South Western Journal of Horticulture, Biology and Environment
P-Issn: 2067- 9874, E-Issn: 2068-7958

Vol.16, No.1, 2025
pp. 25-38
Art.no. e25102

NEW DISTRIBUTION RECORDS OF *Clathrus archeri* (BASIDIOMYCOTA, PHALLACEAE) IN NORTH-WESTERN ROMANIA

Iulia Ramona DEMETER

University of Oradea, Faculty of Informatics and Sciences,
Department of Biology, 1 Universității str., Oradea, Romania;
E-mail: iuliar.demeter@gmail.com

ABSTRACT. *Clathrus archeri is a saprotrophic fungus species, native to the southern hemisphere, that has expanded in Europe over the past century. Between 2021 and 2023, we studied the species distribution in north-western Romania. We identified 14 distribution points, of which 13 were new. They represent more than a quarter of the previous records in the country, indicating that C. archeri is expanding its distribution range. C. archeri was identified in wet deciduous forests dominated mostly by Quercus robur, Q. petraea, Q. cerris, Carpinus betulus, and Fagus sylvatica. Additionally, it populated forest edges or meadows, where the presence of Betula pendula, Larix decidua, and Juniperus communis indicates soils that are acidic or moderately acidic. In some habitats, the presence of particular relict species may indicate the existence of stable microclimates, which are also favorable for C. archeri populations. C. archeri expansion can be related to recent trends of increasing temperatures and rainfall variability, which generate favorable conditions in new areas.*

KEYWORDS: *nonnative species, octopus stinkhorn, forests, wet areas, climate, altitude, soil.*

INTRODUCTION

Clathrus archeri is a saprotrophic fungus, native to Tasmania, Australia, and New Zealand (Dring 1980). It was introduced in Europe in 1914 (Kreisel 2006) or around 1920 (Parent & Thoen 1986, Wojewoda & Karasiński 2010, Jelaska & Levačić 2025), initially observed in eastern France (Parent & Thoen 1986). Its introduction in Europe was likely facilitated by the wool trade (Parent & Thoen 1986). Furthermore, *C. archeri* expanded in Europe,

reaching large populations (Parent & Thoen 1986, Parent et al. 2000, Desprez-Loustau et al. 2007). The emergence of sporocarps depends on climatic conditions (Pietras et al. 2021), particularly rainfall (Pietras et al. 2016). Because the climatic conditions in Europe are similar to those of its native area, *C. archeri*'s distribution was rapid, without needing adaptive processes (Pietras et al. 2021).

Although the species is non-native in Europe, there are differing opinions about its invasive status (Tănase & Pop 2005, Wojewoda & Karasiński 2010, Pietras 2019, Jelaska & Levačić 2025). However, *C. archeri* has become naturalized in many areas of Europe, showing considerable expansion (Łuszczyński 2007). In recent years, it has been identified in new regions (Tkalčec et al. 2005, Łuszczyński 2007, Pietras et al. 2021). A recent study in Croatia found that *C. archeri* is more widespread than previously known, although the time and mode of introduction are not clearly understood, and it appears to be mainly associated with the continental biogeographic region (Jelaska & Levačić 2025). Additionally, a study in northern Poland, which analyzed environmental DNA from soil, indicated the presence of *C. archeri* in areas where no sporocarps were observed, suggesting that its distribution range is underestimated by classical methods (Pietras et al. 2021). Nevertheless, in Romania, *C. archeri* has been recorded to date in only a few areas and is considered rare (Tănase & Pop 2005, Bîrsan et al. 2021). Thus, 47 distribution records are known in Romania (Béres 1996, 2012, Matus et al. 2018, Bîrsan et al. 2021, *Clathrus archeri* (Berk.) Dring in GBIF Secretariat (2023), MyCoPortal 2025, iNaturalist 2025), the initial record being in the Maramureș Mountains (Béres 1996, 2012). The highest altitude at which it was recorded in Romania is about 1200 m in the Gurghiu Mountains (Bîrsan et al. 2014, 2021), and the lowest was 126 m near Eșelnița, close to the Danube (iNaturalist 2025).

Because *C. archeri* has recently been mentioned in new areas in Europe (e.g., Tkalčec et al. 2005, Łuszczyński 2007, Pietras et al. 2021, Jelaska & Levačić 2025), even near Romania (Heluta & Zykova 2018), we hypothesized that the number of distribution records in Romania is underestimated. This assumption is based on the fact that *C. archeri*'s habitat requirements are largely fulfilled in a significant part of Romania, which is considered suitable for the species, as it appears to be related to mountain and hilly areas in northern and western Romania (see Bîrsan et al. 2021). The objectives of the study were to identify new distribution records of *C. archeri* in north-western Romania and to establish the environmental factors

that influence its distribution.

