ORIGINAL PAPER

New record of rare boreo-montane polypore *Resinoporia piceata* (*Fomitopsidaceae*) in Ukraine

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ABSTRACT
Questions: What are the main morphological features of the newfound specimen of *Resinoporia piceata*? What is the conservation significance of the record and how does it contribute to understanding the fungal biodiversity in the region?
Location: Gorgany Nature Reserve.
Methods: field surveys, microscopical identification, analysis of sources**.**
Nomenclature: Index Fungorum (www.indexfungorum.org).
Results: Gorgany Nature Reserve is the only protected area in the Ukrainian Carpathians where any forestry or recreational activities are strictly prohibited. Its territory is one of the most prominent fungal biodiversity hotspots of Ukraine, which harbours some of the rarest wood-inhabiting fungal species of Europe, known in Ukraine from only a few, mostly historical records. In this paper we report a new record of *Resinoporia piceata*, a rare polypore confined to old-growth spruce-dominated forest, which was not recorded in Ukraine for more than 80 years. Detailed description and illustrations of the collected specimen are provided. Ecology, global distribution, conservational significance and taxonomical history of the species is summarized. To safeguard the diversity of rare lignicolous species in the region, it is crucial to secure legal protection for all remaining natural forests in the Ukrainian Carpathians. Equally important is the creation of continuous biodiversity corridors between the Gorgany Nature Reserve and other fungal diversity hotspots.
Conclusion: The record of *Resinoporia piceata*, a rare polypore known in Ukraine from only historical records, is evidence of the outstanding value of the Gorgany Nature Reserve as one of the most prominent fungal diversity hotspots in Ukraine.

KEYWORDS
Gorgany Nature Reserve, mycobiota, *Picea abies*, primeval forests, Ukrainian Carpathians, wood-decaying fungi

CITATION
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INTRODUCTION

Gorgany Nature Reserve is the only protected area in the Ukrainian Carpathians where any forestry or recreational activities are strictly prohibited. The reserve was established in 1996 to protect the best-preserved forests in the upper part of the Bystrytsia Nadvirnianska river basin. Spruce-dominated woodland cover approximately 86% of its total area (Klimuk *et al*. 2006), nearly 53% of which is represented by natural or primeval forests (Cherniavskyi 2021). In 2017, some of the most valuable natural forests of Gorgany Nature Reserve, mostly concentrated in Dzhurdzhynets stream valley, became a part of "Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe" UNESCO Natural World Heritage Site (UNESCO 2017).

Preceding fungal inventories of the Gorgany Nature Reserve revealed a notably rich fungal diversity, considered to be the most original in the Ukrainian Carpathians in terms of the percentage of species (19%) found there, but unknown in any other protected area of the region (Dudka *et al. 2019*). Our recent research (Bohoslavets 2023, Bohoslavets & Prydiuk 2023a, Bohoslavets & Prydiuk 2023b) has revealed there several rare wood-inhabiting fungal species, which are known in Ukraine from only a few, mostly historical records. These discoveries encouraged us to continue the study of lignicolous mycobiota in the area, which resulted in a record of *Resinoporia piceata* (Runnel, Spirin & Vlasák) Audet, a rare Eurasian boreo-montane polypore, confined to old-growth spruce-dominated forests (Spirin *et al*. 2015; Niemelä 2016).

