

OCCURRENCE OF *LIPARIS LOESELII* (L.) RICH. IN THE MAŁOPOLSKA UPLAND (SOUTH POLAND)

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ABSTRACT. The paper summarizes current knowledge on *Liparis loeselii* (L.) Rich., a rare, protected and endangered species, in the Małopolska Upland. It gives an overview of the habitat data and conservation status of the localities of *L. loeselii* known from the literature to date and discusses three newly discovered sites. The distribution of the species in the Małopolska Upland is mapped in the ATPOL grid (10 × 10 km). The threat to the species and prospects for its conservation are also indicated. This species is protected by European law under Annex II of the Habitats Directive (code: 1903).

KEY WORDS: *Liparis loeselii*, Orchidaceae, distribution, new localities, Małopolska Upland

INTRODUCTION

Liparis loeselii, fen orchid, belongs to the orchid family (Orchidaceae). It represents the circumboreal subelement and its range is disjunctive (ZAJĄC and ZAJĄC 2009). Localities of *L. loeselii* are mostly recorded in central and central-eastern Europe, along the southern coasts of the Baltic Sea and the Northern Sea, and in Alpine countries (MEUSEL et AL. 1965, HULTÉN and FRIES 1986). Site density is high in northern Poland (ATLAS... 2001, PAWLIKOWSKI 2004) where optimal habitat conditions are found: fens and peaty-mineral flushes of the class *Scheuchzerio-Caricetea nigrae*, with soil pH being usually neutral or slightly alkaline. These communities are often classified in the order *Caricetalia davallianae*, alliance *Caricion davallianae*, and *L. loeselii* is a characteristic species of the association *Orchido-Schoenetum nigricantis* (MATUSZKIEWICZ 2008).

Liparis loeselli has become very rare due to unique habitats it colonizes (carbonate substrate and seepages, calcareous gyttjas) and widespread peatland draining and management. It is listed in Annex II to the Council Directive 92/43/EEC (code: 1903) (DYREKTYWA... 1992, ROZPORZĄDZENIE... 2010). The species was known from approximately 200 localities in Poland but only about half of them were confirmed after 1980 although new sites were also discovered at that time (KUCHARSKI 2010). *Liparis loeselii* is red-listed in Poland as an endangered species (E) (ZARZYCKI and SZELĄG 2006) and it is classed as a vulnerable species (VU) in the Polish red book (KUCHARSKI 2001). The species is also included on many regional red lists, including the red list of the Małopolska Upland as critically endangered (CR) (BRÓZ

and PRZEMYSKI 2009). It is strictly protected in Poland along other species of the family Orchidaceae (ROZPORZĄDZENIE... 2012).

The main aim of this study is to give an overview of the distribution of *L. loeselii* in the Małopolska Upland and to present three newly discovered sites. Population abundance and community type are determined. Main threats to the species and prospects for its protection are indicated.

Przemyski served as a guide at a field symposium of the International Mire Conservation Group in 2010. The participants toured the majority of the sites and had access to the field visitation material and data.

MATERIAL AND METHODS

Floristic field investigations in the Małopolska Upland began in 2005. Localities of *L. loeselii* known from the literature were visited in that period and three new sites were discovered. Population abundance was estimated at each locality based on the number of flowering individuals. Diagnostically important species were also noted. The distribution of *L. loeselii* in the Małopolska Upland was mapped using GPS data. Sites were mapped in the ATPOL grid squares (ZAJĄC 1978). The basic 10 km square was divided into sixteen 2.5 km squares (Fig. 1).

The nomenclature of vascular plants was accepted after a study by MIREK et AL. (2002). The approach by KONDRACKI (2009) is used in the physico-geographic division of the Małopolska Upland (Wyżyna Małopolska).

RESULTS

Peaty-mineral flushes are rarely noted in the Małopolska Upland and the new sites of *L. loeselii* in the study area are especially noteworthy. These habitat types are also of special value due to the presence of many rare, protected and threatened plant species.

Only two localities of *L. loeselii* had been known from the Małopolska Upland. Three new sites were discovered during recent floristic investigations (Fig. 1).

1. **EF 1510** – Zwierzyniec, peatland S of Zwierzyniec (the border between the Połaniecka Basin/Niecka Połaniecka and the Pińczowski Ridge/Garb Pińczowski in the Nidziańska Basin/Niecka Nidziańska); 50°30'34.42"N/20°42'50.45"E.