MATERIALS AND METHODS

The study took place in north-western Romania (Figure 1). Numerous field trips were conducted in habitats considered characteristic of the species (e.g., Parent et al. 2000, Kreisel 2006, Łuszczyński 2007, Bîrsan et al. 2021), in areas deemed suitable for it (Bîrsan et al. 2021), as well as in other locations. Thus, we investigated forests and meadows in regions surrounding Oaș Depression and the western Apuseni Mountains (Pădurea Craiului Mountains, Bihor, and Codru Moma). The transect method was used in the field (Mueller et al. 2004), although it is not easy to apply to fungi (Cannon 1997). We mostly walked on paths used by humans and animals or forest roads. We made only field observations and took pictures without collecting specimens, as their appearance allowed the identification in situ. The determination was made based on the characters indicated in literature (e.g., Dring 1980, Buczacki et al. 2012). The study took place from 2021 to 2023, during the periods when sporocarps are present (June-October) (Parent & Thoen 1986). Besides the data obtained between 2021 and 2023, we used information obtained accidentally, even 10 years ago.

RESULTS

In north-western Romania, *C. archeri* was identified in 14 locations (13 new records and one reconfirmation) across several mountain ranges and plains, between July and September. In Satu Mare County (Livada - Orașu Nou area), it was found in a humid oak plain forest (*Quercus* sp.) with moss-covered soil. In the Apuseni Mountains, in the Pădurea Craiului subdivision, it was recorded in seven new localities and a reconfirmation, mainly in wet forests of beech (*Fagus* sp.) and mixed beech-oak forests (*Fago-Quercetum roboris quercetosum cerris*). *C. archeri* was also observed in grasslands with shrubs, *Juniperus communis*, *Betula pendula,* and *Pteridium aquilinum* fern. In the Codru Moma subdivision, *C. archeri* was found inside oak forests (*Quercetum petraeae-roboris*) and oak-hornbeam forests (*Carpineto-Quercetum*), as well as at their edges in association with *Larix decidua* and *Betula pendula*, and in seminatural grasslands with shrubs such as *Juniperus communis*. In the Bihor subdivision, the species was found in hornbeam (*Carpinetum betuli*) and hornbeam-beech forests (*Carpineto-Fagetum*)

(Table 1, Figure 1).

