

Platanthera pervia (Orchidaceae), a new taxon for the flora of Slovakia

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Short Report

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Abstract

The paper presents the first records of *Platanthera pervia* Peterm. in Slovakia, based on observations from 21 localities in the Western Carpathians, specifically within the Biele Karpaty, Malé Karpaty, Považský Inovec, Strážovské vrchy, and Západné Beskydy mountain ranges. The localities reported here represent the northeastern limit of its currently known range. The paper provides detailed information on the species' description, distribution, habitat preferences, and key to the identification.

1. Introduction

Members of the genus *Platanthera* Rich., belonging to the subtribe Orchidinae (subfamily Orchidoideae), are widely distributed across Europe, north-western Africa, temperate Asia, and North and Central America. Depending on the taxonomic concept applied, the genus comprises approximately 8–10 species, two of which are particularly widespread: *P. chlorantha* (Custer) Rchb. and *P. bifolia* (L.) Rich (e.g. Delforge 2006, Kühn et al. 2019, Kreutz 2024). Research on the *Platanthera bifolia/chlorantha* complex over the past decade has produced several noteworthy findings, ultimately leading to the description of a new species. In 2017, Durka et al. conducted a study on this complex in Germany, Belgium, and the Netherlands. Based on molecular AFLP markers and morphometric analyses, their study demonstrated that the *P. bifolia/chlorantha* group comprises at least three gene pools, which largely correspond to three morphological groups: *P. chlorantha*, *P. bifolia* s.str., and a taxon informally referred to as non-hybrid intermediates. A subsequent study by Esposito et al. (2018), focusing on Belgian populations, produced slightly different results using AFLP data, morphometric analyses, and floral scent profiling. The study revealed that morphologically intermediate plants displayed genetic patterns similar to those of *P. bifolia*. Floral scent analyses further supported this finding, revealing a strong similarity in scent composition between the intermediate morphotypes and *P. bifolia*. In the article, Titeca and Esposito (2018) compare these two studies and conclude that the sets of intermediates differ. In Esposito et al. (2018), individuals occurred at sites together with, or close to, *P. bifolia* and did not form separate populations, unlike in Durka et al. (2017). Furthermore, the intermediates reported by Durka et al. (2017) were morphologically closer to *P. chlorantha*, whereas those in Esposito et al. (2018) were morphologically closer to *P. bifolia*. However, more recent work by Bleilevens (2025), based on ddRAD molecular data, definitely confirmed the existence of these non-hybrid intermediates. His results indicated that this taxon is genetically distinct from both *P. bifolia* and *P. chlorantha*, likely representing a separate evolutionary lineage. In 2017, based on Durka et al. (2017) work, A. Baum and H. Baum described a new taxon, *P. muelleri* A.Baum et H.Baum. Nevertheless, for intermediate *Platanthera* entities, the earlier name *P. pervia* Peterm. had already been applied. The occurrence of *P. pervia* has been reported not only from the border regions of Germany, Belgium, and the Netherlands (Baum and Baum 2017, Durka et al. 2017), but also from southern Germany, Austria, northern Italy (Veneto region), southern France (Aveyron, Doubs, Hautes-Alpes regions), and northern Spain (Burgos province) (Delforge 2020, Bleilevens et al. 2021). Based on photographs in published works, Bleilevens et al. (2021) also identified occurrences of this species in northern Greece (Rhodope Mts.) and Turkey (Ordu Province). Later, the presence of this taxon was reported from the Czech Republic (Batoušek et al. 2025). Its occurrence in Switzerland (Baum and Baum

2017) is questionable, as P. Delforge (2020) disputed this record. The occurrence in southern Italy (in the Calabria, Basilicata, and Abruzzo regions) is also questionable; from this area, the taxon *P. bifolia* subsp. *osca* R. Lorenz, Romolini, V. A. Romano & Soca was described (Lorenz et al. 2015), characterized by intermediate morphological traits, and was later reclassified to species rank as *P. osca* (R. Lorenz, Romolini, V. A. Romano & Soca) Biagioli, Kreutz & De Simoni (Biagioli et al. 2022). However, the assignment of this taxon to *P. pervia* still requires further study based on molecular data (Bleilevens 2025).

Based on our field surveys conducted between 2015 and 2025, we identified several populations in Slovakia that, based on morphological characters, belong to *P. pervia*. The goal of this study is to document these findings and provide a description of this species for the Slovak flora.

