej. Nowo odnalezione stanowisko jest interesujące ze względu na niezwykłą liczebność kwitnących osobników tego gatunku. *Hammarbya paludosa* występowała tu w zbiorowiskach ze związków *Rhynchosporion albae*, *Caricion lasiocarpae* z klasy *Scheuchzeria-Caricetea fuscae*, a także rzadziej w płatach zbiorowisk ze związku *Sphagnetum magellanici* z klasy *Oxycocco-Sphagnetetea*. Analiza pędów i ilości kwiatów badanych okazów *Hammarbya paludosa* wykazała, że były one dorodniejsze od okazów opisywanych przez innych autorów. Na torfowisku odnotowano również stanowiska innych rzadkich i objętych ochroną prawną gatunków roślin naczyniowych, takich jak: *Betula humilis*, *Salix myrtilloides*, *Carex chordorrhiza*, *Carex limosa*, *Dactylorhiza incarnata*, *Drosera rotundifolia*, *Drosera intermedia*, *Epipactis palustris*, *Ledum palustre*, *Liparis loeselli*, *Pedicularis sceptrum-carolinum*, *Scheuchzeria palustris*, *Utricularia intermedia*, *Menyanthes trifoliata*.

**Słowa kluczowe:** *Hammarbya paludosa* (L.) O. Kuntze, warunki siedliskowe, Równina Łęczyńsko-Włodawska (Polesie Zachodnie)