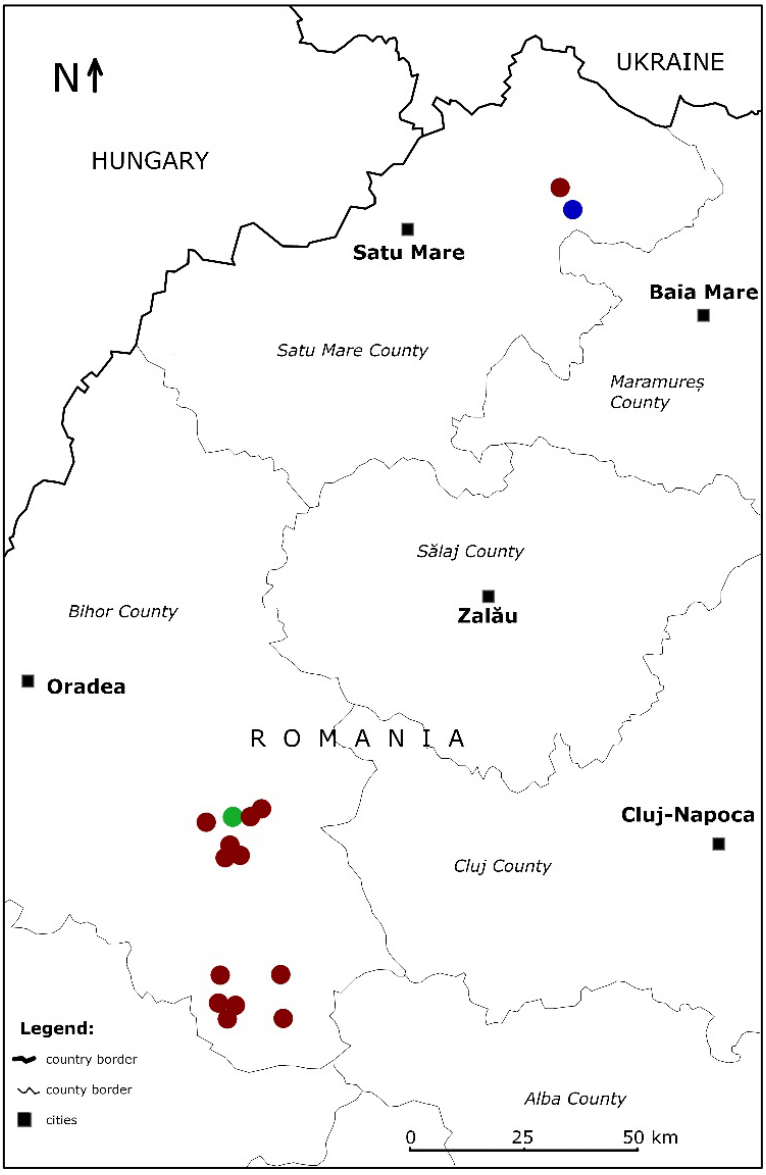

Figure 1. Distribution of *C. archeri* in north-western Romania (red circles – new records, green circle – reconfirmed, blue circle – old record from local people).

Most distribution records are situated in low mountain areas. In the Apuseni Mountains, *C. archeri* inhabits regions with altitudes ranging from

266 to 589 m. At Livada, *C. archeri* was identified at 145 m altitude, in a flat, lowland area (Livada Plain), at one of the lowest altitudes in Romania.

Table 1. New distribution localities of *C. archeri*, with coordinates, altitude, and observation date (*old data provided by local people, **reconfirmed data).

Locality	Coordinates	Habitat	Altitude	Date
Orașu Nou*	47.843168, 23.243188	*Quercetum*	179 m	1985
Livada -Orașu Nou	47.85027, 23.22999	*Quercetum*	145 m	2007
Nucet	46.485833, 22.549722	*Carpinetum betuli*	457 m	2015.07.14
Lunca -Șuștiu -Ursești	46.507930, 22.439193	Transition zone with semi-natural grasslands featuring *Juniperus communis* and *Betula pendula*, adjacent to a *Carpineto-Quercetum* forest; *Larix decidua* likely planted along the ecotone	355 m	2021.07.04
Lunca -Ursești	46.53638, 22.42166	*Quercetum petraeae-roboris*	425 m	2021.07.04
Șuștiu -Briheni	46.500833, 22.429722	*Carpineto-Quercetum*	303 m	2022.09.11
Șuștiu -Briheni	46.50222, 22.43527	*Carpineto-Quercetum*	320 m	2022.09.11
Sighiștel	46.52443, 22.54817	*Carpineto-Fagetum*	426 m	2021.06.12
Căbești -Sohodol	46.764722, 22.406944	*Fagetum*	266 m	2022.06.18
Căbești -Sohodol	46.76207, 22.41384	*Fagetum*	322 m	2023.06.17
Căbești -Sohodol	46.760556, 22.413611	Transitional vegetation and shrub-dominated grasslands with *Juniperus communis*, *Betula pendula*, and *Pteridium aquilinum*	338 m	2022.09.09
Căbești	46.78555, 22.37833	*Fago-Quercetum roboris quercetosum cerris*	339 m	2022.09.09
Crystal Cave Farcu /Stanul Cârnului**	46.81805, 22.43	*Fagetum*	447 m	2022.10.15
Crystal Cave Farcu (Roșia)	46.82678, 22.44664	*Fagetum*	589 m	2022.10.15
Roșia	46.83119, 22.46711	*Fagetum*	403 m	2022.10.15

Sporocarps were observed from June (end of May at Livada) to October (Figure 2). The years 2021 and 2022 were notable for the fructification of this species in the Apuseni Mountains; the number of sporocarps was high, covering large areas (estimated at 8 to 15 individuals per m²). On *C. archeri,* different insects were observed (flies, spiders, ants).

Figure 2. a. Abundant fruiting of *Clathrus archeri*, Șuștiu-Briheni, 2022.09.11; b. Detail of a single specimen, Șuștiu-Briheni, 2022.09.11; c. Abundant fruiting, Căbești, 2022.09.09 d. Early developmental stage (“egg” phase) of multiple specimens, Căbești, 2022.09.09 e. Two specimens in close proximity, top view, Șuștiu-Briheni, 2022.09.11 f. Spider on a fruiting body, Lunca-Șuștiu-Ursești, 2021.07.04 g. Ant at the base of a fruiting body, Lunca-Șuștiu-Ursești, 2021.07.04

DISCUSSION

The 13 new distribution records out of 14 represent more than a quarter (27.65%) of the previously known records in Romania (Bîrsan et al. 2021, iNaturalist 2025, *Clathrus archeri* (Berk.) Dring in GBIF Secretariat (2023)), confirming the precarity of the data about *C. archeri*'s distribution, as it was considered rare in Romania (Bîrsan et al. 2021). However, based on information provided by locals, the species appeared to be present in the Orașu Nou area since 1985, eight years before the first published data (Béres 1996, 2012). Most of our new distribution records were found in forests, as the species had also been previously recorded in forests (Parent et al. 2000).