2. Material and methods

During the floristic survey conducted between 2015 and 2025, data on the distribution, habitat preferences, and population size of *P. pervia* were collected. The geological substrate was identified in the field, and a geological map of the study area (Káčer 2005, scale 1:50,000) was also used (available at <https://app.geology.sk/gm50/>). Population size was assessed by counting the total number of flowering individuals. The description of *P. pervia* was compiled using plant material from Slovakia and by integrating data from previous studies (Baum and Baum 2017, Haynold et al. 2021). The distribution map was created in CorelDRAW using the grid-based mapping methodology for plant species distributions (Jasičová and Zahradníková 1976).

3. Results and discussion

Platanthera pervia Peterm., Anal. Pfl.-Schüss 591, 1846

Type: Germany, auf nassen Wiesen hinter Rückmarsdorf bei Leipzig, s.d., leg. W.L. Petermann (B 10 0358358, Herbarium Botanischer Garten und Botanisches Museum Berlin, Freie Universität Berlin).

Synonyms: *P. muelleri* A. Baum et H. Baum, J. Eur. Orch. 49(1): 137–139 (2017)

Type: Germany, Lengerich, Intruper Berg, 52°10' 55.26"N; 7°53'17.35"E; 118 m, open calcareous beech forest, 3. Jul. 2013, leg. A. Baum and H. Baum (photos 18–23 in Baum & Baum 2017).

3.1. Taxonomic note

Several names have historically been applied to intermediate *Platanthera* entities, but have since fallen into disuse. These include *P. bifolia* var. *brachyglossa* Wallr. (Wallroth 1822), *P. pervia* Peterm. (Petermann 1846), *P. bifolia* var. *robusta* Seemen (Seemen 1894), and *P. fornicata* (Bab.) Buttler (Buttler 2011), based on the name *Habenaria fornicata* Bab. (see also Bleilevens et al. 2021). Following typification, *P. brachyglossa* described by Reichenbach is unequivocally a synonym of *P. bifolia* (Lorenz et al. 2012) and

cannot be applied to intermediate taxa. Similarly, the name *P. fornicata*, based on *Habenaria fornicata* Babington, is also considered a synonym of *P. bifolia*. Babington established the name based solely on Fig. 1143 in Reichenbach (1831: 19, Table 851), which clearly represents *P. bifolia*. As this single illustration is explicitly cited in the protologue, it is designated as the holotype (Lorenz et al. 2012). Consequently, this name cannot be applied to intermediate entities of *Platanthera*. *P. bifolia* var. *robusta*, described by Seemen (1894), differs, among other characters, by a broadly rounded spur entrance, which may indicate an intermediate *Platanthera* taxon; however, the type herbarium specimens are unknown. They were likely housed in the Herbarium Botanischer Garten und Botanisches Museum in Berlin, but may have been destroyed during the Second World War. This suggests that Petermann (1846) had already validly described an intermediate species under the name *Platanthera pervia*. Furthermore, the results of Bleilevens (2025) indicate that *Platanthera muelleri* can be treated as a synonym of *P. pervia* based on taxonomic congruence and genetic identity.

3.2. Description

Plant (Fig. 1a) 30–60 (–70) cm tall. Stem erect, light green, terete, ribbed. Leaves 2–3 (–4) in a basal rosette, broadly ovate-lanceolate to elliptic, obtuse, slightly glossy, with few longitudinal veins; margins slightly undulate, light to mid-green. Stem with up to 5 (–8) lanceolate, leaf-like stem bracts, gradually decreasing in size upwards. Inflorescence cylindrical, elongated, 5–20 (–25) cm long, lax, with (8–) 20–40 (–50) flowers; bracts lanceolate to narrowly lanceolate, shortly acuminate, herbaceous, light green, lower bracts slightly longer than the ovaries, upper bracts shorter. Dorsal sepal (Fig. 1b) white, erect, slightly concave and inclined forward, 4.5–10 mm long, 3–9.5 mm wide. Lateral sepals (Fig. 1b) white, spreading, slightly reflexed, 6–12 (–13) mm long, 2.5–6 (–7.5) mm wide. Petals (Fig. 1b) white greenish at the tip, 4–10 (–12) mm long, 1–3 (–4) mm wide, slightly curved upwards, converging above the gynostemium, from non-overlapping to overlapping. Labellum and spur are white with greenish tips, becoming entirely greenish. Spur (Fig. 1c) horizontal or curved downward, (20) 25–40 (–45) mm, filiform, decurved, apex pointed, nectariferous, approximately twice the length of the ovary. Labellum (Fig. 1b) undivided, tongue-shaped, curved downward, 8–18 mm long, rounded at apex. Thecae (Fig. 2b) slightly divergent or sometimes parallel; distance between anthers at the apex (0.5–) 1.4–1.5 (–2) mm, at the base (0.5–) 1.5–2.1 mm; anther length 3–5 mm. Pollinarium (Figs. 2b–d) consist of clavate to disc-triangular pollinia of firm to slightly friable consistency, sometimes dividing into two hemipollinia (pollinium length 1.2–2.1 mm, width 0.5–1 mm) and caudicle with 0.5–1.1 mm length (Fig. 3b–d). Viscidium round to oval. Lateral stigma lobes not covering the spur entrance (Fig. 2b).