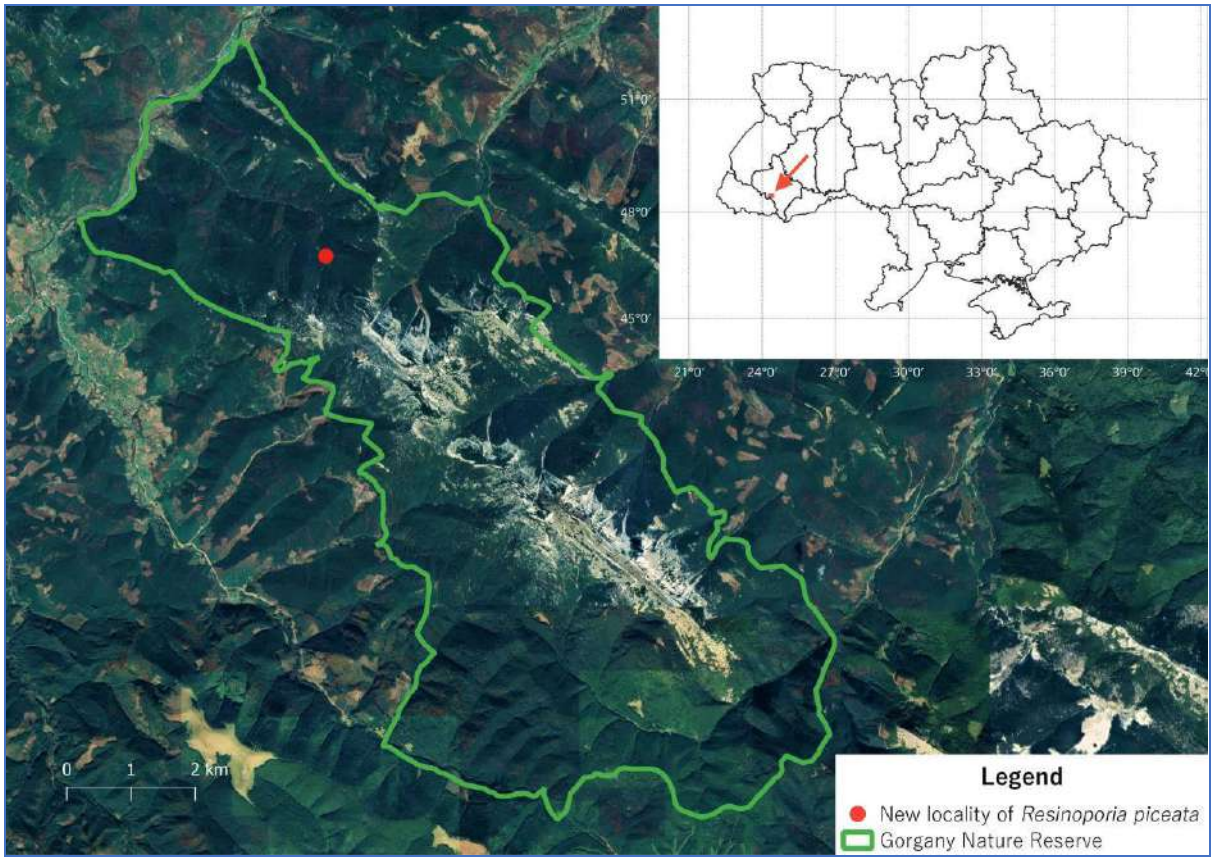

FIGURE 1. New locality of *Resinoporia piceata*.

MATERIAL AND METHODS

The species was recorded in Gorgany Nature Reserve (FIGURE 1) on 14 October 2023 during the field survey. Detailed information on the substrate (tree species, size, wood decay stage and type), habitat (forest type, management status) and location (coordinates, elevation above the sea level) was recorded for the specimen. The wood decay stage is given according to the classification of Renvall (1995). Habitat type is specified according to the National Habitat Catalogue of Ukraine (Kuzemko *et al.* 2018). The specimen is deposited in the Fungarium of the National Herbarium of Ukraine (KW-M) at the M.G. Kholodny Institute of Botany, NAS of Ukraine.

Microscopic slides were mounted in 5% KOH solution and Melzer's reagent (Hjorstam *et al.* 1987). Spore sizes are shown based on at least 20 measurements per sample. Size of basidia and cystidioles is calculated on 10 measurements per sample. We used the following abbreviations to describe microscopic features: av. W = average width of the basidiospores; av. L = average length of the basidiospores; Q = length of the basidiospores divided by width; av. Q = average Q.

Scientific names of the taxa are provided according to the Index Fungorum database (www.indexfungorum.org).

The study site map (FIGURE 1) was created using QGIS 3.28.0 software.

RESULTS AND DISCUSSION

Below we provide a detailed description and illustrations of the macro- and micromorphological structures of the collected specimen of *Resinoporia piceata*, completed with an overview of its ecology, global distribution and conservational significance. Taxonomical history of the species is discussed.

Resinoporia piceata (Runnel, Spirin & Vlasák) Audet, Mushrooms nomenclatural novelties 7: [2] (2017) (FIGURES 2–3)

Basionym: *Antrodia piceata* Runnel, Spirin & Vlasák, in Spirin, Runnel, Vlasák, Miettinen & Põldmaa, Fungal Biology 119(12): 1303 (2015)

Fruitbody (FIGURE 2) with a sweet scent, resupinate, tough, irregularly shaped, forming an oblong patch (17 × 4 cm, up to 5 mm thick in the thickest part) on the decorticated side surface of the fallen log. Pastel-yellow nodulose zones on the vertical parts of the substrate contrast with the lighter pore surface, giving the fruitbody a characteristic stepwise appearance. Hymenophore (FIGURE 3a) poroid, pore surface straw-coloured, tends to darken closer to the margin. Pores 3–5 per mm, round, with thick dissepiments. Tubes up to 3 mm long. Margin narrow and distinct, ochre to vinaceous-brown.

