

REDISCOVERY AND A NEW RECORD OF THE ELUSIVE AND ENIGMATIC *HAMMARBYA PALUDOSA* (L.) KUNTZE (ORCHIDACEAE) IN ROMANIA

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Abstract: The overall range pattern of *Hammarbya paludosa* in Romania is problematic and poorly understood. Here we have compiled an updated distribution for the species in Romania, adding a new locality in the South-Eastern Carpathians, in a transitional bog of the Gutâi Mts (Eastern Carpathians). The species had previously been reported from Romania but we found only a single item of evidence of the plant in a public herbarium (a specimen collected more than a half century ago near Avrig, with no earlier data recorded from that location, and was lodged incorrectly under *Liparis loeselii*), although it is listed in most important checklists of the Romanian flora as certainly present in Romania. The population discovered, consisting of about 30 individuals of *H. paludosa*, was spread over an area of ca. 200 m² and grew in an *Oxycocco-Sphagnetea* community. In Romania the species is highly threatened due to its extreme rarity and the relatively intensive grazing in the area where it occurs.

Keywords: Gutâi Mts, orchids, floristic record, Red Book, Eastern Carpathians, threatened species

Introduction

In the Romanian flora there have been mentioned several orchids whose occurrence is doubtful, which should be reconfirmed (e.g. *Dactylorhiza pindica* B. Willing & E. Willing, *Dactylorhiza kalopissii* E. Nelson subsp. *macedonica* (J. Hölzinger & Künkele) Kreutz, *D. incarnata* (L.) Soó subsp. *cruenta* (O. F. Mueller) P. D. Sell) [24]. However, other species of unclear distribution in Romania such as *Dactylorhiza traunsteineri* (Saut. ex Rchb.) Soó, were recently confirmed [2].

Hammarbya paludosa (L.) Kuntze is also an orchid recently confirmed in our country (certified by a single, old herbarium specimen, lodged in I herbarium) although in most important checklists of the Romanian flora it is listed as certainly present in Romania [3, 32, 6, 38].

Hammarbya is a monotypic genus containing the single species *H. paludosa*. This circum-boreal species is distributed in scattered locations across to Siberia and Japan, in northern and central Europe and into the northern part of North America (Canada and USA) [26, 11]; the species is known in the continental part of the United States only in Minnesota [40]. In Europe the highest altitude reported for this species is 1500 m (Rhodopi Mts, Bulgaria) [34].

H. paludosa is a small plant (reaching a height of 5–20 cm) with 2–4 basal leaves enclosing daughter pseudobulbs, usually with marginal bulbils towards the apex. The flowers are numerous and scattered in a terminal raceme. The lip is lanceolate and shorter than the outer

perianth-segments [30]. The fruit is a small capsule. This orchid is in flower between mid-July and late August.

The reproduction of *H. paludosa* is mostly vegetative via small, apical, foliar, embryo-like structures at the tips of some leaves; this type of asexual propagation is unique in Orchidaceae [46]. *H. paludosa* is pollinated by *Phronia digitata* Hackman; a single documented pollinator was identified on the bog adder's-mouth orchid flowers [46].

H. paludosa requires a particular habitat, and usually grows in semi-shaded, acidic, *Sphagnum* bogs, the species being reported from transition mires and quaking bogs [10].

H. paludosa is considered threatened especially in the USA and Canada and in Central Europe because of drainage and peat extraction; the populations in Northern Europe are relatively stable [47].

The main goal of this study was to clarify the distribution of *Hammarbya paludosa* in Romania, based on a detailed review of the available data concerning the presence of the species in this country. Moreover, the discovery of new sites for this species is reported and the habitat in which *H. paludosa* grows is described. In addition, the conservation status of the species in Romania is briefly discussed.

Material and Methods

Our investigations were based on recent field studies, analysis of herbarium material held in the main Romanian herbaria (acronyms according to Thiers [44]), as well as literature data.

Several field surveys were made between 2006 and 2019 in the Eastern Carpathians, Southern Carpathians and Apuseni Mountains, from where the species was reported.

Species names mainly follow recent taxonomic concepts and are based on the continuously updated Euro+Med database [14]. Species names follow *Flora Europaea* (Tutin *et al.*, 1992–1994 [45]) when an author's name is not indicated.

Phytosociological characteristics of newly discovered sites with *H. paludosa* were studied according to the Braun-Blanquet methodology [5].

The material collected has been lodged in the „A. Borza” Botanical Garden Herbarium, Cluj-Napoca (CL no. 668632).

Results and Discussion

1. Distribution of *Hammarbya paludosa* in Romania

1.1. Historical considerations

1.1.1. Munții Ciomatu (Ciomatu Mts., Eastern Carpathians)

This interesting hotspot of mountain flora in the Eastern Carpathians was relatively well studied from a botanical point of view by Soó [41, 42], although only Schur [39] mentioned the species on Mt. Búdös (Puturosu).