3.3. Distribution in Slovakia

During field surveys conducted between 2015 and 2025, we identified 21 populations in western Slovakia that can be unambiguously assigned to the taxon *P. pervia* based on morphological characters. These populations occur in the Western Carpathians, specifically within the Biele Karpaty, Malé Karpaty, Považský Inovec, Strážovské vrchy, and Západné Beskydy mountain ranges (Fig. 4).

Biele Karpaty Mts.: Vrbovce village, Žalostinná Mt., near Bučkova jama nature reserve, 48.8166425°N, 17.4432169°E, 480 m, 21. Jun. 2025, Kučera J. and Kolník M. (Fig. 1); Vrbovce village, W of the village, 48.8034158°N, 17.4416969°E, 430 m, 21. Jun. 2025, Kučera J. and Kolník M.; S of Šance settlement, valley of Liešťanský potok stream, 48.7998389°N, 17.5289093°E, 430 – 410 m, 27. Jun. 2025, Kolník M.; S of Šance settlement, tributary valley of Liešťanský potok stream, 48.7994607°N, 17.5321165°E, 457 m, 27. Jun. 2025, Kolník M.; Myjava town, Vdoviacovci settlement, Brestovský potok valley, 48.8185492°N, 17.5628837°E, 491 m, 48.8181434°N, 17.5596317°E, 546m, 26. Jun. 2025, Kolník M.; Brestovec village, Poľana settlement, N of settlement, 48.8157041°N, 17.5408415°E, 529 m, 27. Jun. 2025, Kolník M.; N of Poriadie village, valley of Kostolník stream, along the road, 48.8119851°N, 17.6150166°E, 438 m, 48.7995067°N, 17.6136320°E, 407 m, 21. Jul. 2025, Kolník M.; Topolecká village, N of village, along the forest road, 48.8275589°N, 17.6465355°E, 469 m, 14. Jul. 2024 and 25. Jun. 2025, Kolník M.; Moravské Lieskové village, W slope of Bestinné hill, 48.8647938°N, 17.7628721°E, 365 m, 18. Aug. 2024, Kolník M.; Nová Bošáca village, Grúň nature reserve, 48.895076°N, 17.795996°E, 480 m, 21. Jun. 2025, Kučera J. and Kolník M.; Nová Bošáca village, Mravcové nature reserve, 48.9071761°N, 17.7650569°E, 500 m, 21. Jun. 2025, Kučera J. and Kolník M. (Fig. 5a); Melčice-Lieskové village, Hradnianska dolina valley, 48.8641499°N, 17.8837681°E, 286 m, 48.8735285°N, 17.8760529°E, 325m, 48.8750587°N, 17.8754227°E, 333 m, 24. Aug. 2024, 13. Jul. 2025, Kolník M.

Malé Karpaty Mts.: Brezová pod Bradlom village, W of village, meadow Pod Zápačím, 48.651449°N, 17.514510°E, 270 m, 1. Jun. 2021 and 22. Jun. 2025, Kolník M.; Bukovec village, S of village, 48.6891566°N, 17.5142005°E, 431 m, 17. Jun. 2021 and 29. Jun. 2025, Kolník M.; N of Šindeláci settlement, loc. Mierkové, 48.6822684°N, 17.6250245°E, 295–310 m, 25. Aug. 2021 and 2. Jul. 2025, Kolník M.

Považský Inovec Mts.: Moravany nad Váhom village, north slope of the Gajda Mt., 48.5887033°N, 17.9451508°E, 540 m, 27. Jun. 2020, Kučera J. (Fig. 5c); Stará Lehota village, ENE of the village, slope of the Rovence Mt., 48.653848°N, 17.937755°E, 412 m, 11. Jun. 2021 and 23. Jun. 2025, Kolník M.; Stará Lehota village, under Teplý vrch Mt., 48.649707°N, 17.953243°E, 405 m, 7. Jun. 2024, Kučera J. (Fig. 5b); Stará Lehota village, above cemetery, 48.646356°N, 17.948985°E, 443 m, 15. Jun. 2024, Kučera J.; Selec village, E of the village, 48.7849131°N, 18.0040728°E, 430 m, 19. Jun. 2020, Kučera J.