Jastrzębowski reported *L. loeselii* from a "Busk" village as early as in the 19th century (ROSTAFIŃSKI 1872). He probably meant the locality in Zwierzyniec, which is only 3 km north of Busko-Zdrój. The site was discussed in greater detail by GŁAZEK (1989, 1992), who tried to describe a new plant community, *Lipario-Schoenetum ferruginei*, in which *L. loeselii* plays an important role.

Głazek performed ten phytosociological relevés in 1985. The characteristic physiognomy of the phytocoenoses was formed by *Schoenus ferrugineus* (abundance 3-4) and *Phragmites australis* (1-2). Species of the order *Caricetalia davallianae* were relatively abundant, e.g.: *Carex davalliana* (1), *C. flava* (1-2), *C. hostiana* (1), *Epipactis palustris* (1-2), *Eriophorum latifolium* (1-2), *Parnassia palustris* (1), *Pinguicula vulgaris* subsp. *bicolor* (+-2), *Sesleria uliginosa* (+), *Tofieldia calyculata* (+-1) as well as *L. loeselii*. The abundance of *L. loeselii* was 1 in six of the ten phytosociological relevés and + in the other patches.

Field observations of the Zwierzyniec locality conducted since 2005 show that the community's spatial structure is affected by increasingly widespread *Phragmites australis*. Its cover has been growing and its abundance ranges between three and four. The contribution of *Schoenus ferrugineus* (2-3) has decreased. The shrub layer is also becoming widespread and encroaches on the phytocoenosis from the west. It is formed by trees of *Alnus glutinosa*. Its individuals are up to 5 m tall and the density of the shrub layer reaches 50% in places.

The locality of *L. loeselii* is stable but progressing secondary succession and an increased contribution of reeds as compared to 1985 are evident (cf. GŁAZEK 1992). The population of *L. loeselii* in Zwierzyniec at that time was probably stable and relatively rich with the abundance estimated at 1 in six phytosociological relevés. Recent observations of the species show that its resources are considerably smaller. We confirmed the occurrence of ca. 15-20 individuals of *L. loeselii*, and a decline in the population trend has been observed since 1985 (GŁAZEK 1992).

2. **EE: 3723, 3820** – Pakosław (Iłżeckie Foreland/Przedgórze Iłżeckie in the Kielecka Upland/Wyżyna Kielecka); 51°12'13.9"N/21°09'28.5"E.

The peatland in Pakosław is one of the largest peatland areas in the Małopolska Upland. This locality of *L. loesellii* has been known since the 1950s (1954 herbarium collections of K. Zarzycki, T. Tacik, J. Mądalski,

S. and B. Pawłowski, and K. Szczepanek, deposited in the Herbarium of the Institute of Botany, Jagiellonian University – KRA) but it was first published by BRÓŻ and CIEŚLIŃSKI (1971) from the western part of the peatland (EE 3723). NOBIS (2007) did not confirm the locality although he found a few individuals of the species approximately 1.5 km NWW of Pakosław (EE 3820).

The Pakosław community differs from the peatland in Zwierzyniec. Unlike other localities of *L. loeselii* in the Małopolska Upland, calciphilous species are not recorded in the peatland in Pakosław. *Phragmites australis* dominates in the phytocoenosis. It is accompanied by: *Carex distans*, *C. flava*, *C. nigra*, *C. panicea*, *Dactylorhiza incarnata*, *Dianthus superbus*, *Eleocharis palustris*, *Epipactis palustris*, *Eriophorum angustifolium*, *Potentilla erecta* and other species.

The population dynamics of *L. loeselii* in the peatland in Pakosław is difficult to estimate and its abundance in previous years is not known. NOBIS (2007) reported only a few individuals. The population of *Liparis loeselii* comprised ca. 150 individuals according to 2011 oral information by B. Sępioł (Towarzystwo Badań i Ochrony Przyrody/Society for the Study and Protection of Nature).

New localities (Fig. 1)

3. **EF 0531** – between Busko Zdrój and Chmielnik, 1.5 km NE of Młyny village (Połaniecka Basin in the Nidziańska Basin); 50°33'35.07"N/20°45'03.88"E.

