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## OCCURRENCE OF *POTAMOGETON BERCHTOLDII* IN THE BIESZCZADY MTS, EASTERN CARPATHIANS

Występowanie *Potamogeton berchtoldii* w Bieszczadach,  
 Karpaty Wschodnie

**Abstract:** *Potamogeton berchtoldii* is one of the *Potamogeton* species with a poorly understood distribution in Poland. The new locality of the species was found in the Bieszczady National Park (BdPN). The species was present in the habitat created by the Eurasian beaver on the Syhłowaciec stream (ATPOL square GG7010, 49°03'45,24" N, 22°41'40,467" E). The disappearance of the beaver pond is a potential threat for this locality.

**Key words:** *Potamogeton berchtoldii*, Small Pondweed, Potamogetonaceae, *Castor fiber*, Bieszczady Mts.

### Introduction

*Potamogeton berchtoldii* Fieber (Small Pondweed, Potamogetonaceae) is one of the 26 *Potamogeton* species recorded from Poland (Zalewska-Gałosz 2008). This aquatic species is widely distributed in the northern hemisphere (Akhani 2014) and may occur in water habitats like lakes, ponds, streams, drainage ditches with varied trophic and soil (organic or mineral; Zalewska-Gałosz 2008; Akhani 2014). The population trend of Small Pondweed in the world is considered to be stable, however, by an appearance in newly created and eutrophic reservoirs, the species distribution could expand (Akhani 2014).

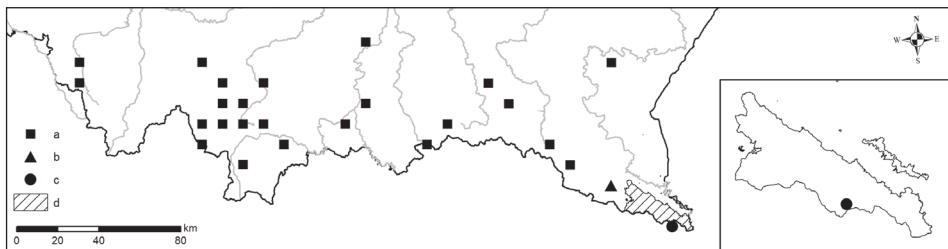
In the IUCN Red List of Threatened Species Small Pondweed is considered as the least concern (LC) species (Akhani 2014). In the Polish Red List (Kaźmierczakowa et al. 2016) the species status is DD (Data Deficient). In Poland, the species is rather rare, as it occurs in up to 100 localities (Zalewska-Gałosz 2008; Rutkowski 2016). In some areas, it is already considered as vulnerable (VU) like in Wielkopolska (Jackowiak et al. 2007) or endangered (EN) as in Lublin Region (Cwener et al. 2016).

In the Polish Carpathians, the species is known from 40 localities (Zalewska-Gałosz 2008; Kozłowska 2009). The highest density of known localities is placed in the Beskid Wysoki Mts and Beskid Niski Mts. Until now, the species has not

been found in the area of the Bieszczady National Park (BdPN), however, it was reported in the Western Bieszczady Mts (Fig. 1; Kozłowska 2009). In the flora of the BdPN at the end of the 20<sup>th</sup> century only two *Potamogeton* species were recorded – *Potamogeton pusillus* L. and *Potamogeton natans* L. Both species occurred at single localities (Zemanek, Winnicki 1999). Since 2000, only one paper mentioned new localities of *P. natans* from the BdPN area (in the Protection District Tarnawa at upper San River; Michalik et al. 2009). The purpose of this short communication was to present new species of *Potamogeton* genus in the flora of the Bieszczady National Park as well as a new locality from the Polish Carpathians.