Strážovské vrchy Mts.: Zliechov village, saddle between Javorina Mt. and Strážov Mt., 48.9653269°N, 18.4478747°E, 750 m, 17. Jun. 2015, Kučera J.

The populations consist of a few dozen individuals, up to 30. At all sites, except for one locality in the Malé Karpaty Mts. near the village of Brezová pod Bradlom, where *P. bifolia* individuals were also present, only plants with intermediate morphological characters were observed.

3.4. Habitat, ecology, and phenology

The localities are situated in the hilly to submontane zone, at elevations ranging from 270 to 750 m above sea level. Populations occur in three main habitat types (Fig. 5): meadow springs and their

margins (including petrifying springs with tufa formation and alkaline fens), forest edges (thermophilous forest fringes on base-rich soils), and open beech forests (submontane calcareous beech forests, submontane species-rich beech forest). The sites are primarily located on calcareous substrates, such as shales, tuffs, limestone, or dolomite. Two localities in the Biele Karpaty Mts. are located on flysch. At the Slovakian localities we studied, a phenological shift was observed: *P. pervia* flowers 2–3 weeks later than *P. bifolia*, consistent with Petermann's (1846b) observations. The flowering period of *P. pervia* coincides with that of *P. chlorantha*.

3.5. Key to the Identification of Representatives of the Genus *Platanthera* in Slovakia

1a. Entrance to the spur open, fully visible and rounded; without lateral stigma lobes; caudicle longer than 0.5 mm 2

1b. Entrance to the spur constricted, with lateral stigma lobes covering spur entrance on both sides; lower parts of the thecae spaced up to 1 mm apart; caudicle very short (0.1–0.4 mm); ratio of caudicle length to total pollinium length approximately 1:6–10 *P. bifolia*

2a. Thecae parallel or slightly converging upwards (angle 0°–25°); distance between the lower parts of the thecae 2–3 mm; caudicle 0.5–1.1 mm long; ratio of caudicle length to total pollinium length approximately 1:2.5–4 *P. pervia*

2b. Thecae distinctly converging upwards (angle 25°–45°); distance between the lower parts of the thecae 4–5 mm; caudicle 1.5–2.1 mm long; ratio of caudicle length to total pollinium length approximately 1:0.7–1 *P. chlorantha*

The most reliable morphological characters for identification are the distance between the lower parts of the thecae, the length of the pollinium caudicle, and the presence or absence of stigma lobes near the entrance to the spur (Fig. 2).

Additional diagnostic characters useful for identification include plant height, spur length, and labellum length. *Platanthera pervia* is generally taller [30–60(–70) cm] than *P. bifolia* [25–45(–65) cm] and *P. chlorantha* (20–45 cm). It is also characterized by a slightly longer spur, measuring (20) 25–40 (–45) mm, compared with *P. bifolia* [(15) 17–30 (–45) mm] and *P. chlorantha* [(21) 23–29 (–33) mm]. Furthermore, the labellum of *P. pervia* (8–18 mm) is slightly longer than that of *P. bifolia* [7–14 (–19) mm] and *P. chlorantha* [(8) 9–14 (–17) mm].

Morphological characters alone are insufficient to distinguish *P. × hybrida* Brügger (hybrid *P. bifolia* × *P. chlorantha*) from *P. pervia*. Therefore, identification should take into account the characteristics of the entire population. Previous studies indicate that hybrids are rare, occurring occasionally in mixed

populations of *P. bifolia* and *P. chlorantha*, and rarely in the absence of both parental species. In contrast, *P. pervia* usually forms entire populations without *P. bifolia* or *P. chlorantha* present at the site.

4. Conclusions

This study provides new data on the distribution of the taxon *P. pervia* in the Western Carpathians of Slovakia. The localities reported here represent the northeastern limit of its currently known range. Due to the lack of comprehensive data on the species' distribution in Slovakia, its overall conservation status cannot be assessed at this time. However, we expect that detailed surveys and population studies of the genus *Platanthera* in Slovakia are likely to reveal additional occurrences. The populations we observed are not under immediate threat; two of them are located within protected areas (Mravcové and Grúň nature reserves). Nevertheless, most populations are small, typically consisting of fewer than 10 individuals. Only four populations (Malé Karpaty Mts. - near Brezová pod Bradlom, Považský Inovec Mts. - two localities near Stará Lehota, and Považský Inovec Mts. - near Selec village) are larger, though none exceed 30 individuals.