The altitudinal distribution of *C. archeri* confirms that the mountainous and hilly areas are favorable in Romania's climatic context (Bîrsan et al. 2021). The species distribution at altitudes typical of the hilly zone (with only one lowland location) confirms its preference for humid habitats (e.g., Bîrsan et al. 2021). *C. archeri* populates different vegetation and climate zones, with previous records in Romania between 126 m (iNaturalist 2025) and 1200 m (Bîrsan et al. 2021). However, it appears to be related to cold, humid areas in the mountains and hills of northern and north-western Romania, which are considered the most suitable areas in the country (see Bîrsan et al. 2021). Most of the new records occur in areas with high suitability, or at least suitable for *C. archeri* (Bîrsan et al. 2021), particularly in hills and low mountainous areas. However, in Șuștiu - Briheni area, the species occurs in a region considered only moderately suitable (Bîrsan et al. 2021), and in Livada (Satu Mare County) it appears at low altitude, at the second-lowest record in Romania (Bîrsan et al. 2021, iNaturalist 2025, *Clathrus archeri* (Berk.) Dring in GBIF Secretariat (2023)). Livada Plain is a flat area, despite being situated in the vicinity of the Oaș Mountains. Nevertheless, the Livada Plain has a cooler climate than other plains in western Romania (Stoenescu et al. 1966, Mândruț 2006), with mountain and cold climate species recorded at low altitudes (Karacsonyi 1987, Covaciu-Marcov et al. 2008, Ferenți et al. 2012, 2013a, b). Still, unlike previous cases represented by native, relict species (Karacsonyi 1987, Covaciu-Marcov et al. 2008, Ferenți et al. 2012, 2013a, b), *C. archeri* is non-native in Europe (e.g., Dring 1980). The fact that invasive species can facilitate the establishment of native ones, mostly through habitat modification, has already been discussed (see Rodriguez 2006), as some have even been considered to have potential conservation

value (Schlaepfer et al. 2011). In this case, another facet becomes evident: non-native species can associate with native species in natural habitats and may even indicate the presence of such habitats and species. Thus, an invasive species is associated with the region's oldest habitats, specifically humid areas of conservation value (Covaciu-Marcov et al. 2008, Ferenți et al. 2013b). Perhaps even more surprising than the record from Livada is the previous one in the Danube Gorge, at Eșelnița (iNaturalist, 2025), in a southern, warmer region of Romania (Stoenescu et al. 1966, Mândruț 2006), with low suitability for *C. archeri* (Bîrsan et al. 2021). However, mountain species were recorded at low altitudes in the Eșelnița Valley (e.g., Petruș-Vancea et al. 2024, Covaciu-Marcov et al. 2025). Thus, the same factors that have influenced native, relict species in western Romania also appear to affect a non-native species.

The occurrence of *C. archeri* sporocarps is influenced by climatic conditions during the cold season, such as precipitation and temperature ranges, as reported in previous studies (e.g., Pietras et al. 2016, 2021, Bîrsan et al. 2021). The climate in north-western Romania, particularly in the Apuseni Mountains, is generally suitable due to moderately cold winters and a sufficient duration of snow cover (Micu et al. 2015). The species occurs in both natural and human-modified habitats, but is considered more frequent in modified communities, having a synanthropic character (Łuszczyński 2007). In north-western Romania, it was observed on moist soils rich in organic matter, as in other cases (Łuszczyński 2007, Heluta & Zykova 2018). *C. archeri* populates acidic soils (Parent & Thoen 1986, Jelaska & Levačić 2025), with moderate moisture, slightly acidic pH, and low nutrient content, such as overgrazed grasslands (Bîrsan et al. 2014). Although limestone areas were considered unfavorable for *C. archeri* (Parent et al. 2000), it was identified in limestone areas in Roșia, Căbești, Sighiștel, and the Codru Moma Mountains. The Apuseni Mountains have a complex geological structure (Răileanu et al. 1960), with limestone and other types of rocks. Nevertheless, decalcification processes may occur in habitats with *C. archeri*, as previously suggested (Parent et al. 2000); however, a greater ecological plasticity of the species is also possible.

