

## Lindernia procumbens (Krocker) Philcox in SW Poland

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Abstract: During years 1998-2002 special studies on the distribution and conditions of occurrence of *Lindernia procumbens* were carried out within the Opole Silesia region in SW Poland. A detailed list of locations based on literature data and new observations of *Lindernia procumbens* are presented. Until now, *Lindernia procumbens* has been noticed in five localities within borders of the region. Recently this species has been found at three new stands.

Keywords: *Lindernia procumbens*, vascular plants, distribution, Opole Silesia, SW Poland, endangered species

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### Introduction

*Lindernia procumbens* (Krocker) Philcox is one of the rarest elements of the Polish flora (Zajac & Zajac 2001a, b). During last few years at over-regional as well as provincial scale, progressive vanishing of this uncommon species could be observed. The consequence of this fact is listing of *Lindernia procumbens* on several red lists and in books of endangered vascular plants. On the regional red list and red book of endangered plants of the Opole Silesia *Lindernia procumbens* was given CR category – critically endangered (Spalek 2002, Nowak et al. 2003). It is worth noticing that *Lindernia procumbens* was evaluated to be critically endangered in Poland (Zajac & Zajac 2001b), Czech Republic and Slovakia (Procházka et al. 1999, Holub & Procházka 2000, Procházka 2001) and Germany (Korneck et al. 1996).

In the Opole Silesia in the south-western Poland *Lindernia procumbens* has been described at five localities scattered all over the region. During current geobotanical investigations carried out in the whole voivodship area, three

locations of the considered species have been discovered. Conditions of occurrence of *Lindernia procumbens* are characterized below. Data on population size, present distribution (Fig. 1) and anthropogenic threats are also given.

## Methods

Fieldworks were conducted in 1998-2002 vegetation seasons. The relevés were done using the Braun-Blanquet method (Braun-Blanquet 1964). The syntaxonomical classification is given due to Matuszkiewicz (2001). The nomenclature of the species follows Mirek et al. (2002).

The description of localities consists of exact stand location, year of discovery, population size and plant assemblage in which the species occurs.

## Geographical distribution and habitat conditions

*Lindernia procumbens* is a species of an extensive range, with few distinguishable centres: Europe with western and central Asia, India Peninsula, East Asia, Malay Peninsula and Indochina Peninsula. In Europe it occurs in scattered locations from Portugal, through France, central and southern Germany, northern Italy, southern Poland, Danube countries to central and southern Ukraine. This species belongs to the Holarctic-Paleatropical linking element (Meusel et al. 1965). In Poland it was noted mainly in the XIXth century, at over 40 stands, in majority concentrated in the upper and middle basin of the Oder river and in the upper Vistula river basin. After 1900 in Poland *Lindernia procumbens* has been reported from 13 locations, and after 1980 it has been stated at 9 stands (Latowski et al. 1988, Zając & Zając 2001b). In Opole Silesia region *Lindernia procumbens* has been noted only at 5 sites. They are as follows: town of Opole – „Kalichteich” pond, Brzeg – bank of the Oder river (Wimmer 1844, Fiek 1881, Schube 1903), Dobrzeń Wielki – bank of the Oder river, Pawłowiczki – „Pulower Teich” pond, Suszkowice (Fiek 1881, Schube 1903).

*Lindernia procumbens* occurs in periodically flooded sites, on river or old oxbow lakes' banks, and at present mainly on bottoms of drying ponds. This plant prefers warm places with sand or muddy bottom, poor in calcium carbonate. It grows in associations from the class Isoëto-Nanojuncetea (e.g. Latowski et al. 1988, Dostal 1989, O'ahel'ová & Zlinská 1993, Oberdorfer 1994, Popiela 1997, Procházka et al. 1999, Zając & Zając 2001b).