This interesting habitat with a carbonate water seepage near Młyny has been investigated a number of times. It was even described by PRZEMYSKI (2006) in a study of a new locality of *Ligularia sibirica*. *Liparis loeselii* was discovered during further field visits in 2006-2010. The species composition and the physiognomy of the community are similar to those in nearby Zwierzyniec (cf. GŁAZEK 1992). The distance between the localities is ca. 6 km. The tree and shrub layers here cover 20% of the surface in places. *Alnus glutinosa*, *Frangula alnus* and *Viburnum opulus* dominate. As well as reeds, a high contribution of *Molinia caerulea*, *Epipactis palustris*, *Galium boreale*, *Potentilla erecta*, *Schoenus ferrugineus*, *Sesleria uliginosa* and *Ligularia sibirica* (abundance 2!) are observed in the ground cover. Considerable numbers of *Carex panicea*, *Equisetum palustre*, *Sanguisorba officinalis*, *Succisa pratensis* or *Valeriana simplicifolia* are also recorded. Many meadow species are present in the phytocoenosis and it resembles the order *Molinietalia caeruleae*, class *Molinio-Arrhenatheretea* (cf. PRZEMYSKI 2006).

Population resources of *L. loeselii* at the locality are very modest: between 10 and 20 individuals.

4. **EF 1222** – between Sędowice and Wrocieryż near Helenówka village, on the right bank of the Mierzawa river (Wodzisławski Ridge/Garb Wodzisławski in the Nidziańska Basin); 50°29'51.62"N/20°22'14.95"E.

A locality of *L. loeselii* was discovered during floristic investigations in the Mierzawa river valley in 2006. Patches with a small contribution of reeds and interesting peatland species such as *Carex davalliana*, *C. dioica*, *C. flava*, *C. lepidocarpa*, *Dactylorhiza incarnata*, *D. majalis*, *Epipactis palustris*, *Pedicularis palustris* (abundantly), *Pinguicula vulgaris* s.l., *Schoenoplectus*

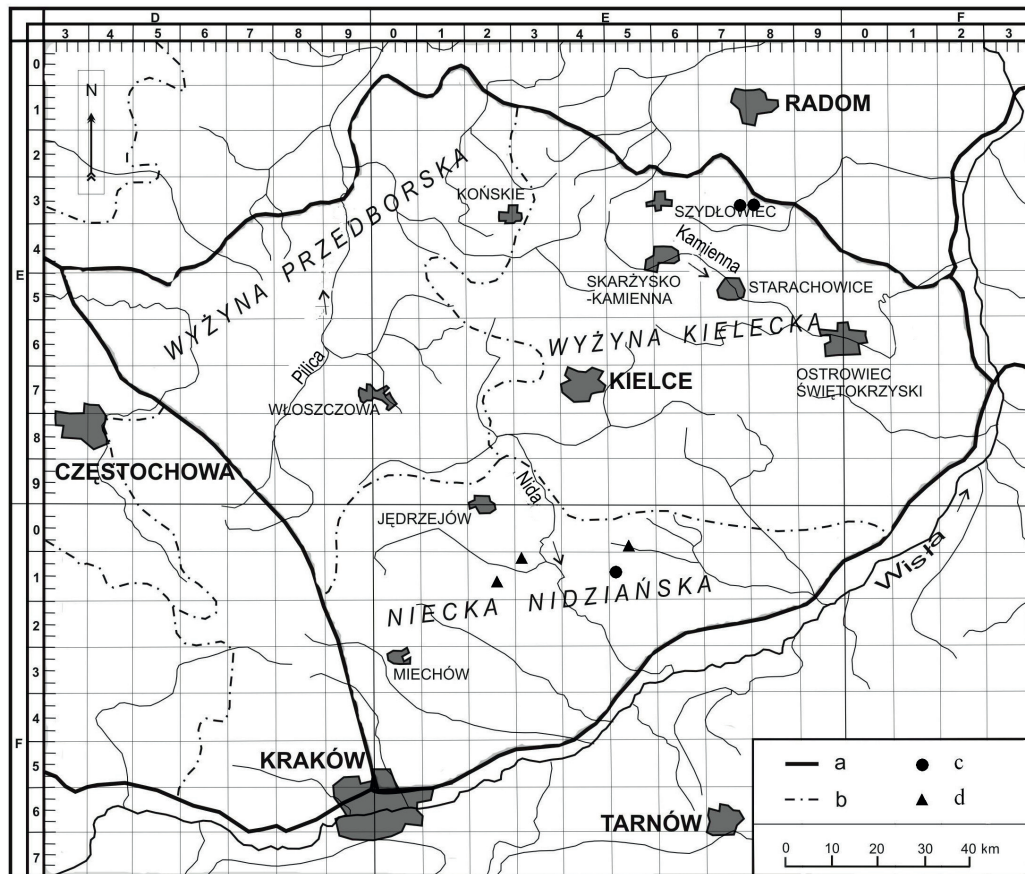


FIG. 1. Distribution of *Liparis loeselii* (L.) Rich. in the Małopolska Upland (a – borders of the sub-province, b – borders of macroregions, c – known localities, d – new localities)