The variety of habitats populated by *C. archeri* indicates its high tolerance to different habitats and types of vegetation (Jelaska & Levačić 2025). In Romania, it was previously recorded in habitats with limited vegetation, including arable lands, meadows, pastures, forests (of various types, such as deciduous, mixed, and coniferous), areas with xeric vegetation, and

bushes (Bîrsan et al. 2021). In north-western Romania, *C. archeri* was observed in wet deciduous forests (*Quercus robur*, *Q. petraea*, *Q. cerris*, *Carpinus betulus*, and *Fagus sylvatica*), sometimes associated with coniferous trees, as in other regions (Parent & Thoen 1986, Bîrsan et al. 2021, Piętka et al. 2021). It populates forests and meadow edges with *Nardus stricta*, as in other cases (Parent & Thoen 1986, Łuszczyński 2007, Bîrsan et al. 2014). In the Codru Moma Mountains, this fact was expected because in the regions, the surface occupied by this type of meadows increased over time (Păscuț & Marușca 2020). *C. archeri* was also identified beside *Larix decidua*, but also in meadows with *Juniperus communis*. The presence of this species was also recorded near *Larix decidua* and *Betula pendula* in Poland (Piętka et al. 2021). In recent years, *Juniperus communis* and *Betula pendula* have extended from the nearby forests into the meadows of the Codru Moma Mountains (Păscuț 2013), a phenomenon also observed in the Lunca-Șuștiu-Ursești area. *Juniperus communis* has a large ecological valence (García et al. 2000), being considered a pioneer species (Oostermeijer & De Knegt 2004), just like *Betula pendula* (Giertych et al. 2006). The preference for acidic soils, observed in *Betula pendula* (Atkinson 1992), *Juniperus communis* (Lakušić & Lakušić 2011), and *C. archeri* (Parent & Thoen 1986, Jelaska & Levačić 2025), suggests that the same environmental factor advantages these species. *C. archeri* also appeared beside *Pteridium aquilinum*, a less typical situation, but previously mentioned (Parent & Thoen 1986). The fern can inhibit the development of some plant species and fungi (San Francisco & Cooper-Driver 1984), due to allelopathic compounds (Butnariu et al. 2015). Additionally, it can modify the soil pH, making it more acidic (Johnson-Maynard et al. 1998). The presence of *C. archeri* in open areas (meadows, forest edges) suggests a high tolerance for habitats with more light. Although this preference was previously indicated (Dring 1980, Parent & Thoen 1986), it was proposed with caution, as the species also populates shaded environments (Parent & Thoen 1986), a fact frequently observed in north-western Romania.

In other regions, *C. archeri* was mentioned only in disturbed plant associations, in areas affected by human activities (Heluta & Zykova 2018). Unlike this, in north-western Romania, most habitats are only slightly affected by human activities, often remaining natural or being re-naturalized, as direct negative human impact has ceased (pastures in the Apuseni Mountains). Nevertheless, there have been or are human activities that could have facilitated the introduction of *C. archeri*. Thus, at Livada, although the species

inhabited a wet forest with rich biodiversity (Karacsonyi 1987, Covaciu-Marcov et al. 2008, Ferenți et al. 2012, 2013a, b), a secondary railway line (now abandoned) runs through the forest. It was modernized in the 1980s, a fact that may have facilitated the introduction of the species, which was initially observed in the region during the same period (information from local people). Once introduced, the species found favourable conditions and has spread in the area, as observed near roads in other cases (Heluta & Zykova 2018). Near other populations, there are active stone quarries, closed mines, and roads. After its introduction in Europe, *C. archeri* spread spontaneously and continuously, initially occurring in isolated populations (Kreisel 2004, 2006). Invertebrates facilitate the dissemination of spores, especially flies attracted by the strong smell (Wojewoda & Karasiński 2010, Johnson & Jürgens 2010, Piętka et al. 2021). In north-western Romania, spiders, flies, and ants were observed on *C. archeri*. Fungi from the Phalaceae family, including *C. archeri*, have a relatively short life cycle (Phillips et al. 2018), producing fruiting bodies rapidly and releasing numerous spores within a short period.

C. archeri is considered an indicator of climatic changes (Kreisel 2006). Some populations in the southern hemisphere may become extinct or face threats; additionally, areas less affected by climate change could become havens for refugees in the future (Pietras et al. 2021). Instead, the species' range may expand, especially in north-eastern Europe (Pietras et al. 2021). Depending on strict climate conditions (Bîrsan et al. 2021), in the context of climate change from Europe (Feehan et al. 2009) and Romania (Micu et al. 2015), it is possible that the distribution and fructification of the species will be affected, as in other cases (Boddy et al. 2014). In these conditions, organisms tend to move towards the north and higher altitudes (Feehan et al. 2009), and *C. archeri* will find suitable niches at higher altitudes in the Carpathians and Alps (Pietras et. al. 2021), expanding into new areas. In western Romania, climate change is noticeable through a decrease in snow cover and precipitation, especially in depressions (Micu et al. 2015). It remains to be seen whether these factors will influence the distribution of *C. archeri* in new areas, as the species requires a persistent snow layer in winter (Bîrsan et al. 2021).