A single, very old herbarium specimen of Schur (from the 19th century, lodged in LW) is indicated from this mountain group [19] but without indication of locality. Nevertheless, since it is known that Schur often mixed up labels and locations from the South-Eastern Carpathians [43] with other mountain regions (e.g. the Alps), we do not consider his herbarium material to be a reliable source of information.

Also, we could not find *H. paludosa* on Mohoș or Buffogó peat bogs nor in other parts of this mountain range (fide A. Bartók, 2008, 2019).

1.1.2. **Munții Gilău-Muntele Mare** (Gilău-Muntele Mare Mts, Apuseni Mountains)

Undoubtedly, Mt. Scărița-Belioara and the Runcului Gorges are two of the most botanically interesting areas of this mountain range, representing a famous refugium for different types of relics. Both areas, situated at a relatively low altitude (the maximum elevation not exceeding 1350 m a.s.l.) harbour numerous Carpathian endemic elements, glacial relict, thermophilous sub-Mediterranean or threatened species, such as *Aquilegia subscaposa* Borbás, *Sorbus semipinnata* Borbás, *Astragalus roemeri* Simonk., *Arctostaphylos uva-ursi* (L.) Spreng., *Dryas octopetala* L., *Pinguicula alpina* L., *Saponaria bellidifolia* Sm., *Gentiana clusii* E. M. Perrier & Songeon, *Alyssum montanum* L., *Pulsatilla grandis* Wender., and *Dianthus petraeus* Waldst. & Kit. subsp. *orbelicus* (Velen.) Greuter & Burdet [9, 1]. Also, from this mountain range two rare orchids (*Malaxis monophyllos* (L.) Sw. and *Herminium monorchis* (L.) R. Br.) were mentioned [36], which were recently reconfirmed by us (*vide* A. N. Brădeanu, 2017–2019).

H. paludosa was first mentioned in the flora of this mountain unit by Paucă and Beldie in volume 10 of the Romanian Flora [33], in the Ierii Valley and Runcului Gorges. We do not know the primary source of these data.

A year later, a second mention of the species in this range was published by Coldea, in a single relevé recorded in a peat bog (*Carici flavae-Blysmetum compressi*) located on the Runcului Gorges [7]. Nevertheless, the repeated botanical studies of Pop *et al.* [36], Hodișan [16, 17] or Csergő [9] in the Runcului Gorges did not report *H. paludosa* from this site.

The species is no longer mentioned in a subsequent publication of the same author (Coldea, 1997) from the identical relevé, recorded in the Runcului Gorges [8]. Probably the erroneous mention of the species from this mountain range is due to confusion with *Malaxis monophyllos* which grows in the association *Cariceto-Eriophoretum latifoliae* [36].

We could not find *H. paludosa* in the Gilău-Muntele Mare Mts (*vide* A. Bartók, 2005–7, 2013, 2019; *vide* A. N. Brădeanu, 2017–2019; *vide* M. M. Bobocea, 2017–2019); and we were also unable to identify herbarium specimens belonging to this taxon from the mountain range in any public herbaria.

Therefore, the occurrence of *H. paludosa* in this mountain range remains unproven by clear data.

1.1.3. **Avrig** (Sibiu County)

A single herbarium specimen from this locality was found in I (no. 61147) with this information on the voucher's label: “*Liparis loeselii* (L.) Rich., Avrig, 18.IX.1965, leg. E. Țopa”. The herbarium material collected by Țopa does not represent *Liparis loeselii*, but *Hammarbya paludosa* (label revised by Irina Irimia, 13 Oct 2011) [18].

Botanists have never mentioned the species in this range. The *Sphagnum* peat bogs situated near Avrig (under the ridges of the Făgăraș Mts) have been studied by E. Pop [35] but in his monograph *H. paludosa* is not listed among the species present.

The current situation of *Sphagnum* peat bogs around Avrig is not satisfactory. Human interventions (intense grazing, drainage, polluted water infiltration into the peat bog) determined extinction of several rare and threatened species in the mentioned area (*vide* A. Bartók, 2017, 2018; *vide* A. N. Brădeanu, 2017, 2018; *vide* M. M. Bobocea, 2017–19).

