OPOLE SCIENTIFIC SOCIETY
NATURE JOURNAL
No 44 – 2011: 30-35

LINDERNIA PROCUMBENS (KROCKER) BORBÁS - NEW ANTHROPOGENIC SITES IN OPOLE SILESIA

SYLWIA NOWAK[1], ARKADIUSZ NOWAK[2]

Laboratory of Geobotany and Plant Conservation, Department of Biosystematics,
Opole University, Oleska 48, 45-052 Opole, Poland
[1]snowak@uni.opole.pl; [2]anowak@uni.opole.pl;

ABSTRACT: During geobotanical studies conducted in 2011 in Opole Silesia, two new localities of one of the rarest and threatened species in Poland - *Lindernia procumbens* were found. A list of locations based on the literature data and new observations of *Lindernia procumbens* in anthropogenic habitats are presented. Details of newly discovered sites with short habitat's description are given.

KEY WORDS: anthropogenic sites, threatened species, vascular plants, distribution, flora conservation, SW Poland

Introduction

Lindernia procumbens is a small, annual, glabrous plant with procumbent to ascending stems from 2 to 15(25) cm high. The plant has opposite leaves up to 20x10 mm, which are elliptical to oblong, obtuse, entire or obscurely crenate-serrate. Pedicels (8-20 mm) usually exceed subtending leaf. Flowers are ordinarily cleistogamous, with pale pink corolla not exceeding calyx. Four stamens are fertile (Tutin et al. 2001, Zając M. and Zając A. 2001).

Lindernia procumbens prefers wet, muddy or sandy warm places, poor in calcium carbonates. It occurs in periodically flooded sites, on river or old oxbow lakes' banks and on bottoms of drying ponds (Latowski et al. 1988, Oberdorfer 1994, Tutin et al. 2001). According to Matuszkiewicz (2007), it is a diagnostic taxon of the *Eleocharetum ovatae* Hayek 1923 association.

Lindernia procumbens represents connecting Holarctic-Paleotropical element. It is a species of an extensive range, with a few centers of its occurrence: Europe, western and Central Asia, India, eastern Asia, Indochina Peninsula, Malay Peninsula and Java. In Europe, it occurs in scattered localities, in north-western Portugal, middle France, central and southern Germany, northern and middle Italy, southern Poland, Danube countries, central and southern Ukraine (Hegi 1975, Meusel et al. 1978, Latowski et al. 1988, Tutin et al.

2001). The species is also introduced in USA (Hegi 1975). In Poland, the majority of *Lindernia procumbens* sites (over 40) were reported in the second half of the XIXth century, mainly from the upper and middle basin of the Oder river, rarely in the Vistula river basin. After 1900 this taxon has been noted only at 13 locations (Latowski et al. 1988, Zając M. and Zając A. 2001). Between 1960 and 1985 *Lindernia procumbens* has not been recorded in Poland, therefore it was thought to be rapidly withdrawing species in Polish flora (Jasiewicz 1981). As a consequence *Lindernia procumbens* was assessed in Red List of Poland (Zarzycki 1986) as an extinct species. This taxon was again discovered in 1986 in south-western part of the Oświęcim Basin (Zając M. and Zając A. 1988). In the following years new data of *Lindernia procumbens* were described (Popiela and Stasińska 1994, Wayda 1996, Banaś and Paul 2000, Spałek 2006, Nobis A. et al. 2010). In Opole Silesia the species was found in the following sites: Opole – "Kalichteich" pond, Brzeg – bank of the Oder river (Wimmer 1844, Fiek 1881, Schube 1903), Dobrzeń Wielki – bank of the Oder river (leg. Grabowski 1834, WRSL, Fiek 1881, Schube 1903), Pawłowiczki – "Pulower Teich" pond, Suszkowice (Fiek 1881, Schube 1903), Siedlice and Winna Góra near Namysłów, Bąki near Dobrodzień – the bottoms of dried fishponds (Spałek 2006). In August 2011, two new sites of *Lindernia procumbens* were found (Fig. 1).