tabernaemontanii, covering a few ares, grow among dense reed beds of *Phragmitetum australis*. A 15-are habitat has developed along the dyke separating two vast reed beds of *Ph. australis*. A strongly hydrated, thick layer of peat occurs here. Water is retained on the ground surface throughout the year. *Salix cinerea* and juvenile individuals of *Alnus glutinosa* occur to the west. They pose a considerable threat to the community in which *L. loeselii* grows.

This locality has the lowest population abundance of the *L. loeselii* sites in the Małopolska Upland and it is only three to four species rich.

5. EF 1300 – Bełk, its E part, left bank of the Mierzawka (Kruczka) river (Jędrzejowski Plateau/Płaskowyż Jędrzejowski in the Nidziańska Basin); 50°32'30.94"N/20°26'07.76"E.

The locality in Bełk was found in 2009. The fen orchid grows on a carbonate peatland, with the physiognomy of moss vegetation (100% of the surface is covered by mosses, mainly proper mosses which require additional bryological studies). Flowering plants of the order *Caricetalia davallianae* and other species, typical of the association of this order, were noted, e.g. *Carex distans*, *C. lepidocarpa*, *C. panicea*, *Dactylorhiza xaschersoniana*, *Eriophorum latifolium*, *Menyanthes trifoliata*, *Pedicularis palustris*. Species of the genus *Chara* and the rare *Utricularia minor* grow in small hollows filled with water. PIWOWARSKI (2011) reported localities of the following

species from the area: *Carex davalliana*, *Crepis succisifolia*, *Dactylorhiza incarnata*, *D. majalis*, *Epipactis palustris* and *Schoenoplectus tabernaemontanii*. There are few reeds at the site occupied by the fen orchid although a dense reed bed grows nearby. The site is used by the local population. Cows are driven across to the river and are partly grazed here. This may be a crucial factor for the persistence of this community on the Mierzawka river.

Only five individuals were recorded in Bełk in 2009. Two to three flowering individuals were found in the following years. The size of the typical habitat is small and the population is not large. Further investigations may show that the richness of *L. loeselii* populations is considerably greater.

THREAT AND PROTECTION

Progressing secondary succession, exacerbated by peatland draining, is the main threat to *L. loeselii* (JASNOWSKI 1972, HERBICHOVA 1999, RYDIN and JEGLUM 2009). It can lead to permanent habitat degradation and sites may never regenerate. The expansion of reed species, chiefly *Phragmites australis*, is another important threat.

All of the localities of *L. loeselii* in the Małopolska Upland are endangered due to progressing secondary succession. The most vulnerable are the sites

TABLE 1. Localities of *Liparis loeselii* (L.) Rich. in the Małopolska Upland and their membership in the Natura 2000 areas, including conservation measure plans (www.kielce.rdos.gov.pl, www.warszawa.rdos.gov.pl)

No.	Locality	Natura 2000 area	Project of conservation measure plans	Record of protective measures
1	Bełk	Ostoja Nidziańska PLH260003	yes, 2011	1) mowing of reed, 2) grubbing of trees and shrubs, 3) pasturage, 4) monitoring, 5) environmental education
2	Młyny	Ostoja Szaniecko-Solecka PLH260034	planned in 2012	X
3	Pakosław	Pakosław PLH140015	planned in 2012	X
4	Sędowice	Dolina Mierzawy PLH260020	planned after 2013	X
5	Zwierzyniec	Ostoja Szaniecko-Solecka PLH260034	planned in 2012	X

in Pakosław, Zwierzyniec and Młyny, where willow shrubs with *Salix cinerea* and birch-alder scrub proliferate. Reeds pose a similar threat as they dominate at the majority of *L. loeselii* sites. The locality in Bełk is somewhat different. The excessively developing shrub layer is not present and the nearby *Phragmitetum australis* reed bed is not part of the patch in which *L. loeselii* grows. This is probably caused by periodic cattle grazing. Cows are not grazed in Bełk regularly but periodically or even occasionally (e.g. while they are driven to the river). Grazing off effectively inhibits succession processes and preserves the floristic composition and the structure of the community in the dynamics balance. It can also lead to excessive eutrophication and mineralization and changes in the structure of the top peat layer. Mowing is the optimal protective treatment to preserve populations of *L. loeselii* and the phytocoenosis in which it occurs.