The increase in the number of records and the abundance of basidiocarps in 2021-2022 indicate that *C. archeri* is expanding in Romania. The reduced information about invasive fungi does not necessarily reflect their absence, but rather the limited knowledge about fungal assemblages (Desprez-

Loustau et al. 2007). This fact does not necessarily indicate a low success of invasions among fungi (Desprez-Loustau et al. 2007), a fact confirmed also by *C. archeri* in north-western Romania.

REFERENCES

Atkinson, M.D. (1992): *Betula pendula* Roth (*B. verrucosa* Ehrh.) and *B. pubescens* Ehrh. Journal of Ecology 80(4): 837-870.

Béres, M. (1996): *Anthurus archeri* (Berk.) Ed. Fischer (fam. Clathraceae) – o ciupercă rară în România. Naturalia 2-3: 113-116.

Béres, M. (2012): Macromycetes species included in the Bern Convention Appendix I in the Red List in Romania and the rare presence in the historical Maramures County. Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii 22(2): 155-165.

Bîrsan, C., Cojocariu, A., Cenușă, E. (2014): Distribution and ecology of *Clathrus archeri* in Romania. Notulae Scientia Biologicae 6(3): 288-291.

Bîrsan, C., Mardari, C., Copoţ, O., Tănase, C. (2021): Modelling the potential distribution and habitat suitability of the alien fungus *Clathrus archeri* in Romania. Botanica Serbica 45(2): 241-250.

Boddy, L., Büntgen, U., Egli, S., Gange, A.C., Heegaard, E., Kirk, P.M., Mohammad, A., Kauserud, H. (2014): Climate variation effects on fungal fruiting. Fungal Ecology 10: 20-33.

Butnariu, M., Samfira, I., Sarac, I., Negrea, A., Negrea, P. (2015): Allelopathic effects of *Pteridium aquilinum* alcoholic extract on seed germination and seedling growth of *Poa pratensis*. Allelopathy Journal 35(2): 227-236.

Buczacki, S., Shields, C., Ovenden, D. (2012): The most complete field guide to the mushrooms & toadstools of Britain & Ireland. Harper Collins Publisher, London.

Cannon, P.F. (1997): Strategies for rapid assessment of fungal diversity. Biodiversity and Conservation 6: 669-680.

Covaciu-Marcov, S.-D., Sas, I., Cicort-Lucaciu, A.-Ş., Bogdan, H.V., Kovacs, E.H., Maghiar, C. (2008): The Herpetofauna of the Natural Reservation from the Inferior Course of the Tur River And its Surrounding Areas. pp. 111-129. In: Sike, T., Nagy, M. (eds.), Biharean Biologist – Supplement: Flora si Fauna Rezervatiei Naturale "Raul Tur" / The Flora and Fauna of the Tur River Natural Reserve, University of Oradea Publishing House, Oradea.

Covaciu-Marcov, S.-D., Dumbravă, A.-R., Ferenți, S. (2025): Searching for the missing newts: notes on newt distribution in the Iron Gates Natural Park, Romania. eco.mont – Journal on Protected Mountain Areas Research and Management 17(1): 17-24.

Desprez-Loustau, M.-L., Robin, C., Buée, M., Courtecuisse, R., Garbaye, J., Suffert, F., Sache, I., Rizzo, D.M. (2007): The fungal dimension of biological invasions. Trends in Ecology & Evolution 22(9): 472-480.

Dring, D.M. (1980): Contributions towards a rational arrangement of the Clathraceae. Kew Bulletin 35(1): 1-97.

Feehan, J., Harley, M., Van Minnen, J. (2009): Climate change in Europe. 1. Impact on terrestrial ecosystems and biodiversity. A review. Agronomy for Sustainable Development 29: 409-421.

Ferenţi, S., Sas-Kovács, E.H., Cupşa, D., Ianc, R.M. (2012): Some data on the terrestrial isopod assemblages from Livada forest, north-western Romania. Entomologica romanica 17: 13-19.

Ferenţi, S., Sas-Kovács, E.H., Sas-Kovács, I., Covaciu-Marcov, S.-D. (2013a): Data upon the terrestrial isopod fauna from the western slope of Oas Mountains Romania. Entomologica romanica 18: 5-10.

Ferenţi, S., Cupşa, D., Sas-Kovács, E.H., Sas-Kovács, I., Covaciu-Marcov, S.-D. (2013b): The importance of forests and wetlands from the Tur River natural protected area in conservation of native terrestrial isopod fauna. North-Western Journal of Zoology 9(1): 139-144.

García, D., Zamora, R., Gómez, J.M., Jordano, P., Hódar, J.A. (2000): Geographical variation in seed production, predation and abortion in *Juniperus communis* throughout its range in Europe. Journal of Ecology 88(3): 435-446.