Lindernia procumbens is still considered to be one of the rarest species in Polish flora and was included in Polish Red Data Book of Plants as a critically endangered (CR) (Zając M. and Zając A. 2001). In the latest edition of the red list of the vascular plants in Poland (Zarzycki and Szeląg 2006), the plant was assessed as a vulnerable species (V). In Opole Silesia, it has reached a status of a critically endangered taxon (Nowak A. et al. 2008). It was also given very high threat category (CR) in other central European countries, e.g. the Czech Republic and Slovakia (Procházka et al. 1999, Holub and Procházka 2000, Procházka 2001), Germany (Korneck et al. 1996). Because of its rarity in European range, it is listed in Annex 4 to Council Directive 92/43/EEC (Habitat Directive 1992) and covered by the Bern Convention (1979).

Methods

Field investigations were conducted in 2011. The relevés were made using the Braun-Blanquet method (Braun-Blanquet 1964). The syntaxonomical classification is given due to Matuszkiewicz (2007). The nomenclature of plants follows Mirek et. al. (2002).

The localities description comprises exact stand location, population size, plant assemblage in which *Lindernia procumbens* occurs and threats on new sites.

Results

As a result of geobotanical studies conducted within the area of Opole Silesia, two new populations of *Lindernia procumbens* were found.

The first newly discovered site of *Lindernia procumbens* is located in Biała Nyska (N 50^{o} 26' 54,7''; E 17^{o} 17' 49,4''; ATPOL square: CF21). There were ca. 100 specimens growing on alluvium muds of the Biała Głuchołaska river within the "Zbiornik Nyski" dammed reservoir. The population of this species occurs in the *Eleocharetum ovatae* association from the *Isoëto-Nanojuncetea* class. Floristic composition of the community in which *Lindernia procumbens* has been recorded is presented in the relevé below:

1. Biała Nyska; Date: 26.08.2011; height: 192 m a. s. l.; relevé surface: 2m^{2}; cover of the herb layer (c) – 35%, cover of the moss layer (d) – 5%; number of species in relevé – 14; Ch.Ass. *Eleocharetum ovatae*: ***Lindernia procumbens*** **+**, *Carex bohemica* +; Ch.All. *Elatini-Eleocharition ovatae*: *Limosella aquatica* 2; Accompanying species: *Peplis portula*

2, *Polygonum persicaria* 1, *Riccia* sp. d 1, *Rorippa amphibia* 1, *Alisma plantago-aquatica* +, *Bidens radiata* +, *Echinochloa crus-galli* +, *Juncus compressus* +, *Lemna minor* +, *Lythrum salicaria* +, *Spirodela polyrhiza* +.

The second population of studied taxon developed also on muddy alluvia of the "Zbiornik Nyski" reservoir, in its southern banks near Siestrzechowice village (N 50^{o} 26' 17,2"; E 17^{o} 16' 26,0"; ATPOL square: CF20). The population here is quite scarce counting not more than 20 specimens growing in open spaces between *Bidens radiata* patches near reservoir embankments. Floristic structure of the phytocoenosis is given below:

2. Siestrzechowice; Date: 26.08.2011; height: 191 m a. s. l..; relevé surface: 2m^2; cover of the herb layer (c) – 85%, cover of the moss layer (d) – 5%; number of species in relevé – 21; Ch.Ass. *Eleocharetum ovatae*: *Carex bohemica* 1, ***Lindernia procumbens*** +; Ch.All. *Elatini-Eleocharition ovatae*: *Cyperus fuscus* 2, *Limosella aquatica* 2; ChO. *Cyperetalia fusci*: *Gnaphalium uliginosum* 1, *Potentilla supina* 1; ChCl. *Isoëto-Nanojuncetea*: *Plantago intermedia* 1; Accompanying species: *Bidens radiata* 1, *Chenopodium glaucum* +, *Lythrum salicaria* +, *Myosoton aquaticum* +, *Oenanthe aquatica* +, *Peplis portula* +, *Phragmites australis* +, *Polygonum persicaria* 1, *Ranunculus sceleratus* +, *Riccia* sp. d 1, *Rorippa amphibia* 2, *Rumex maritimus* 1, *Trifolium hybridum* + , *Veronica anagallis-aquatica* +.