Declarations

Conflict of interest:

The Authors do not have any conflicts of interest. Consent to participate: Accept. Consent for publication: Accept. Human and animal rights: Not applicable. Data availability: Not applicable.

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Author Contribution

Both authors contributed to the conception and design of the study. Both authors collected data in the field. Analysis was performed by Jaromír Kučera and Martin Kolník. The first draft of the manuscript was written (including the creation of images and maps) by Jaromír Kučera, and Martin Kolník commented on previous versions of the manuscript. Both authors read and approved the final manuscript.

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Figures

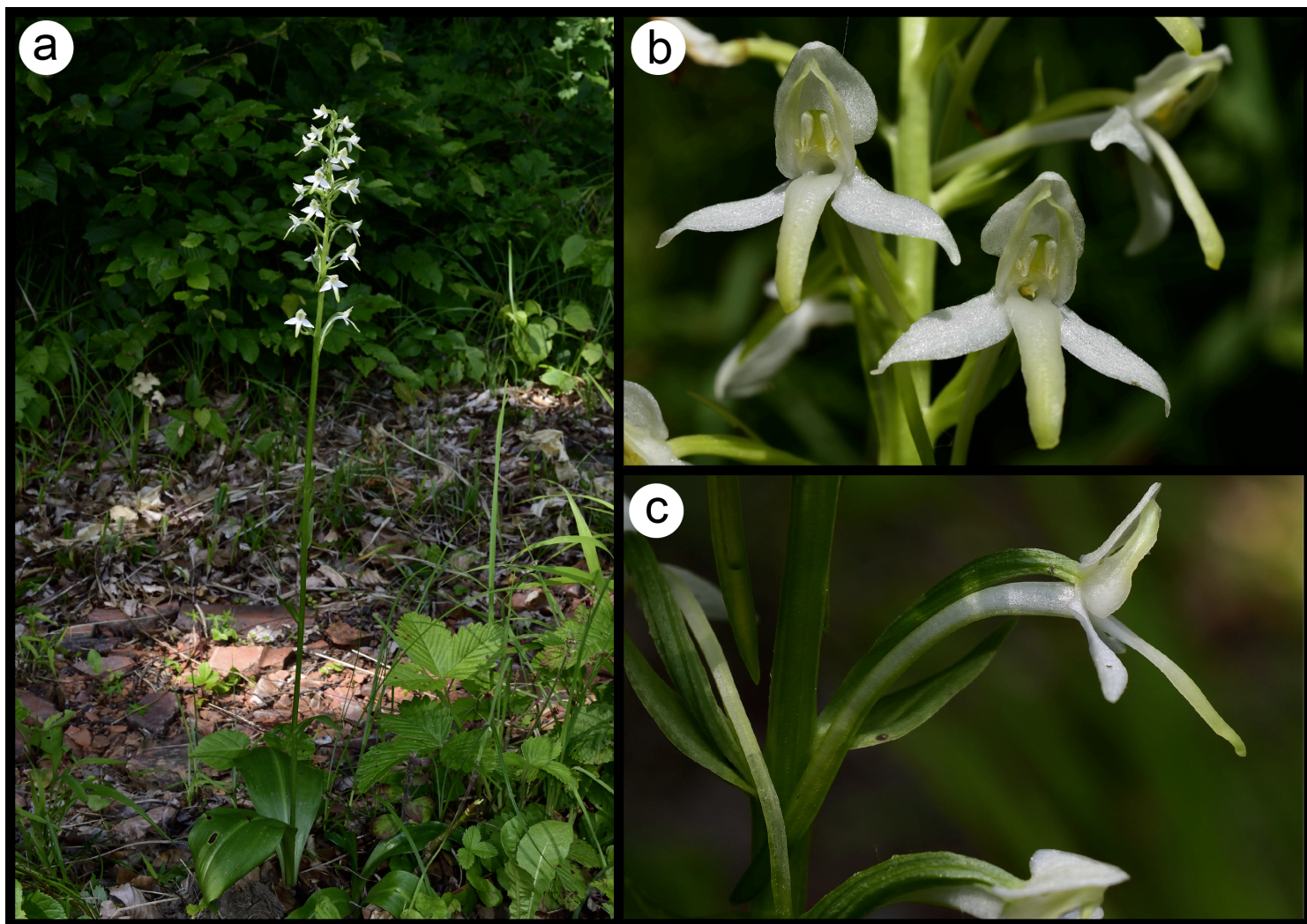


Figure 1

a Habitus, **b** flower detail, front view, **c** flower detail, lateral view. Photos were taken at a locality in Biele Karpaty Mts. (Bučkova jama nature reserve), 21. Jun. 2025 (photo: J. Kučera)