## Results

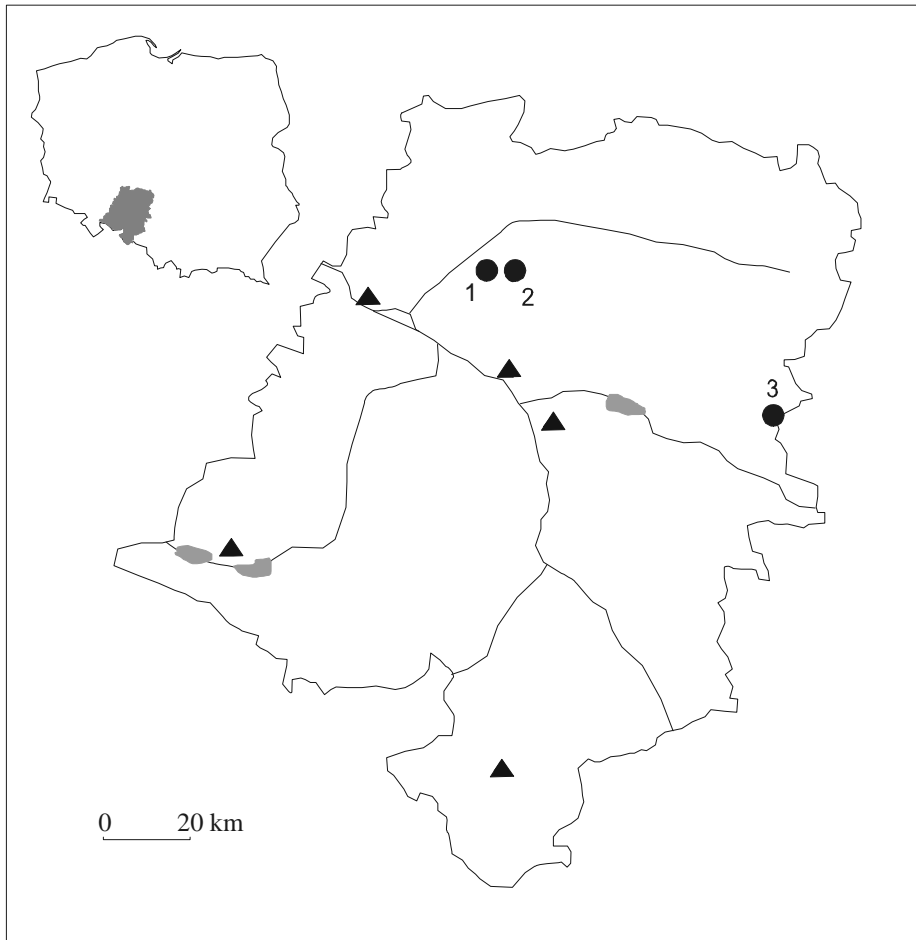
### Distribution in SW Poland

During the recently conducted investigation *Lindernia procumbens* was found in following locations:

1. Siedlice near Namysłów; 1998; ca 200 specimens on the bottom of a dried fishpond in *Eleocharetum ovatae* (Tab. 1, relevés 1, 2).

2. Winna Góra near Namysłów; 1998; ca 50 specimens on the bottom of a dried fishpond in *Eleocharetum ovatae* (Tab. 1, relevés 3, 4).

3. Bąki near Dobrodzień; 2002; ca 100 thousands specimens on the bottom of dried fishponds in *Eleocharetum ovatae* (Tab. 1, relevés 5-10). In most locations in Poland and other European countries *Lindernia procumbens* occurs in low numbers. Until present the total population of this species was estimates at ca 1000-1500 specimens (Zajac & Zajac 2001b). Thus, the described location is the most numerous stand of this species in Poland and one of the greatest in Europe.



**Fig. 1. Distribution of *Lindernia procumbens* in SW Poland. ● – new locality, ▲ – locality from the literature.**

Tab. 1. *Eleocharetum ovatae* HAYEK 1923 n. n.