Protection actions have been conducted only at the Pakosław site since 2009 but they are mostly geared towards conserving *Ligularia sibirica*. Trees and shrubs are cut down and *Phragmitetum australis* reed beds, communities containing *Urtica dioica*, and mesic meadows are mown. The biomass is immediately transported off the site to prevent excessive eutrophication (TABOR and TABOR 2009), which is also favourable for *L. loeselii* populations.

Such protection management should be introduced at all of the *L. loeselii* sites in the Małopolska Upland as soon as possible. Otherwise populations are very likely to decline and *L. loeselii*, a rare species in this region of Poland, may become extinct. The network of Natura 2000 areas designated in the Świętokrzyskie Voivodeship and successively implemented protection measure plans offer some hope for *L. loeselii*. All of the localities in the Małopolska Upland are part of the Natura 2000 ecological area but only the site in Bełk has a record of active protection measures (Table 1).

As many localities of *L. loeselii* in Poland as possible should be included in population observations. A total of 18 sites are monitored to date and the majority of them

are in northern Poland (KUCHARSKI 2010). Localities in the Małopolska Upland should be monitored as sites on the range limit of the species.

CONCLUSION

Four of the total number of localities in the Małopolska Upland are in the Nidziańska Basin (Fig. 1). This is not surprising as the geological structure of the macroregion is calcareous (FLIS 1956). Only one site (the peatland in Pakosław) is in the Kielecka Upland. Population abundance of *L. loeselii* varies at individual sites. The localities in Bełk and Sędowice are the least abundant sites (up to 10 individuals) while the population in Pakosław is estimated at ca. 150 individuals. Falling groundwater levels and overgrowing by trees and shrubs are main threats to *L. loeselii* both in the study area and in the whole of Poland (PAWLIKOWSKI 2004). All of the sites in the study area are part of the Natura 2000 network (Table 1). It should be expected that protection actions aiming to preserve rare types of natural habitats and plant and animal species related to them (Annex I and II to the Habitat Directive) will soon be conducted to address successively implemented protection plans for Natura 2000 areas. This will also include populations of *L. loeselii* and many other rare and threatened vascular plants that accompany it.

REFERENCES

- ATLAS rozmieszczenia roślin naczyniowych w Polsce. (2001). Eds A. Zając, M. Zając. Pracownia Chorologii Komputerowej Instytutu Botaniki UJ, Kraków.
- BRÓŻ E., CIEŚLIŃSKI S. (1971): Przewodnik przyrodniczy po okolicach Radomia. Radomskie Towarzystwo Naukowe, Radom.
- BRÓŻ E., PRZEMYSKI A. (2009): The red list of vascular plants in the Wyżyna Małopolska Upland (S Poland). In: Rare, relict and endangered plants and fungi

