First report of *Arvernella microclada* (Amblystegiaceae) in Germany

Vincent Hugonnot[1] & Florine Pépin[1]
***Meylania* 76 (2025): 21–24**

Abstract

Arvernella microclada Hugonnot & Hedenäs, a minute pleurocarpous moss previously known from France and Turkey, is newly recorded from the Feldberg massif (Black Forest, Germany), confirming its Euro-Pontic montane distribution. The species was found at 1320 m a.s.l. on moist gneiss blocks in a subalpine avalanche corridor dominated by tall-herb vegetation. This discovery highlights its preference for cold, dynamic, early-successional habitats, supporting the hypothesis that the species is probably geographically widespread but ecologically rare, likely due to its specific habitat requirements

Introduction

Arvernella microclada Hugonnot & Hedenäs (*Amblystegiaceae*) is a minute pleurocarpous moss initially described from volcanic summits of the French Massif Central (Hugonnot & Hedenäs 2015). Although first regarded as a narrow regional endemic (Hugonnot & Bellot 2015), subsequent discoveries in the Vosges (Tinguy et al. 2019) and the Pontic Mountains of northeastern Turkey (Hedenäs in Ellis et al. 2021) have revealed a much broader, albeit seemingly disjunct, distribution. These occurrences consistently involve cool, humid montane environments, often with unstable rocky substrates. The present study adds a new record from Germany, in the Feldberg massif of the Black Forest.

Ecological context of the Feldberg massif

The Feldberg massif, peaking at 1493 m a.s.l., is the highest point of the Black Forest (Baden-Württemberg, SW Germany) and represents a subalpine island with cold, oceanic-influenced conditions. Annual precipitation exceeds 1600 mm, with snow cover typically lasting from November to late April. Mean temperatures range from −6 °C in January to +15 °C in July around 1300 m (Bogenrieder 2013). The geology is dominated by fractured gneiss and paragneiss, shaped by glacial and periglacial processes into extensive blockfields and avalanche gullies. The vegetation at the collection site reflects the high precipitation, long snow cover, and siliceous substrate. The Feldberg massif supports a diverse range of montane and subalpine vegetation types. High-montane mixed beech forests (*Aceri-Fagetum*), fir-spruce forests (*Luzulo-Abietetum*) and acidophilous beech forests (*Luzulo-Fagetum*) are dominant forest communities. Other significant vegetation types include tall-herb communities of the *Adenostylion alliariae* alliance and pioneer vegetation on avalanche screes and glacial blockfields (Bogenrieder 2013, Hügin 2006).

[1] 25 Impasse des Oponces, 43380 Blassac, France. Hugonnot.vincent@orange.fr

Results

Arvernella microclada was found on small, unstable rock fragments on steep slopes within a complex vegetation system. The upper slope is covered by acidic grasslands and dwarf shrub heaths (*Nardo-Callunetea*). Below, the avalanche track hosts a species-rich, high montane grassland (*Sorbo-Calamagrostietum*), where snow slides move soil, stones, and plant material downhill. These materials accumulate in the runout zone, creating deeper, nutrient-rich soils. This area supports low-growing willow thickets (*Salicetum appendiculatae*) formed by species such as *Sorbus chamaemespilus*, *S. aria*, *S. aucuparia*, and *Acer pseudoplatanus*, which can bend and regrow after avalanche impacts. A rich layer of tall subalpine herbs grows beneath these shrubs where *A. microclada* was observed. The accompanying species were *Brachythecium geheebii* Milde, *Rhizomnium punctatum* (Hedw.) T.J. Kop., *Sciuro-hypnum reflexum* (Starke) Ignatov & Huttunen. The observed specimens had no sporophytes (Fig. 1) but was demonstrably autoicous.

Record details

Germany, Baden-Württemberg, commune Feldberg, Freiburg district, locality: Zastlerbach, altitude 1320 m, 47.878119°, 8.005291°, 16 May 2025. V. Hugonnot & F. Pépin coll., private herbarium of V. Hugonnot.