Hyphal system dimitic. Skeletal hyphae 2–3,5 µm in diameter, hyaline, thick-walled, slightly amyloid, without septa. Subicular generative hyphae very difficult to discern, 2–2,5 µm in diameter, hyaline, clamped. Hymenium with thin-walled tapering cystidioles, 20–25 × 5–6 µm, thin-walled. Basidia clavate, 11–17 × 5–6 µm, thin-walled, 4-spored. Basidiospores (3,5–)3,8–5,9 × 1,4–2,5 µm, Q = 1,8–2,9, av. L = 4,64 µm, av. W = 2,03 µm, av. Q = 2,31; variable in shape and size (FIGURE 3b), ellipsoid to cylindrical, slightly curved, tapering towards the apiculus, hyaline, thin-walled, non-amyloid.

Specimen examined: Ukraine, Ivano-Frankivsk region, Nadvirna district, Gorgany Nature Reserve, Dzhurdzhynets stream valley, "Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe" UNESCO Natural World Heritage Site, permanent forest monitoring plot No 2, 48.467833 N, 24.309889 E, 1130 m a.s.l., steep (24–35°) west-facing (250°) slope, primeval spruce forest of upper part of the forest belt on rich soils, on the decorticated lateral surface of the uprooted trunk of *Picea abies* 41 cm in diameter and approximately 32 m long (from the root collar), brown rot, decay stage 3, 14 October 2023, leg. & det. O. Bohoslavets (KW-M71567).

FIGURE 2. *Resinoporia piceata*: general view of the fruitbody.

Ecology. Brown rotter on the lying dead wood of conifers (mainly *Picea* spp.). The species is known mostly from undisturbed spruce-dominated forests (Spirin *et al*. 2015).

Global distribution. Recorded (Vampola & Pouzar 1992, Niemelä *et al.* 2001, Ryvarden & Melo 2014, Spirin *et al.* 2015, Liljeblad 2023) in Europe (Croatia, Czech Republic, Estonia, Finland, France, Germany, European part of Russia, Poland, Slovakia, Sweden, Ukraine) and Asia (China, Japan, Russian Far East). The species is extremely rare along all of its distribution range (Holec & Beran 2006, Spirin *et al.* 2015).

Notes. The genus *Resinoporia* Audet was introduced in 2017 to incorporate eleven species of closely related resupinate brown-rotting polypores, previously known as the "*Antrodia crassa* group" (Spirin *et al.* 2015, Audet 2017). In 1936 and 1937, Albert Pilát collected fungi belonging to this genus for the first time in Ukraine on the territory of present-day Zakarpattia Oblast as part of his fundamental study of wood-inhabiting fungi of the Eastern Carpathians (Pilát 1940; Holec 2002). In more than half a century, Petr Vampola revised seven collections from Berlebash (PRM 487883, 487958, 487959, 488431, 491064) and Lishchynka (PRM 28696, 29028) stream valleys (Ukraine), which Pilát himself identified as *Poria crassa* Karsten (Pilát 1940; Holec 2002). As a result of the revision, these collections, together with the material from Croatia, Czech Republic, Poland and Slovakia, were identified as *Amyloporia sitchensis* (Baxt.) Vampola et Pouzar (Vampola & Pouzar 1992). Almost simultaneously, Niemelä *et al.* (1992) and Ryvarden & Gilbertson (1993) reported this species (as *Antrodia sitchensis* (D.V. Baxter) Gilb. & Ryvarden) from Estonia and Finland. These finds were perceived as the first European records of the fungus, previously known exclusively from North America.