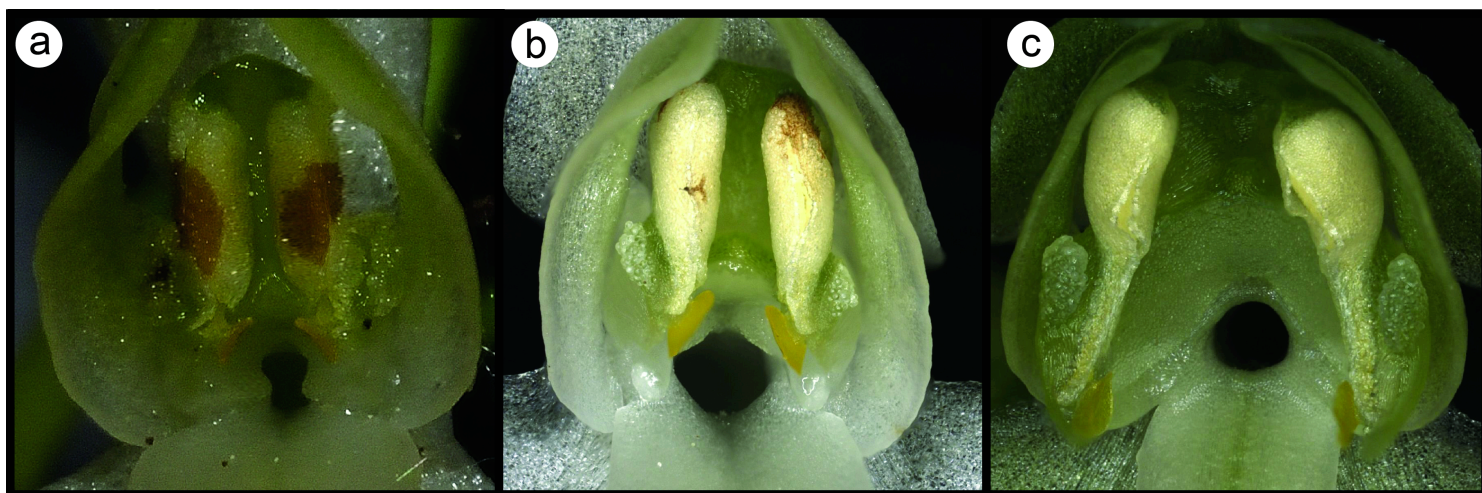


Figure 2

Thecae and entrance to the spur of the **a** *P. bifolia*, Považský Inovec Mts., near Vozokany village, 3. Jun. 2025, **b** *P. pervia*, Biele Karpaty Mts., Mravcové nature reserve, 21. Jun. 2025 and **c** *P. chlorantha*, Malé Karpaty Mts., Skalka Mt, 21. Jun. 2025 (photo J. Kučera)

