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Original scientific paper

CENANGIUM OLYMPII, COMB. NOV.

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New records of the cup-fungus *Zeus olympius* Minter & Diam. (Rhytismataceae, Ascomycota) are reported from the territory of Kosovo, and a new taxonomic combination for the species is proposed. Phylogenetic analyses were conducted using nrITS (Nuclear ribosomal internal transcribed spacer) sequences from dry material collected in Kosovo and Greece. Based on the new phylogenetic placement, where species morphologically identified as *Zeus olympius* are placed within a clade of the genus *Cenangium*, *Cenangium olympii* M. Karadelev, K. Rusevska, G. Wu & Zhu L. Yang is introduced as a comb. nov. for *Zeus olympius*.

Key words: Ascomycota; *Zeus olympius* Minter & Diam.; new species combination; *Pinus heldreichii*; Balkan Peninsula

INTRODUCTION

Zeus olympius Minter & Diam. is an ascomycete first described from Mount Olympus in Greece [1]. This species is typically found on dry branches and twigs of living Bosnian pine (*Pinus heldreichii* Christ.). It is presumed to be restricted to Bosnian pine, and has not been observed in association with other pine species. Stoykov [2] provided comprehensive data on its morphological characteristics (macroscopic and microscopic), habitat (natural and planted Bosnian pine) and distribution in Bulgaria (Pirin Mt, Slavyanka Mt, Vitosha Mt), as well as in Greece (Olympus Mt – already known and one new locality – Pindus Mt). Later, Stoykov [3] published findings of *Zeus olympius* from North Macedonia (Galicica National Park).

MATERIALS AND METHODS

The specimen of *Zeus olympius* was collected from Shar Mountain in Kosovo during the spring of 2018, in an area characterized by an undisturbed natural forest of Bosnian pine (Figure 1). Microscopic analyses were conducted on both fresh and dried material using Melzer's reagent, KOH and water, with observations made using an LW Scientific i4 microscope. Macroscopic photos were taken using a Nikon Coolpix P520 camera. Phylogenetic analyses were conducted by applying a nuclear ribosomal internal transcribed spacer (nrITS) of dried material from the territory of Kosovo and Greece. The raw sequence matrix was aligned with other available ITS sequences from GenBank using MAFFT 7.508 [4] and subsequently trimmed with Gblocks 0.91b [5]. The GTR+G+I substitution model was determined, and the methods of Maximum Likelihood and Bayesian Inference were separately implemented in RAXML 8.2.10 [6] and MrBayes 3.2.6 [7].



Figure 1. Natural forest of Bosnian pine (*Pinus heldreichii*) in Shar Mt in Kosovo.
Photo: Mitko Karadelev

RESULTS AND DISCUSSION

Fresh and well-developed ascomata (Figure 2) were collected from dry twigs and small branches of living trees of Bosnian pine. The species was observed exclusively in the Prevala area, located within Shar Mountain National Park in Kosovo, at an altitude of approximately 1,600 meters. The ascomata grow scattered or in small groups on the dead portions of twigs and small branches of Bosnian pine, still living towards their base. Phylogenetic analysis of the specimens from Kosovo and Greece revealed that the species, morphologically identified as *Zeus olympius*, belongs to a distinct clade within the genus *Cenangium* (Figure 3). In

light of this revised phylogenetic placement and in accordance with the current species name, we propose the new combination, i.e. *Cenangium olympii* M. Karadelev, K. Rusevska, G. Wu & Zhu L. Yang.

The established distribution of the species is illustrated in Figure 4. In view of the fact that the geographical range of distribution of *Pinus heldreichii* encompasses Albania, Bosnia and Herzegovina, Croatia, Montenegro, and Italy, it is reasonable to anticipate that *C. olympii* is likely more widespread in the area. This fungus species is listed in the Macedonian Red List of Fungi in the CR (critically endangered) category [8].