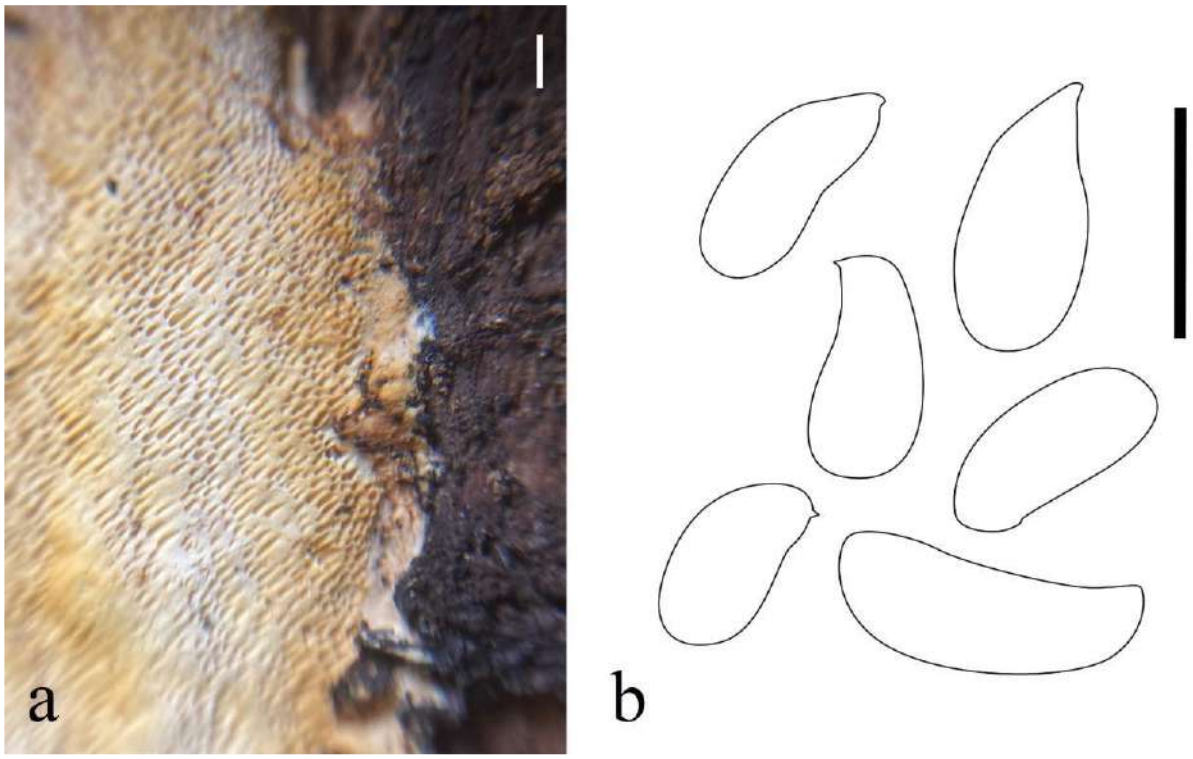

FIGURE 3. *Resinoporia piceata*: a – close up view of the hymenial surface and the margin (bar = 1 mm); b – basidiospores (bar = 5 µm).

However, a taxonomic reevaluation of *A. sitchensis* conducted by Spirin *et al.* (2015) demonstrated that this name is applied exclusively to North American material, and the European samples belong to a separate novel species, *Antrodia piceata* Runnel, Spirin & Vlasák. Interestingly, specimens collected by Pilát in Berlebash and Lishchynka stream valleys represent the earliest collections of the species, currently known as *Resinoporia piceata*.

Since all the previous finds of *R. piceata* in Ukraine were made decades ago, our record reveals the only currently known locality of the species in the country. Together with the other records of the rarest wood-inhabiting fungi of Europe (e.g., *Amylocystis lapponica* (Romell) Bondartsev & Singer and *Phellinidium pouzarii* (Kotl.) Fiasson & Niemelä) from Gorgany Nature Reserve (Bohoslavets & Prydiuk 2023a), this find provide direct evidence of the outstanding value of this territory as one of the most prominent fungal biodiversity hotspots of Ukraine. In order to preserve the diversity of these species in the Ukrainian Carpathians in the face of the gradual loss of natural forest cover in the region (Spracklen & Spracklen 2020), all of the remaining areas of natural forests should be legally protected by obtaining a preservation status, where forestry of any kind is strictly prohibited. Moreover, since the distribution of the wood-inhabiting fungi is heavily affected by habitat connectivity (Abrego *et al.* 2015), the creation of continuous unmanaged biodiversity corridors between the Gorgany Nature Reserve and other fungal diversity hotspots, such as natural forests of Chornohora and Svydovets massif of the Carpathian Biosphere Reserve (Holec 2008), is critically important.

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РЕЗЮМЕ

Богославець О.М. (2023). Нова знахідка рідкісного бореомонтанного трутовика *Resinoporia piceata* в Україні. *Чорноморський ботанічний журнал* 19(4): 358–364. doi: 10.32999/ksu1990-553X/2023-19-4-2

Природний заповідник «Горгани» – єдина природоохоронна територія в Українських Карпатах, де суворо заборонена будь-яка господарська та рекреаційна діяльність. Його територія є одним з найвизначніших осередків грибного біорізноманіття України, де зареєстровані деякі з найрідкісніших дереворуйнівних грибів Європи, відомих в Україні лише з кількох, переважно історичних записів.. У цій статті ми повідомляємо про нову знахідку рідкісного трутовика *Resinoporia piceata*, приуроченого до старовікових лісів з переважанням ялини, що не реєструвався в Україні протягом понад 80 років. Подано детальний опис та ілюстрації на основі макро- та мікроморфологічних ознак зібраного зразка. Коротко викладено екологію, глобальне поширення, природоохоронне значення та таксономічну історію виду. Наголошується на критичній необхідності отримання законодавчого охоронного статусу для всіх природних лісів, що залишилися в Українських Карпатах, а також створення безперервних коридорів біорізноманіття між природним заповідником «Горгани» та іншими осередкам різноманіття дереворуйнівних грибів для збереження різноманіття рідкісних видів у регіоні.

Ключові слова: дереворуйнівні гриби, мікобіота, праліси, природний заповідник «Горгани», Українські Карпати, *Picea abies.*