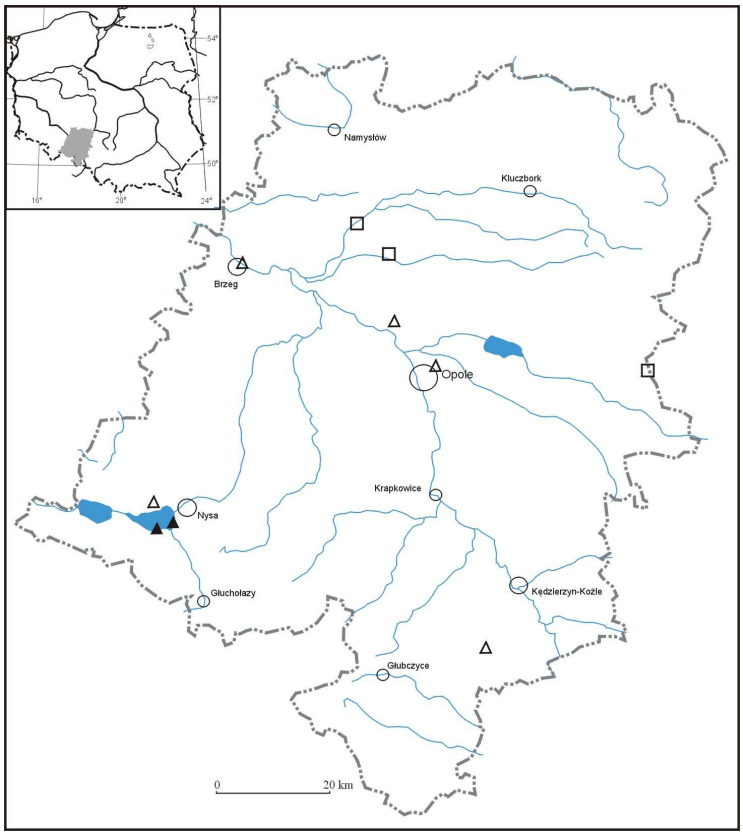

Fig. 1 Distribution map of *Lindernia procumbens* (Krocker) Borbás. in Opole Silesia. □ - literature locality confirmed after 1990, Δ - literature locality not confirmed after 1990, ▲ - new locality

Results

As a result of geobotanical studies conducted within the area of Opole Silesia, two new populations of *Lindernia procumbens* were found.

The first newly discovered site of *Lindernia procumbens* is located in Biała Nyska (N 50^o 26’ 54,7’’; E 17^o 17’ 49,4’’; ATPOL square: CF21). There were ca. 100 specimens growing on alluvium muds of the Biała Głuchołaska river within the "Zbiornik Nyski" dammed reservoir. The population of this species occurs in the *Eleocharetum ovatae* association from the *Isoëto-Nanojuncetea* class. Floristic composition of the community in which *Lindernia procumbens* has been recorded is presented in the relevé below:

1. Biała Nyska; Date: 26.08.2011; height: 192 m a. s. l.; relevé surface: 2m^2; cover of the herb layer (c) – 35%, cover of the moss layer (d) – 5%; number of species in relevé – 14; Ch.Ass. *Eleocharetum ovatae*: ***Lindernia procumbens*** **+**, *Carex bohemica* +; Ch.All. *Elatini-Eleocharition ovatae*: *Limosella aquatica* 2; Accompanying species: *Peplis portula* 2, *Polygonum persicaria* 1, *Riccia* sp. d 1, *Rorippa amphibia* 1, *Alisma plantago-aquatica* +, *Bidens radiata* +, *Echinochloa crus-galli* +, *Juncus compressus* +, *Lemna minor* +, *Lythrum salicaria* +, *Spirodela polyrhiza* +.

