

**LARIX DECIDUA MILL. IN ROMANIA: CURRENT AND PAST
DISTRIBUTION, COENOTIC PREFERENCES,
AND CONSERVATION STATUS**

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Abstract: This paper aims to present an overview of the *Larix decidua* Mill. formations in Romania, in terms of phytosociology, sozology and phytohistory. We have analyzed data from the literature regarding the associations containing larch, and their current fragmented distribution in the Romanian Carpathians. The latter is influenced by the ecological requirements of the species, as well as by human influence through deforestation and reforestation. It is assumed that natural populations of *Larix decidua* are concentrated in five major centres: the Ceahlău, Ciucaș, Bucegi, Lotru and Trascău mountains. From the sozological perspective, *Larix decidua* subsp. *carpatica* is present on the critical list of vascular plants in Romania as a Carpathian endemic. Regarding the conservation status, information related to this species and to the habitat of Community interest, 9420 *Alpine Larix decidua* and/or *Pinus cembra* forests, were extracted from the list of Sites of Community Interest (SCIs). The status of a glacial relict taxon was confirmed by analyzing the palynological sites where it has been recorded. *Larix decidua* is one of the trees that survived in glacial refugia during the LGM and Late Glacial.

Key words: *Larix decidua*, Natura 2000 sites, palynology, Romanian Carpathians.

Introduction

In Romania, *Larix decidua* (Larch, Pinaceae family) is described in the spontaneous flora as comprising two subspecies: subsp. *decidua* and subsp. *carpatica* (Domin) Šiman (var. *polonica* auct.) [3, 42]. This paper treats the species name according to the online version of *Flora Europaea* [54]: *Larix decidua* Mill.

From a sozological point of view only *L. decidua* var. *polonica* is considered to be “Endangered”, whereas *Larix decidua* var. *decidua*, and *L. decidua* var. *carpatica* are considered as of “Least Concern” [55, 56]. The Red Book of vascular plants of Romania does not include *Larix* [6].

The general distribution of this species in Romania has been described exhaustively by Rubțov [40]; and from a phytosociological point of view, the communities of *Larix decidua* Mill. have been addressed by various authors [2, 31, 4, 50]. In terms of classification into Natura 2000 habitats [7, 30], thickets of *Larix decidua* were included in the habitat 9420 *Alpine Larix decidua* and/or *Pinus cembra* forests. According to our knowledge, there is still no publication that addresses the distribution of this species in Natura 2000 sites designated after 2007 in Romania.

Records of the presence of *Larix* in the palynological sites from the Late Glacial (LG) and Holocene periods indicate its persistence in the Romanian Carpathians as a glacial relict [9, 29, 48]. Therefore, this study intends to provide an overview of the presence of larch in different communities, as well as in Natura 2000 habitats, and in palynological sites.

Material and Methods

From a phytosociological perspective, we have presented the coenotaxa from Romania where *Larix decidua* (Mill.) is dominant or mentioned by the authors as a companion species. We have analyzed different bibliographical sources to obtain mainly a list of plant associations in which this species is present, and some general remarks on its current distribution area in Romania.

With regard to *Larix decidua* protection in the Red Lists from Romania and of protected areas in the Natura 2000 network, we have extracted data from the standard forms of Sites of Community Importance [57, 58]. We have selected the sites where the habitat with *Larix* (i.e. code 9420), or only the species itself were present.

Concerning the presence and persistence of *Larix* during the LG and Holocene in Romania, we have taken into account all the observations made in recent decades by palynological analyses and chronological assessment through ^{14}C dating. We have analyzed and selected only the sites with *Larix* pollen and/or its macrorests present in the diagrams. Some of these diagrams are accompanied by ^{14}C dating, others are not. We proceeded to calibrate these datings for uniformity in interpretation of results, by using the CALIB REV 6.0.0 software [44, 45] and the data set INTCAL09 [39]. We also used the chronozones for the relative temporal framing [38], when ^{14}C dating was not available.

Results and Discussion

Analyzing the larch forests of the Romanian Carpathians from the *phytogeographical perspective*, as compared to the Alps, Coldea [4] included the phytocoenoses dominated by *Larix* in the association *Saxifraga cuneifoliae-Laricetum* (Beldie 1967) Coldea 1991 (Syn: *Piceto-Laricetum carpaticae* Beldie 1967, *Laricetum carpaticae* Beldie 1967, *Larici-Pinetum cembrae* Leandru 1954), which he considers specific to the South-Eastern Carpathians. According to Coldea [4], the associations and the site conditions where the species is present, but not dominant in the canopy, are as follows:

- a) *Seslerio rigidae-Pinetum sylvestris* (Csűrös et Spîrchez, 1963) Csűrös et al. 1968 (Syn: *Pinetum sylvestris seslerietosum* Csűrös et Spîrchez 1963, *Poeto-Pinetum sylvestris* Borza 1959). These relict phytocoenoses cover small surfaces on the calcareous and shady slopes of the Leaota Mts, Trascăului (Cheile Rîmeșului) Mts, Muntele Mare (Scărița-Belioara);
- b) *Juniperetum sabinae* Csűrös 1958. The coenoses of this association inhabit small surfaces on the screes of sunny and steep slopes from the Trascăului Mts. and Muntele Mare;
- c) *Leucobryo-Pinetum* Matusz. 1962 (Syn: *Myrtillo-Pinetum* Burduja et Ștefan 1982 non Kobenza 1930, *Betulo-Pinetum* Burduja et Ștefan 1982). These communities of the association have been identified only in a few massifs of the Romanian Carpathians (Vrancei, Leaota, and Retezat mountains), on sunny mountain slopes.
- d) *Hieracio rotundati-Piceetum* Pawl. et Br.-Bl. 1939 (Syn: *Piceetum carpaticum* Soó 1930, *Piceetum montanum* auct.roman.). This association is represented by spruce-fir forests widespread in the upper montane belt, in the mountains of Rodnei, Călimani, Rarău, Tarcău and Bistriței, on the Bistrița Aurie Valley. They also occur in the mountains of Siriu, Piatra Mare, Bucegi, Parâng, Sebeș, Țarcu, Godeanu, Retezat, Cernei, and Vlădeasa, on the valleys Someșul Cald, Mogoșului, Drăganului, Sebișel, Iadului, etc.

- e) *Rhododendro myrtifolii-Piceetum* Coldea et Pînzaru 1986 (Syn : *Pino cembrae-Piceetum* Chifu et al. 1984). The phytocoenoses of the association occur at the upper limit of the forest zone of the Maramureşului, Rodnei, Călimani and Bistriţei mountains.
- f) *Saxifraga cuneifoliae-Laricetum* (Beldie 1967) Coldea 1991 (Syn: *Piceto-Laricetum carpaticae* Beldie 1967, *Laricetum carpaticae* Beldie 1967, *Larici-Pinetum cembrae* Leandru 1954). The populations of *Larix decidua* belonging to this association are found in the Bucegi Mts, at the upper limit of the forest zone, on steep slopes.

Apart from the last two associations listed Gafta et Mountford [30] note the presence of *Larix* formations in the association:

- g) *Bruckenthalio-Piceetum* Borhidi 1969. Spruce-fir forests of the upper limit from the Parâng, Sebeş, Cozia, Retezat, and Bihorului mountains belong to this association. They are spread between 1600-1750 m a.s.l.

Turtureanu *et al.* [50] identify two other associations with *Larix* in the Trascăului Mts. at low altitudes, on limestone:

- h) *Asperulo capitatae-Seslerietum rigidae* (Zolyomi 1939) Coldea 1991;
i) *Seslerio rigidae-Fagetum* Soó et Vida 1963.

From the *sozological perspective*, *Larix decidua* ssp. *carpatica* is present on the critical list of vascular plants in Romania [36] as a Carpathian endemic species.

Sârbu *et al.* [41] also mention *Larix decidua* Mill. subsp. *carpatica* (Domin) Šiman (*L. decidua* Mill. var. *polonica* (Wóycicki) Ostenf. & Syrach), on the list of globally, European and nationally endangered taxa (criterion A), in the category of “Areas populated by globally threatened taxa” (Ai), based on the list of *The World List of Threatened Trees* [35].

Regarding **Natura 2000 habitats**, the protection status also applies to *Larix* stands of the habitat of Community importance 9420, *Alpine Larix decidua and/or Pinus cembra forests* [7, 30]. This habitat is assigned to *Alpine larch-arolla forests* (code 42.3), according to Palearctic Classification (CLAS. PAL.). His subtype in Romania, *Carpathian larch and arolla forests* (code 42.35), is described as “rare formations of *Larix decidua* or *Pinus cembra* from Carpathians, where each species appears separately as unique dominant, together as co-dominants, or in admixture with *Picea abies*” [30, pg. 81].

In terms of the presence of this 9420 habitat in Natura 2000 sites from Romania, as it appears in the official description (the standard forms of sites), we found it in 10 of the 408 sites that are listed in Romania (Table 1). In six of these 10 sites, *Larix* is listed in the category of “Other important species of flora and fauna”, which also is mentioned in nine other sites, while in the rest of the four sites, the species is either omitted (Târnovu Mare – Latoriţa, Trascău), or does not occur (Călimani – Gurghiu, Retezat; only *P. cembra* is present). Percentages of this habitat type representation in relation to the area of each site will likely be changed after finalizing of the mapping process.