- in Poland. Eds Z. Mirek, A. Nikel. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków: 123-136.
- DYREKTYWA Rady 92/43/EWG z dnia 21 maja 1992 w sprawie ochrony siedlisk naturalnych oraz dzikiej fauny i flory. (1992). Dz. Urz. UE 15/t. 2, L206/7.
- FLIS J. (1956): Szkic fizyczno-geograficzny Niecki Nidziańskiej. Czasop. Geogr. 27, 2: 123-159.
- GŁĄZEK T. (1989): Nowe dla Polski południowej stanowisko *Schoenus nigricans* L. Fragm. Florist. Geobot. 34, 3-4: 249-253.
- GŁĄZEK T. (1992): *Lipario-Schoenetum ferruginei* – a new plant association. Fragm. Florist. Geobot. 37, 2: 549-562.
- HERBICHOVA M. (1999): Antropogeniczny aspekt kierunków i tempa sukcesji roślinności na torfowiskach wysokich właściwych. In: Mechanizmy antropogenicznych przekształceń szaty roślinnej. Konferencja Naukowa, Poznań, grudzień 1999. Zakład Taksonomii Roślin UAM, Poznań: 13.
- HULTÉN E., FRIES M. (1986): Atlas of North European vascular plants. North of the Tropic of Cancer. Vol. 1. Koeltz Scientific Books, Königstein.
- JASNOWSKI M. (1972): Rozmiary i kierunki przekształceń szaty roślinnej torfowisk. Phytocenosis 1, 3: 193-208.
- KONDRACKI J. (2009): Geografia regionalna Polski. Wyd. Nauk. PWN, Warszawa.
- KUCHARSKI L. (2001): *Liparis loeselii* (L.) Rich. Lipiennik Loesela. In: Polska czerwona księga roślin. Paprotniki i rośliny kwiatowe. Eds R. Kaźmierczakowa, K. Zarzycki. Instytut Botaniki im. W. Szafera Polskiej Akademii Nauk, Kraków: 574-575.
- KUCHARSKI L. (2010): Lipiennik Loesela *Liparis loeselii* (L.) Rich. In: Monitoring gatunków roślin. Przewodnik metodyczny. Part 1. Ed. J. Perzanowska. Generalna Inspekcja Ochrony Środowiska, Warszawa: 99-109.
- MATUSZKIEWICZ W. (2008): Przewodnik do oznaczania zbiorowisk roślinnych Polski. Wyd. Nauk. PWN, Warszawa.
- MEUSEL H., JÄGER E., WEINERT E. (1965): Vergleichende Chorologie der Zentraleuropäischen Flora. Fischer, Jena.
- MIREK Z., PIĘKOŚ-MIRKOWA H., ZAJĄC A., ZAJĄC M. (2002): Flowering plants and pteridophytes of Poland. A checklist. Vol. 1. Biodiversity of Poland. – Krytyczna lista roślin naczyniowych Polski. T. 1. Różnorodność biologiczna Polski. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków.
- NOBIS M. (2007): Rośliny naczyniowe zachodniej części Przedgórze Iłżeckiego (Wyżyna Małopolska). Pr. Bot. 40.
- PAWLIKOWSKI P. (2004): *Liparis loeselii* (L.) Rich. Lipiennik Loesela. In: Gatunki roślin. Poradnik ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny. Vol. 9. Eds B. Sudnik-Wójcikowska, H. Werblan-Jakubiec. Ministerstwo Środowiska, Warszawa: 150-154.
- PIWOWARSKI B. (2011): New stations of rare, protected and endangered species of vascular plants in the Płaskowyż Jędrzejowski plateau (Wyżyna Małopolska upland). Roczn. AR Pozn. 390, Bot. Stec. 15: 5-11.
- PRZEMYSKI A. (2006): Nowe stanowisko *Ligularia sibirica* (Asteraceae) w Polsce. Fragm. Florist. Geobot. Pol. 13, 2: 411-414.
- ROSTAFIŃSKI J. (1872): Florae Polonicae Prodrömus. Verh. Zool.-Bot. Ges. Wien 22: 81-202.
- ROZPORZĄDZENIE Ministra Środowiska z dnia 13 kwietnia 2010 r. w sprawie siedlisk przyrodniczych oraz gatunków będących przedmiotem zainteresowania Wspólnoty, a także kryteriów wyboru obszarów kwalifikujących się do uznania lub wyznaczenia jako obszary Natura 2000. (2010). Dz.U. nr 77, poz. 510.
- ROZPORZĄDZENIE Ministra Środowiska z dnia 5 stycznia 2012 r. w sprawie ochrony gatunkowej roślin. (2012). Dz.U. 2012, nr 0, poz. 81.
- RYDIN H., JEGLUM J. (2009): The biology of peatlands. Oxford University Press, Oxford.
- TABOR M., TABOR J. (2009): Ochrona torfowiska Pakośław. Mazowiecko-Świętokrzyskie Towarzystwo Ornitologiczne, Pionki.
- ZAJĄC A. (1978): Założenia metodyczne „Atlasu rozmieszczenia roślin naczyniowych w Polsce”. Wiad. Bot. 22, 3: 145-155.
- ZAJĄC M., ZAJĄC A. (2009): Elementy geograficzne rodzimej flory Polski. Pracownia Chorologii Komputerowej Instytutu Botaniki UJ, Kraków.
- ZARZYCKI K., SZELĄG Z. (2006): Red list of the vascular plants in Poland. In: Red list of plants and fungi in Poland. Eds Z. Mirek, K. Zarzycki, W. Wojewoda, Z. Szeląg. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków: 9-20.

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