## Study species

*Potamogeton berchtoldii* is a hydrophyte without rhizome with thin, 0.1–1 meter length stems. Stems are richly or sparingly branched and nodal glands are well-developed. The species is homophyllous, developing only submerged, sessile, linear, entire leaves, located alternately, of a varied colour: olive-green, light green, or brown-green. The leaves are 17–85 mm long, and 0.5–2.3 mm wide, not bordered by a marginal vein. The main vein (midrib) runs through the leaves, and it narrows from 1/5 of the width at the base of the leaf to the sharply or bluntly pointed tip of the leaf blade. The midrib is surrounded by well-developed air channels. The lateral vein one on each side of midrib is distinct, connected with the midrib at a 90-degree angle. Translucent stipules are open, 5–15 mm long. The species develops cylindrical, dark green turions (6–18 mm long, 0.6–1.4 wide) located terminally on the main shoots or axillary branches. The species blooms between June and September. During flowering, it produces 2–4 green flowers,



**Fig. 1.** Distribution of *Potamogeton berchtoldii* in the Polish Carpathians in 10 x 10 km ATPOL squares: a – localities after Zalewska-Gałosz (2008), b – locality after Kozłowska (2009), c – new locality, d – Bieszczady National Park area. In the insert, the exact location of pondweed in the Park is shown. ATPOL squares taken after Komsta (2016) and Verey (2017).

**Ryc. 1.** Rozmieszczenie *Potamogeton berchtoldii* w polskich Karpatach w siatce ATPOL 10 x 10 km: a – stanowiska za Zalewska-Gałosz (2008), b – stanowisko za Kozłowska (2009), c – nowe stanowisko, d – obszar Bieszczadzkiego Parku Narodowego. W ramce lokalizacja stanowiska rdestnicy Berchtolda w Parku. Siatka ATPOL za Komsta (2016) i Verey (2017).

with (3–)4–(–7) carpels (Zalewska-Gałosz 2008; Rutkowski 2016; Pladius 2020). The species belongs to the group of linear-leaved species that also includes e.g. *Potamogeton pusillus*, *P. trichophyllus*, *P. rutilus*, *P. obtusifolius* (Lindqvist et al. 2006; Zalewska-Gałosz 2008). Due to its relatively small size and similarity to *P. pusillus* (e.g. Zalewska-Gałosz 2008) the species is probably often overlooked. Until 2003 when the status of *P. berchtoldii* was established as a separate species, the taxon was counted as *P. pusillus* s. lato (after Zalewska-Gałosz 2008). Additionally, *P. berchtoldii* can hybridise, e.g. with *P. natans*, forming a sterile hybrid *P. ×variifolius* Thore, however, hybrids of *P. berchtoldii* are very rare (Preston 1995; Akhani 2014) and have never been reported from Poland (Zalewska-Gałosz, Ronikier 2012).

## Results and discussion

*Potamogeton berchtoldii* was found on 1 August 2020 on the surface of the beaver pond (Fig. 2) at the Syhłowaciec stream (1 x 1 km ATPOL square: GG7010; central location of the pond: 49°03'45,24" N, 22°41'40,467" E) in the BdPN (Fig. 1). The depth of the pond, where species individuals occurred, was 0.8–1 meters.



**Fig. 2.** *Potamogeton berchtoldii* on the surface of the beaver pond at the Syhłowaciec stream in the Bieszczady National Park, August 2020 (Photo by R. Rakowska).

**Ryc. 2.** *Potamogeton berchtoldii* na powierzchni stawu bobrowego na potoku Syhłowaciec w Bieszczadzkiem Parku Narodowym, sierpień 2020 (Fot. R. Rakowska).

*P. berchtoldii* population occupied 50 m<sup>2</sup> of a water surface. It formed the dense mat on the surface. No other floating macrophytes were observed on the pond surface.

Several flowering specimens were collected for identification and are preserved in the Herbarium of the Institute of Botany, Jagiellonian University in Kraków (KRA), Poland.

A locality where *Potamogeton berchtoldii* was observed in the BdPN is one of the localities where the Eurasian beaver *Castor fiber* L. was introduced in the '90s of the 20<sup>th</sup> century. Syhłowaciec stream is a watercourse in which beaver individuals were released in 1996 (Derwich et al. 2007) like in other localities in Poland to restore the natural character of the valley (Rakowska, Stachurska-Swakoń 2021). During the time of beaver presence and its activities in this watercourse, rodent created the ponds being a result of dam building, that could serve as new habitats for a different group of species. The number of beaver ponds varied between years (Rakowska, Stachurska-Swakoń 2020).