This habitat type of community interest corresponds in Romania to the following **national habitats** [7, 30]:

- ❖ R4201 Southeastern Carpathians spruce (*Picea abies*) and Swiss stone pine (*Pinus cembra*) grooves with *Bruckenthalia spiculifolia*.
- ❖ R4202 Southeastern Carpathians spruce (*Picea abies*) and Swiss stone pine (*Pinus cembra*) grooves with *Rhododendron myrtifolium*.
- ❖ R4204 Forests and groves of larch (*Larix decidua*) with *Saxifraga cuneifolia*.

Table 1: Distribution of *Larix decidua* (Mill.) and 9420 Alpine *Larix decidua* and/or *Pinus cembra* forests habitat in Natura 2000 sites of Romania according to official Standard Forms

Nr.	Natura 2000 site name	Site code (ROSCI)	Area (ha)	9420 Habitat presence	Percent of habitat surface	Taxon listed among other important species
1	Apuseni	0002	75943	Yes	0.5	<i>Larix decidua</i> ssp. <i>Carpatica</i>
2	Bucegi	0013	38787	Yes	2.6	<i>Larix decidua</i> <i>Larix decidua</i> ssp. <i>carpatica</i> <i>Larix decidua</i> ssp. <i>Polonica</i>
3	Buila - Vânturarița	0015	4525	No	0	<i>Larix decidua</i>
4	Călimani - Gurghiu	0019	134936	Yes	0.5	-
5	Ceahlău	0024	7737	Yes	3	<i>Larix decidua</i> ssp. <i>Carpatica</i>
6	Cheile Bicazului – Hășmaș	0027	7642	No	0	<i>Larix decidua</i> ssp. <i>Polonica</i>
7	Ciucaș	0038	21864	Yes	3	<i>Larix decidua</i> ssp. <i>Carpatica</i>
8	Creasta Nemirei	0047	3509	No	0	<i>Larix decidua</i> ssp. <i>Carpatica</i>
9	Cușma	0051	44284	No	0	<i>Larix decidua</i>
10	Harghita Mădăraș	0090	13373	No	0	<i>Larix decidua</i>
11	Munții Făgăraș	0122	198618	No	0	<i>Larix decidua</i> ssp. <i>carpatica</i> <i>Larix decidua</i> ssp. <i>Polonica</i>
12	Munții Rodnei	0125	48062	Yes	1	<i>Larix decidua</i> ssp. <i>Carpatica</i>
13	Pădurea Glodeasa	0153	544	No	0	<i>Larix decidua</i>
14	Parâng	0188	30434	Yes	2	<i>Larix decidua</i>
15	Piatra Craiului	0194	15867	No	0	<i>Larix decidua</i> ssp. <i>Carpatica</i>
16	Postăvarul	0207	1303	No	0	<i>Larix decidua</i>
17	Retezat	0217	43561	Yes	1.7	-
18	Târnovu Mare – Latorița	0239	1366	Yes	15	-
19	Trascău	0253	50064	Yes	0.1	-

Apart from these habitats, Doniță *et al.* [7] described other national habitats without Natura 2000 correspondence, where *Larix* can be found as companion species.

- ❖ R4213 Southeast Carpathians forests of *Picea abies* with *Doronicum columnae*.
- ❖ R3115 Southeast Carpathian shrubs of *Juniperus*.

The presence and persistence of *Larix* during the LG and Holocene has been confirmed in Romanian Carpathians by *palynological studies* and macrorests analyses performed in the last two decades by various researchers from Romania and abroad (Figure 1, Table 2).

In Romania there are some *Larix* occurrences in pollen spectra from the LG, over 10,000 years old [8, 9, 12, 17, 23, 24, 26, 34, 48, 49]. At the transition between LG and Holocene (Preboreal) this taxon was also reported [5, 13, 22], whereas several records of *Larix* in the Holocene from different climatic periods or “chronozones” (Boreal, Atlantic, Sub-Boreal and Sub-Atlantic) are coming from different areas of the Romanian Carpathians [9, 10, 11, 14, 15, 16, 18, 19, 20, 21, 25, 27, 28].