The second population of studied taxon developed also on muddy alluvia of the "Zbiornik Nyski" reservoir, in its southern banks near Siestrzechowice village (N 50^o 26’ 17,2”; E 17^o 16’ 26,0”; ATPOL square: CF20). The population here is quite scarce counting not more than 20 specimens growing in open spaces between *Bidens radiata* patches near reservoir embankments. Floristic structure of the phytocoenosis is given below:

2. Siestrzechowice; Date: 26.08.2011; height: 191 m a. s. l..; relevé surface: 2m^2; cover of the herb layer (c) – 85%, cover of the moss layer (d) – 5%; number of species in relevé – 21; Ch.Ass. *Eleocharetum ovatae*: *Carex bohemica* 1, ***Lindernia procumbens*** **+**; Ch.All. *Elatini-Eleocharition ovatae*: *Cyperus fuscus* 2, *Limosella aquatica* 2; ChO. *Cyperetalia fusci*: *Gnaphalium uliginosum* 1, *Potentilla supina* 1; ChCl. *Isoëto-Nanojuncetea*: *Plantago intermedia* 1; Accompanying species: *Bidens radiata* 1, *Chenopodium glaucum* +, *Lythrum salicaria* +, *Myosoton aquaticum* +, *Oenanthe aquatica* +, *Peplis portula* +, *Phragmites australis* +, *Polygonum persicaria* 1, *Ranunculus sceleratus* +, *Riccia* sp. d 1, *Rorippa amphibia* 2, *Rumex maritimus* 1, *Trifolium hybridum* + , *Veronica anagallis-aquatica* +.

Conclusions

The newly discovered sites are located within the dammed reservoir which is managed with main aims to support the anti-flooding protection of the Nysa Kłodzka river basin and to maintain the recreational functions of this artificial lake. Additionally, the area of *Lindernia procumbens* occurrence is often used for fishery or even motocross events. Thus, the newly found populations seem to be at permanent, considerable risk. In 2011 some reconstruction works of the dam were planned. The lowering of the water level in reservoir could drain the outskirt areas of the lake and cause the withdrawing of *Isoëto-Nanojuncetea* species. One of the possibilities of the effective conservation of those two new populations is to include them as a conservation focal topic in management plan of the Special Protection Area "Zbiornik Nyski" PLB160002 which was established for birds protection. As a consequence the protection of both populations has to be undertaken during renovation works.

Despite this anthropogenic factors, it is worth to notice, that external areas of both artificial lakes (Zbiornik Nyski, Zbiornik Otmuchowski) offer extensive and suitable habitats for *Isoëto-Nanojuncetea* species like *Lindernia procumbens*. Thus, the maintenance of these

species in such areas seem not to be considerably threatened, when the special efforts would be implemented during reconstruction works. One of the newly discovered locations was included in state monitoring system of Poland.

Bibliography

Banaś B., Paul W. 2000. Distribution of *Lindernia procumbens* (Scrophulariaceae) in the Polish Carpathians and their foreland. Fragm. Flor. Geobot. Polonica 7: 365-368.

Bern Convention 1979. Convention on the Conservation of European Wildlife and Natural Habitats (19.09.1979). Council of Europe. European Treaty Series No 104.

Braun-Blanquet J. 1964. Pflanzensoziologie, Grundzüge der Vegetationskunde. 3 Aufl. Springer Verlag, Wien – New York. 865 pp.

Fiek E. 1881. Flora von Schlesien, preussischen und österreichischen Antheils, enthaltend die wildwachsenden, verwilderten und angebauten Phanerogamen und Gefäss-Cryptogamen. J. U. Kern's Verlag, Breslau, 571 pp.

Habitat Directive 1992. Council Directive 92/43/EEC of 21 May 1992 on the conservation of the natural habitats and of wild fauna and flora. Official Journal of the European Communities.

Hegi G. 1975. Illustrierte Flora von Mitteleuropa. Band VI. Teil 1. Verl. Paul Parey, Berlin und Hamburg, 631 pp.

Holub J., Procházka F. 2000. Red List of vascular plants of the Czech Republic – 2000. Preslia 72: 187-230

Jasiewicz A. 1981. Wykaz gatunków rzadkich i zagrożonych flory polskiej. Fragm. Flor. Geobot. 27(3): 401-414.

Korneck D., Schnittler M., Vollmer I. 1996. Rote Liste der Farn- und Blütenpflanzen (*Pteridophyta* et *Spermatophyta*) Deutschlands. In: Ludwig G., Schnittler M. (eds.). Rote Liste gefährdeter Pflanzen Deutschlands. Schr.-R. f. Vegetationskunde. 28: 21-187.