Figure 2. Fresh ascomata of *Cenangium olympii*.
Photo: Mitko Karadelev

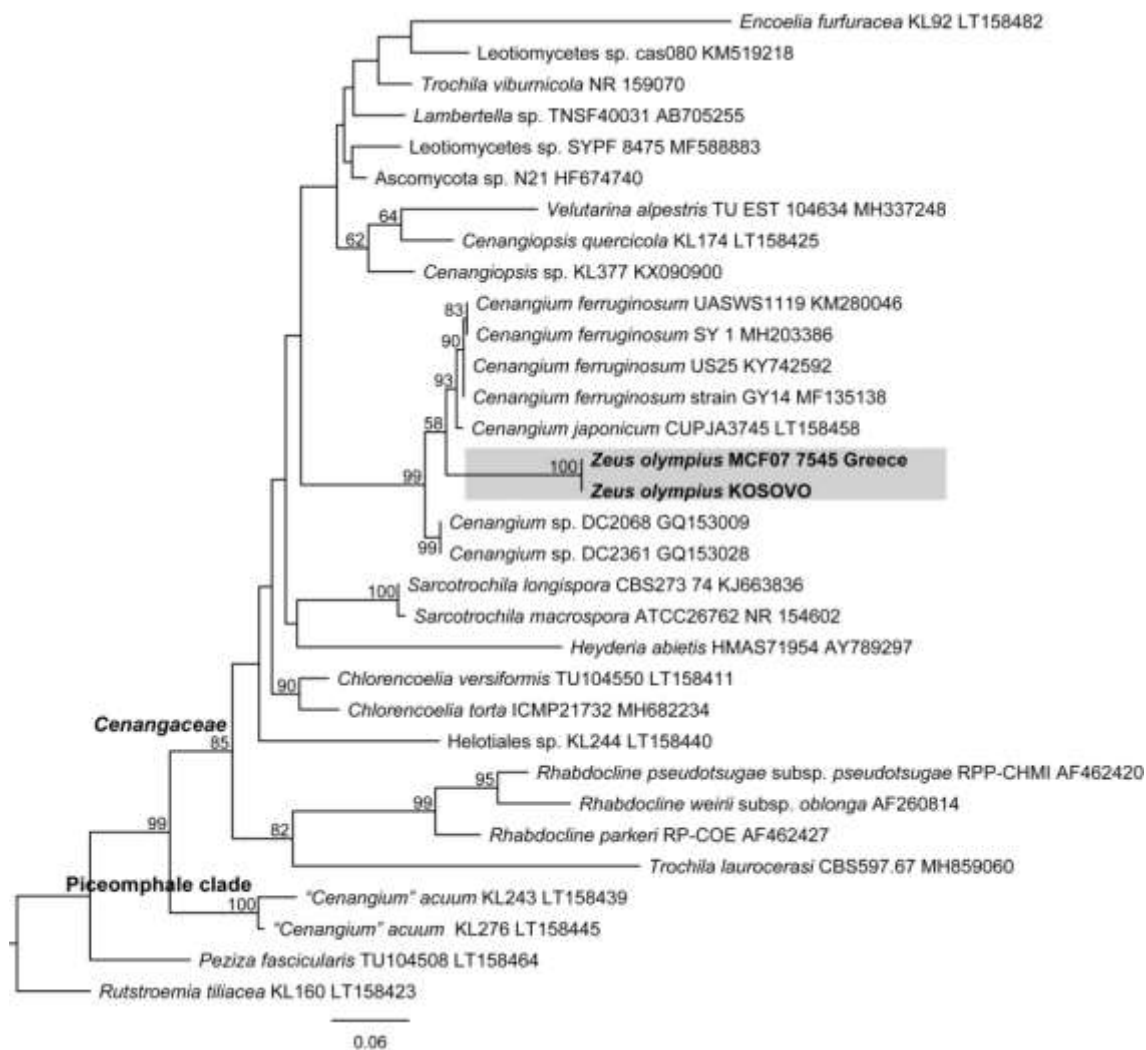


Figure 3. A phylogenetic tree of the examined material from Kosovo and Greece.