Giertych, M.J., Karolewski, P., Żytkowiak, R., Oleksyn, J. (2006): Differences in defence strategies against herbivores between two pioneer tree species: *Alnus glutinosa* (L.) Gaertn. and *Betula pendula* Roth. Polish Journal of Ecology 54(2): 181-187.

Heluta, V.P., Zykova, M.O. (2018): Distribution of *Clathrus archeri* (Phallales, Basidiomycota), a fungus to be excluded from the Red Data Book of Ukraine, within the country. Ukrainian Botanical Journal 75(2): 137-142.

Jelaska, S.D., Levačić, D. (2025): Past, present and future of an alien fungus *Clathrus archeri* in Croatia. Acta Botanica Croatica 84(2), https://doi.org/10.37427/botcro-2025-017.

Johnson, S.D., Jürgens, A. (2010): Convergent evolution of carrion and faecal scent mimicry in fly-pollinated angiosperm flowers and a stinkhorn fungus. South African Journal of Botany 76(4): 796-807.

Johnson-Maynard, J.L., McDaniel, P.A., Ferguson, D.E., Falen, A.L. (1998): Changes in soil solution chemistry of and soils following invasion by bracken fern. Soil Science 163(10): 814-821.

Karacsonyi, C. (1987): Elemente montane în stațiuni de joasă altitudine din nord-vestul României. Studii și Cercetări de Biologie, Seria Biologie Vegetală 40(2): 67-70.

Kreisel, H. (2004): Globalisierung der Pilzflora. Verhandlungen des Botanischen Vereins Berlin-Brandenburg 137: 43-52.

Kreisel, H. (2006): Global warming and mycoflora in the Baltic Region. Acta Mycologica 41(1): 79-94.

Lakušić, B., Lakušić, D. (2011): Anatomy of four taxa of the Genus *Juniperus* sect. *Juniperus* (Cupressaceae) from the Balkan Peninsula. Acta Botanica Croatica 35(2): 145-156.

Łuszczyński, J. (2007): Diversity of Basidiomycetes in various ecosystems of the Góry Świętokrzyskie Mts. Monographiae Botanicae 97: 1-220.

Matus, G., Csiky, J., Bauer, N., Baráth, K., Vasuta, G., Barabás, A., Hricsovinyi, D., Takács, A., Antal, K., Budai, J., Erzberger, P., Molnár, P., Deme, J., Barina, Z. (2018): Taxonomical and chorological notes 7 (75-84). Studia Botanica Hungarica, 49(2): 83-94.

Mândruţ, O. (2006): Mic Atlas de Geografie a României. Ed. Corint, București.

Micu, D.M., Dumitrescu, A., Cheval, S., Birsan, M.-V. (2015): Climate of the Romanian Carpathians: Variability and trends. Springer, Cham.

Mueller, G.M., Schmit, J.P., Hubndorf, S.M., Ryvarden, L., O'Dell, T.E., Lodge, D.J., Leacock, P.R., Mata, M., Umaña, L., Wu, Q. (F.), Czederpiltz, D.L. (2004): Recommended protocols for sampling macrofungi. pp. 168-172. In: Mueller, G.M., Bills, G.F., Foster, M.S. (eds.),

Biodiversity of fungi: Inventory and monitoring methods. Academic Press, Elsevier.

Oostermeijer, J.G.B., De Knegt, B. (2004): Genetic population structure of the wind-pollinated, dioecious shrub *Juniperus communis* in fragmented Dutch heathlands. Plant Species Biology 19(3): 175-184.

Parent, G.H., Thoen, D. (1986): État actuel de l'extension de l'aire de *Clathrus archeri* (Berkeley) Dring (syn.: *Anthurus archeri* (Berk.) Ed. Fischer). Ed. Fischer) en Europe et particulièrement en France et au Benelux. Bulletin trimestriel de la Société mycologique de France 102(3): 237-272.

Parent, G.H., Thoen, D., Calonge, F.D. (2000): Nouvelles données sur la répartition de *Clathrus archeri*, en particulier dans l'ouest et le sud-ouest de l'Europe. Bulletin de la Société mycologique de France 116(3): 241-266.

Păşcuţ, C.G. (2013): Paucă (1941) - Păşcuţ (2012) - A comparative study on the vegetation in Codru-Moma Mountains. Analele Universităţii din Oradea, Fascicula Protecţia Mediului 20: 147-168.

Păşcuţ, C.G., Maruşca, T. (2020): Studies regarding the evolution of grassland productivity from Codru Moma Mountains (Western Carpathians). Annals of the Academy of Romanian Scientists, Series on Agriculture, Silviculture and Veterinary Medicine Sciences 9(2): 61-68.