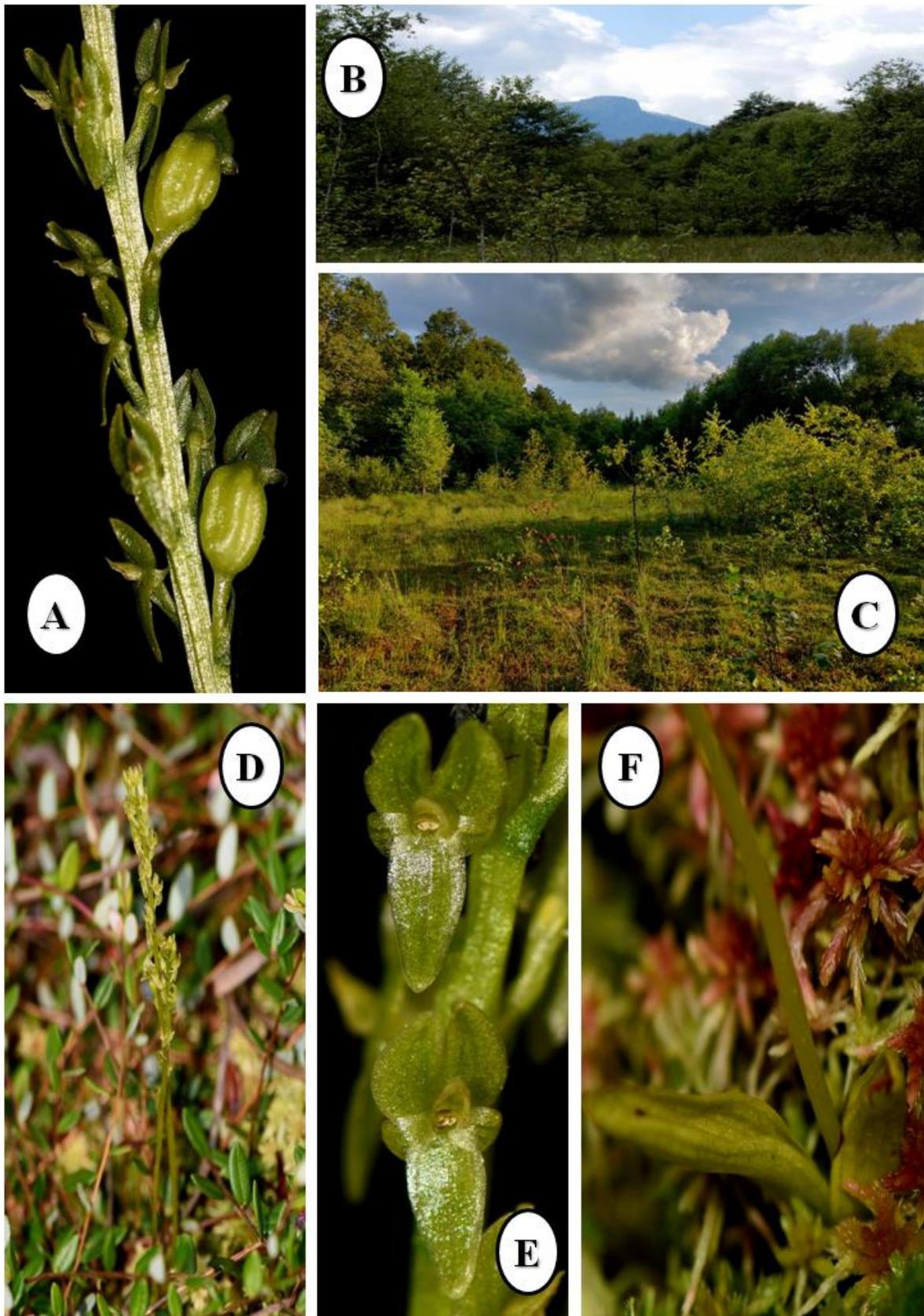


Fig. 1: A - *H. paludosa* (flowers and fruits); B, C - *H. paludosa* (habitat); D - *H. paludosa* (habit); E - *H. paludosa* (flowers); *H. paludosa* (leaf) (Photos A. N. Brădeanu & A. Bartók)

Unfortunately, subsequent observations at this locality in the last three years could not confirm the existence of *H. paludosa* (fide A. Bartók, pers. obs. 2017, 2018; fide A. N. Brădeanu, 2017, 2018; fide M. M. Bobocea, 2017–2019).

Therefore, the occurrence of *H. paludosa* near Avrig remains unsupported by currently known field data.

1.1.4. Lacul Fărăgău (Fărăgău Lake, Mureș County)

Fărăgău Lake is a protected area situated between Târgu Mureș and Reghin. The lake was formed behind of a natural dam of sediments. According to the pollen examination, its origin is referred to the postglacial age [23].

The first comprehensive flora of the area was published at the beginning of the 21th century by Kiss Székely, mentioning a total of 164 vascular plant species [22].

H. paludosa was first listed from Fărăgău Lake by Kiss Székely [20], but unfortunately, this significant floristic find remained undocumented in the sense that a specimen was not deposited in a public herbarium; although the author mentioned the deposition of herbarium material he collected in 1976 in the Mureș County Natural Museum collection [21]. In a recent paper, Sămărghișan enumerated the orchids in the herbarium collections mentioned above but did not report the presence of *H. paludosa* [37].