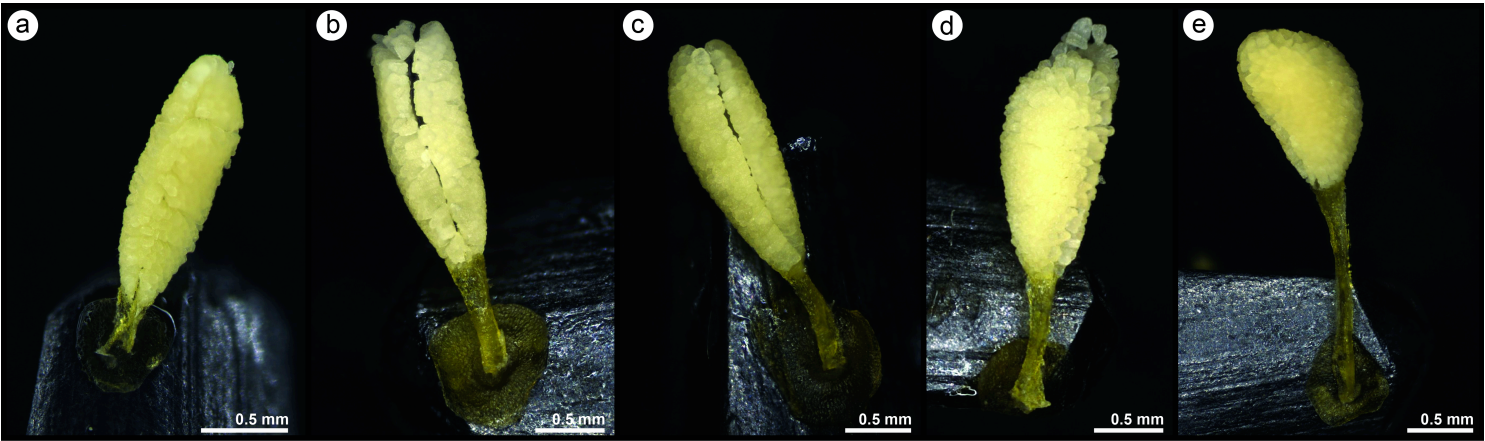


Figure 3

Pollinarium of the **a** *P. bifolia*, Považský Inovec Mts., near Vozokany village, 26. May. 2025, **b** *P. pervia*, Biele Karpaty Mts., near Bučkova jama nature reserve, 21. Jun. 2025, **c** *P. pervia*, Biele Karpaty Mts., Mravcové nature reserve, 21. Jun. 2025, **d** *P. pervia*, Považský Inovec Mts., near Selec village, 19. Jun. 2025, **e** *P. chlorantha*, Malé Karpaty Mts., Skalka Mt, 21. Jun. 2025 (photo J. Kučera)