Petruş-Vancea, A., Cupşa, D., Ferenţi, S., Dumbravă, A.-R., Covaciu-Marcov, S.-D. (2024): Low altitude *Vaccinium myrtillus* L. populations in the Eşelniţa Valley (Danube Gorge, Carpathian Mountains, Romania). Journal for Nature Conservation 82: 126730.

Phillips, E., Gillett-Kaufman, J.L., Smith, M.E. (2018): Stinkhorn Mushrooms (Agaricomycetes: Phallales: Phallaceae): PP345, 11/2018. EDIS 2018(6), https://doi.org/10.32473/edis-pp345-2018.

Piętka, J., Byk, D., Byk, A. (2021): Octopus stinkhorn *Clathrus archeri* (Berk.) Dring, an alien stinkhorn fungus (Phallaceae), in north-eastern Poland. Baltic Forestry 27(2): 574.

Pietras, M. (2019): Aliens Among Us. Academia. The magazine of the Polish Academy of Sciences 3-4(63-64): 38-43.

Pietras, M., Rudawska, M., Iszkuło, G., Kujawa, A., Leski, T. (2016): Distribution and molecular characterization of an alien fungus *Clathrus archeri* in Poland. Polish Journal of Environmental Studies 25(3): 1197-1204.

Pietras, M., Kolanowska, M., Selosse, M.A. (2021): Quo vadis? Historical distribution and impact of climate change on the worldwide distribution of the Australasian fungus *Clathrus archeri* (Phallales, Basidiomycota). Mycological Progress 20: 299-311.

Răileanu, G., Cioflica, G., Şoigan, P., Lazăr, C., Pop, G. (1960): Anexa 6. Republica Populară Română. Harta geologică. P p. 1-27. In: Gherasimov, I.P., Herbst, C., Ianiţki, N.F., Ianovici, V., Jirmunski, M.M., Kamanin, L.G., Leontiev, N.F., Mănecsu, M., Mihăilescu, V., Morariu, T., Murgescu, C., Stern, N., Vlad, C.L. (eds.), Monografia geografică a Republicii Populare Romîne în două volume. Cernescu, N., Dzerdzeevski, B.L., Formazov, A.N., Lvovici, M.I., Murzaev, E.M., Sficlea, V., Soceava, V.B., Alexandru, M., Badea, L., Bunescu, A., Cergău, L., Dragomirescu, Ş., Gruescu, I.S., Herbay, A., Ionescu-Dunăreanu, I., Neamu, G., Nedelcu, E., Niculescu, G., Provotorova, G.A., Roşu, A., Stăncescu, C. (vol. eds.), Monografia geografică a Republicii Populare Romîne. Vol. 1. Geografia fizică. Anexe. Editura Academiei Republicii Populare Române, Bucureşti. [in Romanian].

Rodriguez, L.F. (2006): Can invasive species facilitate native species? Evidence of how, when, and why these impacts occur. Biological Invasions 8: 927-939.

San Francisco, M., Cooper-Driver, G. (1984): Anti-microbial activity of phenolic acids in *Pteridium aquilinum*. American Fern Journal 74(3): 87-96.

Schlaepfer, M.A., Sax, D.F., Oldens, J.D. (2011): The potential conservation value of non-native species. Conservation Biology 25(3): 428-437.

Stoenescu, Ş.M., Şchiop, A., Dica, I., Popescu, E., Patrichi, E., Ţepeş, E. (1966): Atlasul climatologic al R.S.R., Bucureşti.

Tănase, C., Pop, A. (2005): Red List of Romanian Macrofungi Species. Bioplatform – Romanian National Platform for Biodiversity. Ed. Academiei Române, Bucureşti, 101-107.

Tkalčec, Z., Mešić, A., Antonić, O. (2005): Survey of the Gasteral Basidiomycota (Fungi) of Croatia. Natura Croatica: periodicum Musei Historiae Naturalis Croatici = casopis Hrvatskog aprirodoslovnog muzeja 14(2): 99-120.

Wojewoda, W., Karasiński, D. (2010): Invasive macrofungi (*Ascomycota* and *Basidiomycota*) in Poland. Biological Invasions in Poland 1: 7-21.

***iNaturalist community (2025): Observations of *Clathrus archeri* from Romania. Exported from https://www.inaturalist.org/observations?place_id=8858&subview=map&taxon_id=51135 [May 26, 2025].

***MyCoPortal (2025): https://www.mycoportal.org/portal/collections/map/googlemap.php?usethes=1&taxa=141827 accessed on 26.05.2025.

***_Clathrus archeri_ (Berk.) Dring in GBIF Secretariat (2023). GBIF Backbone Taxonomy. Checklist dataset, https://doi.org/10.15468/39omei accessed via GBIF.org on 2025-05-24.