Latowski K., Zając M., Zając A. 1988. *Lindernia procumbens* (Krocker) Philcox. In: Jasiewicz A. (ed.). Materials for knowledge of rare and endangered species of Poland. Part I. Fragm. Flor. Geobot. 33: 416-421.

Matuszkiewicz W. 2007. Przewodnik do oznaczania zbiorowisk roślinnych Polski. PWN, Warszawa, 537 pp.

Meusel H., Jäger E., Rauschert S., Weinert E. 1978. Vergleichende Chorologie der zentraleuropäischen Flora. II. Text xi+418pp., Karten p.259-421. G. Fischer Verl., Jena.

Mirek Z., Piękoś-Mirkowa H., Zając A., Zając M. 2002. Flowering Plants and Pteridophytes of Poland - a Checklist. Biodiversity of Poland Vol. 1. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków, 442 pp.

Nobis A., Nobis M., Piotrowicz K., Kącki Z., Dajdok Z. 2010. *Lindernia procumbens* in Poland: the relationship between weather conditions and the occurrence of the species. Biodiv. Res. Conserv. 17: 39-46.

Nowak A., Nowak S., Spałek K. 2008. Red list of vascular plants of Opole Province 2008. Opol. Scient. Soc., Nature Journal 41: 141-158.

Oberdorfer E. 1994. Pflanzensoziologische Exkursionsflora. 7 Auflage. Verlag Eugen Ulmer, Stuttgart, 1050 pp.

Popiela A., Stasińska M. 1994. New locality of *Lindernia procumbens* (Scrophulariaceae) in the basin of the Barycz River. Fragm. Flor. Geobot. Polonica 1: 350-352.

Procházka F., Husák Š., Oťaheľová 1999. *Lindernia procumbens* (Krocker) Philcox. p. 225. In: Čeřovský J., Feráková V., Holub J., Maglocký Š., Procházka F. (eds.). Červená kniha ohrožených a vzácných druhů rostlín a živočíchu ČR a SR. Vol. 5. Vyšši rostliny. Příroda a. s., Bratislava. 456 pp..

Procházka F. (ed). 2001. Černý a červený seznam cévnatých rostlin České republiky (stav v roce 2000). Příroda, Praha 18:1-166.

Schube T. 1903. Die Verbreitung der Gefässpflanzen in Schlesien, preussischen und österreichischen Anteils. Druck von R. Nischowsky, Breslau, 361pp.

Spałek K. 2006. *Lindernia procumbens* (Krocker) Philcox in SW Poland. Thaiszia J. Bot. 16: 51-57.

Tutin T. G., Heywood V. H., Burges N. A., Moore D. M., Valentine D. H., Walters S. M., Webb D. A. (eds.). 2001. Flora Europaea. Vol. 3. Diapensiaceae to Myoporaceae. Cambridge University Press, Cambridge, 385 pp.

Wayda M. 1996. New locality of *Lindernia procumbens* (Scrophulariaceae) in the Sandomierz Basin. Fragm. Flor. Geobot. Polonica 3: 401-402.

Wimmer F. 1844. Flora von Schlesien. Verl. von F. Hirt. Breslau. 792 pp.

Zając M., Zając A. 1988. Communities of *Isoëto-Nanojuncetea*-class at the bottom of drying up ponds in southern part of Kotlina Oświęcimska valley. Zesz. Nauk. UJ Prace Bot. 17: 155-160.

Zając M., Zając A. (eds.). 2001. *Lindernia procumbens* (Krocker) Philcox. p. 322-324. In: Kaźmierczakowa R., Zarzycki K. (eds.). Polish Red Data Book of Plants, Pteridophytes and Flowering Plants, Polish Academy of Sciences. W. Szafer Institute of Botany, Institute of Nature Conservation, Kraków.

Zarzycki K. 1986. Lista wymierających i zagrożonych roślin naczyniowych w Polsce. In: Zarzycki K., Wojewoda W. (eds.). Lista wymierających i zagrożonych roślin naczyniowych Polski, p. 11-27. PWN, Warszawa.

Zarzycki K., Szeląg Z. 2006. Red list of the vascular plants in Poland. p 9-20. In: Mirek Z., Zarzycki K., Wojewoda W., Szeląg Z. (eds.). Red list of plants and fungi in Poland. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.