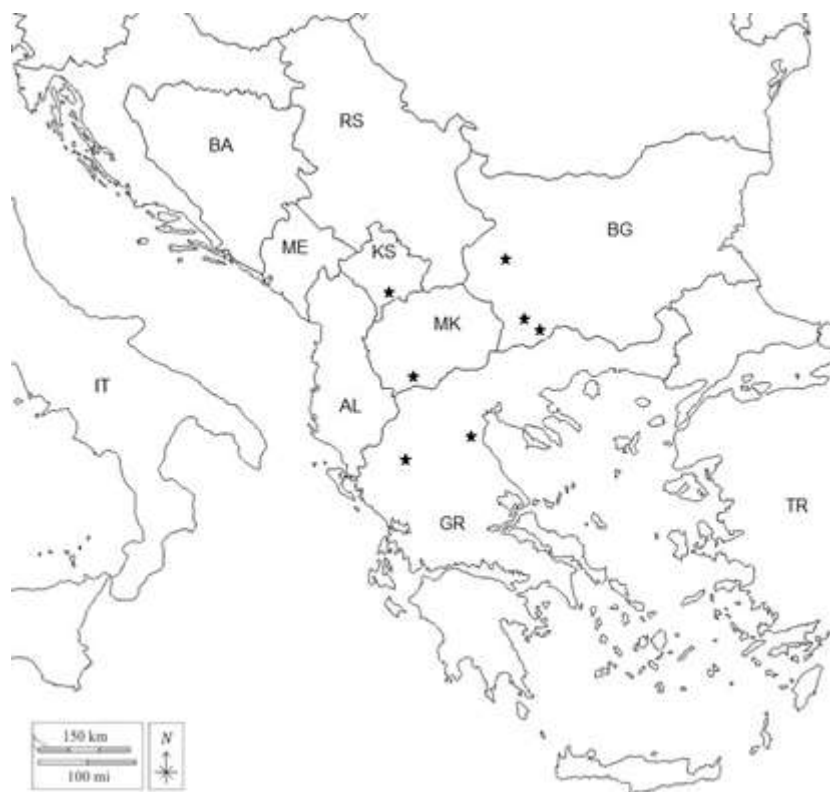


Figure 4. A distribution map of *Cenangium olympii* in the Balkan Peninsula

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REFERENCES

- [1] D. W. Minter, R. Lowen, S. Diamandis, *Zeus olympius* gen. et sp. nov. and *Nectria ganymede* sp. nov. from Mount Olympus, Greece, *Transactions of the British Mycological Society*, **88** (1) (1987), pp. 55–61.
- [2] Y. D. Stoykov, B. Assyov, B. Alexov, K. Grazdilov, Novel collections of *Zeus olympius* and *Cosmospora ganymede* (Ascomycota) from Bulgaria and Greece, *Ascomycete.org*, **6** (4) (2014), pp. 73–80. DOI: 10.25664/art-0103
- [3] Y. D. Stoykov, New records of two ascomycetes from the Republic of North Macedonia, *Phytologia Balcanica*, **26** (3) (2020), pp. 431–435.
- [4] K. Katoh, K. Misawa, Ki. Kuma, T. Miyata, MAFFT: A novel method for rapid multiple sequence alignment based on fast Fourier transform, *Nucleic acids research*, **30** (14) (2002), pp. 3059–3066.
- [5] J. Castresana, Selection of conserved blocks from multiple alignments for their use in phylogenetic analysis, *Molecular Biology and Evolution*, **17** (4) (2000), pp. 540–552.
- [6] A. Stamatakis, RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies, *Bioinformatics*, **30** (9) (2014), pp. 1312–1313.
- [7] F. Ronquist, M. Teslenko, P. Van Der Mark, DL. Ayres, A. Darling, S. Höhna, B. Larget, L. Liu, MA. Suchard, JP. Huelsenbeck JP, MrBayes 3.2: efficient Bayesian phylogenetic inference and model choice across a large model space, *Systematic biology*, **61** (3) (2012), pp. 539–542.
- [8] M. Karadelev, S. Tofilovska, K. Rusevska, National red list of fungi (2021): Focusing on Critically Endangered Species. CONTRIBUTIONS, *Section of Natural, Mathematical and Biotechnical Sciences, MASA*, **42** (1–2) (2021), pp. 37–43.
http://manu.edu.mk/contributions/NMBSci/vol42_43_1_2p3.html

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Zeus olympius Minter & Diam. е вид торбеста габа за првпат опишана од планината Олимп во Грција. Видот расте исклучиво на суви гранки од живи стебла на муника (*Pinus heldreichii* Christ.). Познат е само од Балканскиот Полуостров и тоа од Бугарија – од планините Пирин, Славјанка и Витоша, потоа од Грција - од планината Олимп, и од Македонија – од Националниот парк Галичица. Видот е исто така регистриран на еден нов локалитет, Превала на Шар Планина, што се наоѓа на територијата на Косово.

Заради утврдување на таксономската положба на видот *Zeus olympius*, вршени се филогенетски анализи со употреба на nrITS (Nuclear ribosomal internal transcribed spacer) на сув материјал од Косово и Грција. Филогенетското стебло добиено врз база на морфолошки идентификуваните примероци како *Zeus olympius* покажа дека тие припаѓаат на посебна гранка од родот *Cenangium*. Како резултат на новата филогенетска позиција, во трудот за видот *Zeus olympius* се предлага нова комбинација: *Cenangium olympii* M. Karadelev, K. Rusevska, G. Wu & Zhu L. Yang.

Клучни зборови: Ascomycota; *Zeus olympius* Minter & Diam.; нова комбинација на вид; *Pinus heldreichii* Балкански Полуостров