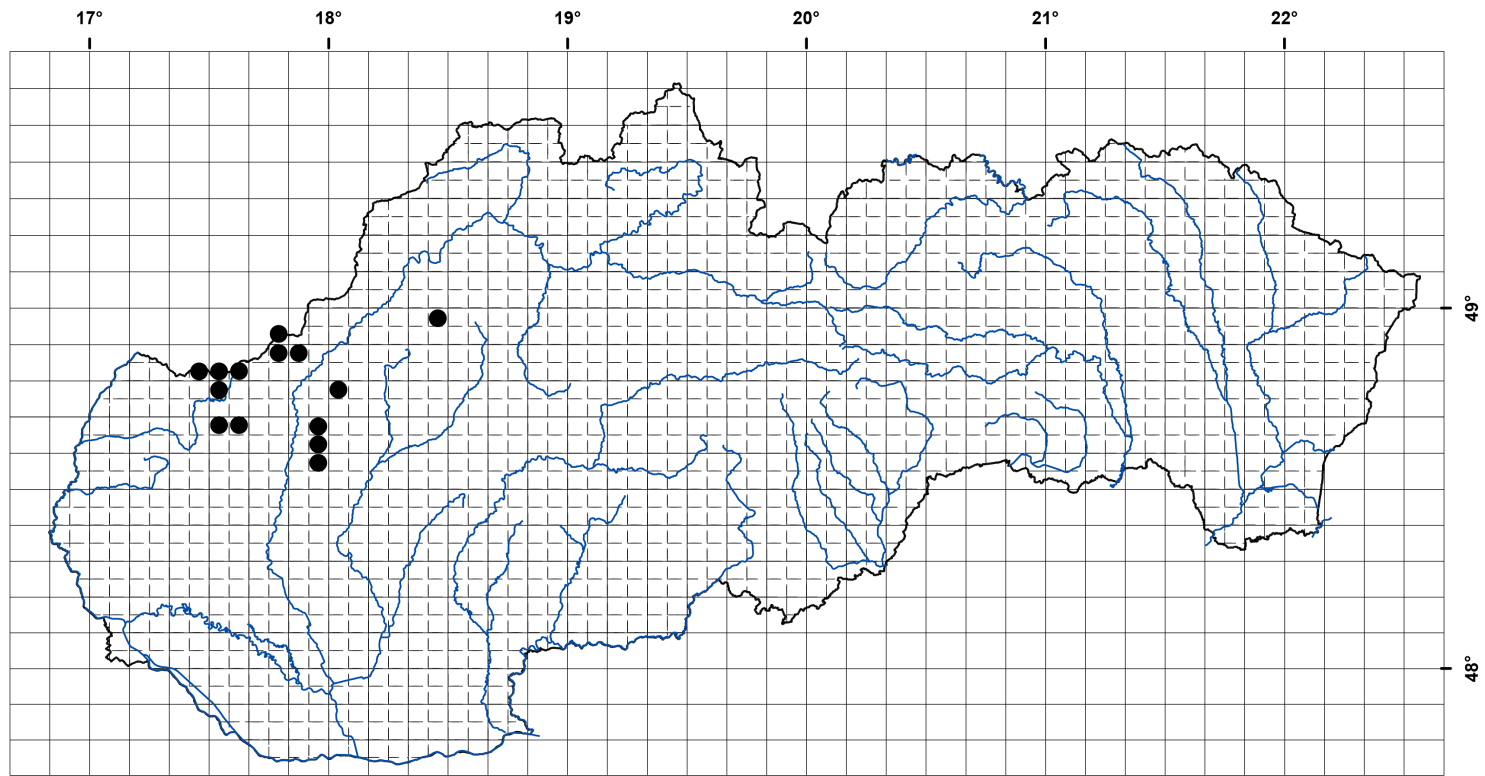


Figure 4

Map showing the distribution of *P. pervia* in Slovakia

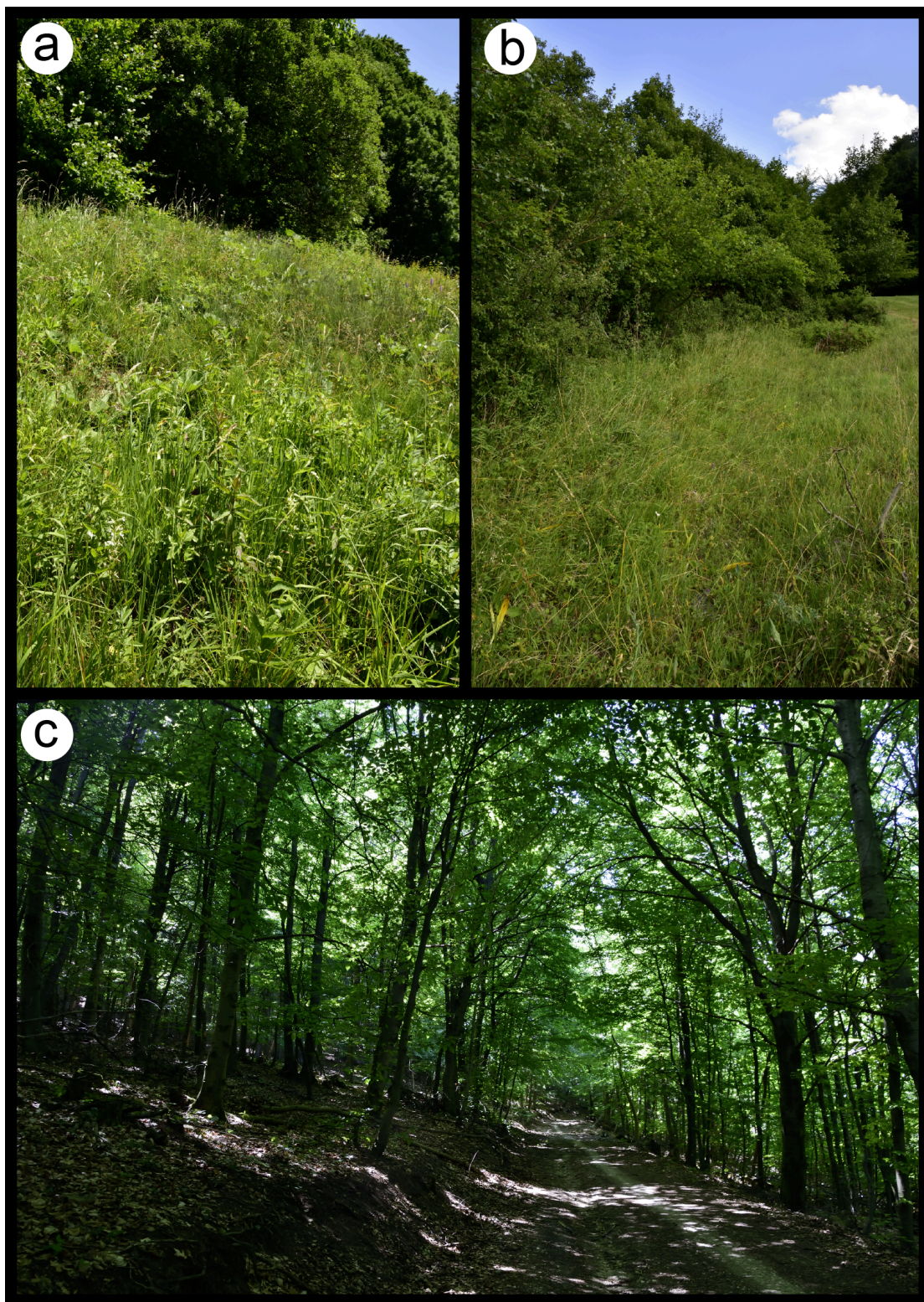


Figure 5

Biotopes with *P. pervia* at the localities: **a** Biele Karpaty Mts., Mravcové nature reserve, 21. Jun. 2025, **b** Považský Inovec Mts., under Teplý vrch Mt., 7. Jun. 2024, **c** Považský Inovec Mts., Gajda Mt., 27. Jun. 2020 (photo J. Kučera)