In subsequent papers Kiss Székely highlighted the extinction of the species from the site, due to human interventions at the end of the 20th century [21, 22].

Several other recent botanical investigations in this locality failed as well to find *H. paludosa* (A. Mátis – pers. comm.).

To summarise, the present investigations suggest that the occurrence of *H. paludosa* in the area of Fărăgău Lake remains unproved by clear data.

1.2. New localities for *H. paludosa* in the South-Eastern Carpathians

Munții Gutâi (Gutâi Mts., Eastern Carpathians)

Botanists never mentioned the species in this mountain range. The area is relatively well studied from a botanical point of view by Moldovan [27, 28, 29] but *H. paludosa* is not listed among the species present.

H. paludosa was discovered by the authors during a one-day botanical excursion in Gutâi Mts on 19 July 2019, in a transitional bog. The individuals were found in full flower, some specimens already having a couple of fruits. A flowering specimen has been lodged in the „A. Borza” Botanical Garden Herbarium, Cluj-Napoca (CL, no. 668632), and photos were taken of the species (Figure 1).

The exact location of the site is omitted on conservation grounds for two main reasons: the population of the species is very small (only few specimens of *H. paludosa* are present in the bog) and the site is easily accessible by car. Also, the enthusiasm of photographers and botanists exposes the population of *H. paludosa* to trampling damage.

2. Habitat description based on recent field observations

At the European level *H. paludosa* is assigned to phytosociological classes *Scheuchzerio-Caricetea nigrae* and *Oxycocco-Sphagnetetea* [25].

In Romanian botanical literature *H. paludosa* is ascribed to *Rhynchosporion albae* syntaxa [38]. From Natura 2000 habitats perspectives, this taxon is considered an accompanying

species for the habitat 7140 Transition mires and quaking bogs [15].

We recently discovered *H. paludosa* in the Gutâi Mts, Maramureş County. Approximate 30 individuals were found in a transitional bog at the border of a forest dominated by aspen (*Populus tremula*) intermixed with downy birch (*Betula pubescens*) and black alder (*Alnus glutinosa*) in an area of ca. 200 m². Here it grows in moist communities on a transitional bog in an open habitat of north-east aspect and at an altitude of 530 m a.s.l. In the investigated phytocoenoses *Sphagnum magellanicum* and *Vaccinium oxycoccos* are dominant species, seconded by *Carex rostrata*, *Scheuchzeria palustris*, *Eriophorum vaginatum*, *Dryopteris cristata*, *Drosera rotundifolia*, *Menyanthes trifoliata*, etc.

We determined the pH of a collected water sample, the result being 6,4 (slightly acidic).

The plant community in which *H. paludosa* was identified in the Gutâi Mts is the class *Oxycocco-Sphagnetea*.

2. Conservation status of *H. paludosa* in Romania

Only one small area that contains populations of *H. paludosa* is known with certainty in Romania, in a restricted part of the Gutâi Mts. The species is recorded in the Red Lists of vascular plants of Romania as Endangered (E) [4, 12] or placed in the Vulnerable/Rare zoological category (V/R) [31]. *H. paludosa* is also included in the Red Book of Vascular Plants of Romania in the Critically Endangered zoological category (CR) [13].

On the basis of new chorological data and estimation of the number of individuals (between 30 and 100) and the condition of populations, we can define *H. paludosa* as IUCN category CR C2a(i) [47] in Romania.

As new populations of *H. paludosa* are found it is clear that the mystery surrounding the enigmatic bog adder's-mouth orchid in Romania is partly due to insufficient search effort coupled with the elusive nature of the plant. We have presented a tentative distribution range of the species, but future surveys are still required in order to understand the true occurrence of *H. paludosa* in Romania.

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**REGĂSIREA ȘI DESCOPERIREA UNEI NOI LOCALITĂȚI A ENIGMATICEI SPECII
HAMMARBYA PALUDOSA (L.) KUNTZE ÎN ROMÂNIA**

(Rezumat)

Studiul nostru realizează o analiză critică a distribuției speciei *Hammarbya paludosa* în România. În literatura botanică românească este menționată prezența speciei, însă în urma cercetării herbarelor din România s-a găsit doar o singură coală, cu material colectat de la Avrig (de unde specia nu mai fusese menționată). În plus, o analiză critică a literaturii botanice disponibile ne conduce la concluzia că toate locurile menționate în Carpații Românești nu pot fi susținute prin date concrete și prin urmare prezența speciei *H. paludosa* în aceste localități se consideră îndoielnică. Se confirmă prezența speciei într-o stațiune nouă din Munții Gutâi, respectiv se descrie ambianța fitocenotică în care crește aceasta. De asemenea, se discută pe scurt și aspectele de conservare a speciei în România, propunând includerea ei în categoria CR C2a(i).