Discussion

The recent discovery of *Arvernella microclada* in the Feldberg massif supports the hypothesis of Hugonnot & Hedenäs (2015) that this species is more widespread in Europe than previously thought but often overlooked due to its minute size and superficial resemblance to pleurocarpous mosses such as *Heterocladium flaccidum* or *Serpoleskea*

Figure 1. *Arvernella microclada* (Feldberg, Foto: F. Pépin); note the confervoid and succulent aspect of the shoots.

confervoides (Tinguy et al. 2019). The species grows in highly dynamic, early-successional scree habitats characterised by high humidity, snow persistence, and limited vascular plant competition. It can be categorised as an early pioneer species.

This ecological strategy is shared by the two other known species of the genus. *Arvernella pisarenkoi*, from Sakhalin Island, grows on shaded limestone outcrops within mixed forests of *Picea yezoensis*, *Abies sachalinensis*, and tall-herb vegetation (*Filipendula*, *Cacalia*) at mid-elevations, under a snow-rich and oceanic climate (Ignatov et al. 2021). *Arvernella sibirica*, recently described from the Altai-Sayan region, inhabits deeply snow-covered tall-herb fir forests dominated by *Abies sibirica*, where coarse vegetation maintains a humid microclimate and bare micro-sites on stones provide low-competition niches (Pisarenko et al. 2022).

The disjunct Eurasian distribution of the genus — from temperate Western Europe to the Russian Far East — may reflect either a relictual biogeographical pattern shaped by past climatic oscillations or repeated colonisation of analogous ecological niches. Either scenario highlights the ecological specialization of *Arvernella* species and supports further exploration of under-collected, humid montane systems such as the Carpathians, Jura, Böhmerwald or regions in the Alps (e.g., in the Canton of Ticino in Switzerland), where additional populations or even undescribed taxa of the same genus might be found.

A detailed mapping of the population, including an estimation of colony size and structure, as well as a long-term monitoring program, would be valuable to assess population trends and potential threats. At present, however, taking into consideration its strong ecological requirements and the fact that potential subalpine and non-calcareous mountain ranges are very rare in Germany, *Arvernella microclada* could be considered as Vulnerable (VU) in this country.

Acknowledgments

Matthias Ahrens and Thomas Kiebacher are gratefully acknowledged for their insightful feedback on a preliminary draft of this manuscript.

References

Bogenrieder A. 2013. Der Feldberg im Schwarzwald. The Feldberg in the Black Forest Tuexenia Beiheft 6: 7–28.

Ellis L.T., Bednarek-Ochyra H., Chandini V.K., Manju C.N., Nishida P.P., Sajitha Menon S. et al. 2021. New national and regional bryophyte records, 68. Journal of Bryology 43 (4): 387–402.

Hügin G. 2006. Die Hochlagenflora des Schwarzwalds und seiner Nachbargebirge. Liste der in Schwarzwald, Vogesen, Nord-Jura und Schwäbischer Alb oberhalb 1000 m nachgewiesenen Farn- und Samenpflanzen. Kochia 1: 49–104.

Hugonnot V. & Bellot M. 2015. *Arvernella microclada* Hugonnot & Hedenäs, une mousse nouvelle endémique des sommets auvergnats (France). Nowellia bryologica 50: 15–17.

Hugonnot V. & Hedenäs L. 2015. *Arvernella microclada* Hugonnot and Hedenäs (Amblystegiaceae), a new minute species from France, requiring a separate genus. Journal of Bryology 37: 184–191.

Ignatov M.S., Ignatova E.A. & Kuznetsova O.I. 2021. A rare European endemic moss genus *Arvernella* is discovered in Sakhalin, Russian Far East, where it is also rare. Arctoa 30: 1–7.

Pisarenko O.Yu., Kuznetsova O.I., Ignatova E.A. & Ignatov M.S. 2022. A further range extension of the genus *Arvernella* (Bryophyta). Arctoa 31: 1–6.

Tinguy H., Hugonnot V., Stoehr B. & Bick F. 2019. *Arvernella microclada* (Amblystegiaceae) newly reported in Vosges (Alsace, France). Herzogia 32: 200–208.