Relevé number	1	2	3	4	5	6	7	8	9	10	C
Date: year	98	98	98	99	02	02	02	02	02	02	
month	08	08	08	08	08	08	08	08	08	08	
day	19	19	25	28	27	27	27	27	27	27	
Locality	WG	WG	S	S	B	B	B	B	B	B	
Cover of herb layer [%]	20	30	20	30	90	90	85	80	90	80	
Cover of moss layer [%]	-	+	-	-	-	+	-	-	-	-	
Area of relevé [m <sup>2</sup> ]	10	20	20	20	20	30	30	30	30	30	
Number of species in relevé	14	13	13	14	8	11	10	13	12	16	
<b>Ch. <i>Eleocharetum ovatae</i></b>											
<i>Lindernia procumbens</i>	+	+	+	+	3	3	4	3	5	4	V
<i>Eleocharis ovata</i>	1	2	1	2	4	3	2	2	2	2	V
<i>Carex bohemica</i>	.	1	.	+	.	.	.	+	1	+	III
<i>Elatine triandra</i>	1	+	+	+	.	.	.	.	.	.	II
<i>Elatine hexandra</i>	+	+	.	.	.	.	.	.	.	.	I
<i>Elatine hydropiper</i>	+	+	.	.	.	.	.	.	.	.	I
<b>Ch. <i>Elatini-Eleocharition ovatae</i></b>											
<i>Limosella aquatica</i>	+	+	1	+	+	+	+	+	1	1	V
<i>Eleocharis acicularis</i>	+	+	1	2	+	.	1	+	+	+	V
<i>Cyperus fuscus</i>	.	+	.	+	.	.	.	.	.	.	I
<b>Ch. <i>Cyperetalia fusci</i></b>											
<i>Gnaphalium uliginosum</i>	.	1	.	+	.	.	.	+	+	+	III
<i>Riccia sorocarpa</i> d	.	+	.	.	.	+	.	.	.	.	I
<i>Potentilla supina</i>	.	.	.	.	.	.	.	.	+	+	I

<b>Ch. Isoëto-Nanojuncetea</b>											
<i>Plantago intermedia</i>	.	.	+	+	.	.	.	.	.	+	II
<i>Jucus bufonius</i>	2	1	.	.	.	.	.	.	.	.	I
<b>Accompanying species</b>											
<i>Alisma plantago-aquatica</i>	1	+	+	+	1	+	+	1	+	1	V
<i>Pepelis portula</i>	.	.	1	+	+	1	+	+	+	+	IV
<i>Callitriche verna</i>	+	+	.	.	+	+	.	+	+	+	IV
<i>Oenanthe aquatica</i>	.	.	.	.	2	2	2	1	+	1	III
<i>Polygonum persicaria</i>	.	.	.	.	.	+	+	+	1	+	III
<i>Rorippa amphibia</i>	.	.	.	.	+	+	.	+	.	+	II
<i>Juncus articulatus</i>	+	.	1	1	.	.	.	.	.	.	II
<i>Polygonum hydropiper</i>	.	.	+	+	.	.	.	.	.	.	I
<i>Rumex maritimus</i>	.	.	+	+	.	.	.	.	.	.	I
<i>Lythrum salicaria</i>	.	.	+	.	.	.	.	.	.	+	I
<i>Alopecurus geniculatus</i>	.	.	.	.	.	.	+	.	.	+	I

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**Sporadic species: Accompanying species:** *Glyceria maxima* + (8), *Sagittaria sagittifolia* + (6), *Schoenoplectus lacustris* + (7), *Solidago gigantea* + (3), *Sparganium erectum* + (1), *Trifolium repens* + (3).

**Explanations:** WG – Winna Góra, S – Siedlice, B – Bałki, Ch. – characteristic species, d – moss taxa, C – constancy.

## Threats

*Lindernia procumbens* is endangered within its entire European range, thus it was covered with Bern Convention and Habitats Directive. For this type of species from the class Isoëto-Nanojuncetea, occurring periodically, it is very difficult to state which of the stands are extinct, unless favourable habitats are lacking. This is so in valleys of regulated rivers, where ponds and oxbow lakes have been destroyed. In Poland such an example is the river Oder, where habitats favourable for this species have been irretrievably destroyed, as on their place industrial factories and housing estates were built (Zajac & Zajac 2001b). If suitable habitats remained preserved, there is always a chance of occurrence of *Lindernia procumbens* in favourable conditions, however they are difficult to determine. A threat for this species is an intensive fish culture in fishponds, which due to a constant use of ponds does not allow for formation of habitats suitable for *Lindernia procumbens*. Influence of organic and chemical pollution on this species remains unknown.

To improve or establish a proper conservation status of the *Lindernia procumbens* population within the regional borders it would be indispensable to create there area of ecological use, based on the Nature Conservation Act. Two of newly discovered stands (Siedlice, Winna Góra) are located in the area of the Stobrowski Landscape Park. One of the largest European localities of this species in Bałki should be covered with protection in the form of a Nature-Landscape Complex as soon as possible. To preserve *Lindernia procumbens* in this locality intensive fish farming should be stopped in this area. It would be also purposeful to dry some fishponds once in few years for a longer time, to allow for formation of habitats favourable for *Lindernia procumbens*.

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