This year's observation of *Potamogeton berchtoldii* in the beaver pond at the Syhłowaciec stream not only allows to identify new species from Potamogetonaceae in the BdPN flora but also allows to determine new, confirmed locality from the Bieszczady Mts and Eastern Carpathians. As it was mentioned, two *Potamogeton* species were reported so far from the area of the BdPN (Zemanek, Winnicki 1999; Michalik et al. 2009).

The discovery of new localities of *Potamogeton berchtoldii* in the Eastern Carpathians may be related to progressing dispersal of this species in the Carpathians Mts. However, it is also possible that high-morphological variation of the species and similarity to other linear-leaved *Potamogeton* species, like *Potamogeton pusillus*, is a reason for the under-recorded localities in Poland (Nowak et al. 2007; Zalewska-Gałosz 2008). Some doubts of the possible overlooked distribution of the species in the Bieszczady Mts were also pointed by Kozłowska (2009). Incorrect species identification is also a reason for poor knowledge of *Potamogeton* species distribution in Ukraine (Borsukevych 2013). In last years the species was reported from different regions of Poland like the Ciśniańsko-Wetliński Landscape Park in the Western Bieszczady Mts (Kozłowska 2009) where it was found in anthropogenic reservoirs, the Opole Silesia (Nowak et al. 2007) or Wel River in North-Central Poland the only locality where Small Pondweed appeared in river (Szoszkiewicz et al. 2014). Further discoveries of new localities of *P. berchtoldii* and examination of the specimens preserved in Herbaria will allow presenting the actual distribution of this species in Poland.

Considering the source of the Small Pondweed population in the Bieszczady Mts some hypotheses should be taken. The species is dispersed mainly by hydrochory (Pladias 2020). However, there is no chance to dispersing seeds or any parts of this plant into Syhłowaciec stream by water – the source of the stream starts around 620 meters above the beaver pond in which the species was observed. Seeds

from this stream may be transported further by water due to fact that Syhłowaciec is a tributary of the Wołosaty River. This indicates that plant diaspores must have been transported to this location differently. Epizoochory and/or endozoochory may be a factor in this dispersal. According to Green et al. (2016) different water-bird species are responsible for the dispersal of diaspores of various plant species, which includes *Potamogeton* species. Five years after the introduction of beaver individuals into Syhłowaciec stream, new bird species appeared, like mallard duck *Anas platyrhynchos* (Derwich et al. 2007). This duck is present near this stream to this day (personal observation). It is possible that the individuals of mallard duck or other waterbirds species transported diaspores into BdPN from the Ciśniańsko-Wetliński Landscape Park (Kozłowska 2009) or even from Western Ukraine where the species occurs in over 20 localities (Borsukevych 2013).

In the world, there are no defined threats for *Potamogeton berchtoldii* (Akhani 2014). However, for the locality in the BdPN there are few, e.g. the vanishing of the beaver ponds after the disappearance of the beaver families and destruction of the beavers' constructions. The disappearance of rodent individuals from Syhłowaciec stream is highly possible due to their long-time presence (over 20 years) and no signs of repairing damaged dams (after the flood in 2020) during two months observation in 2020. The other threat is the instability of the beaver ponds as their number and location on the stream could differ between years (Rakowska, Stachurska-Swakoń 2020). However, this threat is less likely, compared to the first one, because this particular pond exists at least 11 years (Rakowska, Stachurska-Swakoń 2020). The stability of this pond is confirmed by the presence of the Small Pondweed itself. According to Rosell et al. (2005) only on beaver ponds with age over 10 years *Potamogeton* species appear.

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## Summary

*Potamogeton berchtoldii* jest jednym z gatunków *Potamogeton*, którego rozmieszczenie w Polsce jest jeszcze mało poznane. Nowe stanowisko gatunku stwierdzono w Bieszczadzkim Parku Narodowym (BdPN). Gatunek był obecny w niewielkim stawie utworzonym w ostatnich latach przez bobra europejskiego na potoku Syhłowaciec w południowej części Parku, w zlewni potoku Wołosatka (ATPOL GG7010, 49°03'45,24" N, 22°41'40,467" E). Potencjalnym zagrożeniem dla tego stanowiska jest zanik stawu bobrowego.