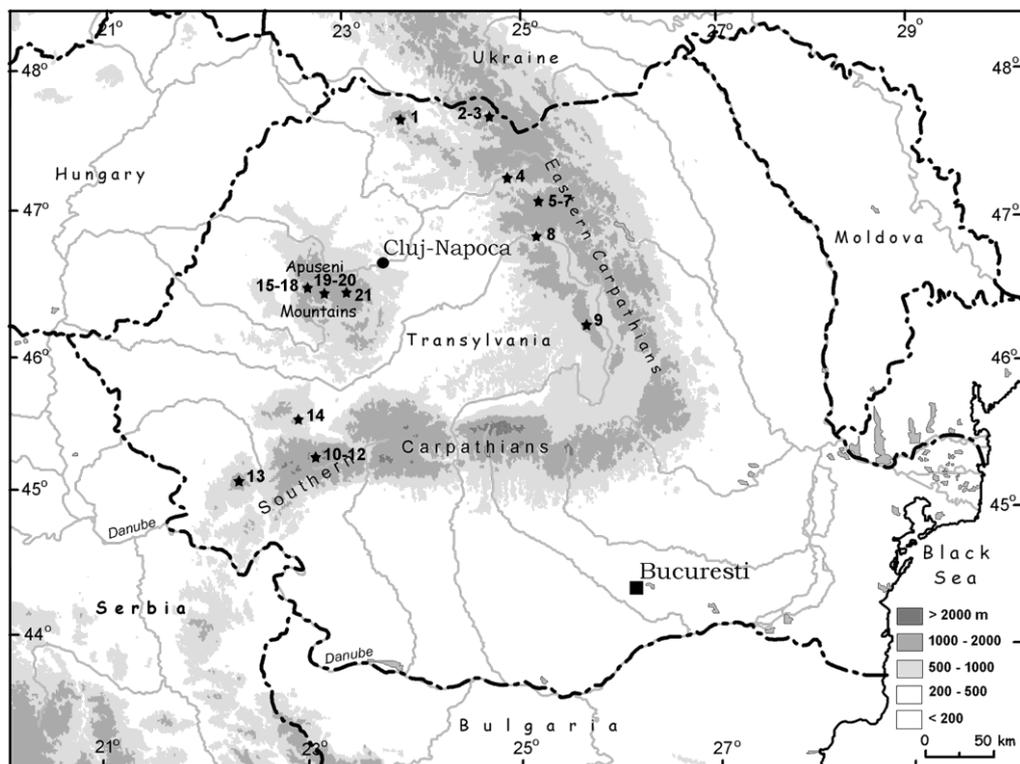


Fig. 1: Palynological sites from the Romanian Carpathians with *Larix* evidence: 1. Preluca Țiganului; 2. Bardău; 3. Cristina; 4. Poiana Stampei Pilugani; 5. Iezerul Căliman; 6. Poiana Puturosul; 7. Între afini; 8. Toplița; 9. Luci; 10. Tăul dintre Brazi; 11. Galeș; 12. Tăul Zănoğuții; 13. Zănoaga Roșie; 14. Peșteana; 15. Ic Ponor; 16. Molhașul Mare; 17. Călineasa; 18. Padiș Sondori; 19. Peștera Scărișoara; 20. Căpățâna; 21. Dameș.

Larix decidua is widespread in SE France, Switzerland, N Italy, S Germany, Austria, Czech Republic, Slovakia, Poland, Ukraine and Romania (Figure 2), at altitudes that vary widely, between 600 and 2500 m. a.s.l. Generally, its distribution is limited to small areas, the largest being in the Alps.

The Romanian Carpathians were refugia for some taxa such as *Pinus*, *Betula*, *Picea*, *Alnus*, *Larix*, *Salix* and *Juniperus* during the Last Glacial phase, that is why the vegetation response to the LG warming was quite rapid [29]. The LG interstadial treeline ecotone has been estimated between 1100 and 1500 m a.s.l. by Feurdean *et al.* [29] mainly on the basis of pollen data. Only few sites are known from this important refugial area where pollen analysis was complemented by macrofossil data [23, 26, 34, 52].

Even though *Larix decidua* is a very cold-tolerant species, able to survive winter temperatures down to -50°C [51], its presence in LG pollen spectra is often underrepresented, because of its low pollen production, weak dispersion capacity, and poor preservation in sediments [1, 33]. The pollen data on *L. decidua* probably underestimate the distribution of the tree. According to Pearman [37], pollen sites outside the “belt” of *L. decidua* record very little or no *L. decidua* pollen, even when the species occurs a short distance away.

The review of the past presence of *Larix* pollen spectra from Romania reveals a fragmented distribution (Figure 1), due to the issues presented above, and to the insufficiency of modern palynological data from past decades, when identifying the genera has become commonplace. None of the older palynological spectra show evidence of the presence of *Larix*. If we look at the available data, it appears that the stands of *Larix* were present in the LG and

early Holocene in the mountain belt from the Gutâiului, Căliman, Harghita, Retezat, Semenic, Poiana Ruscă and Apuseni mountains. This situation is somewhat different as compared to the location of natural populations of *Larix* today.

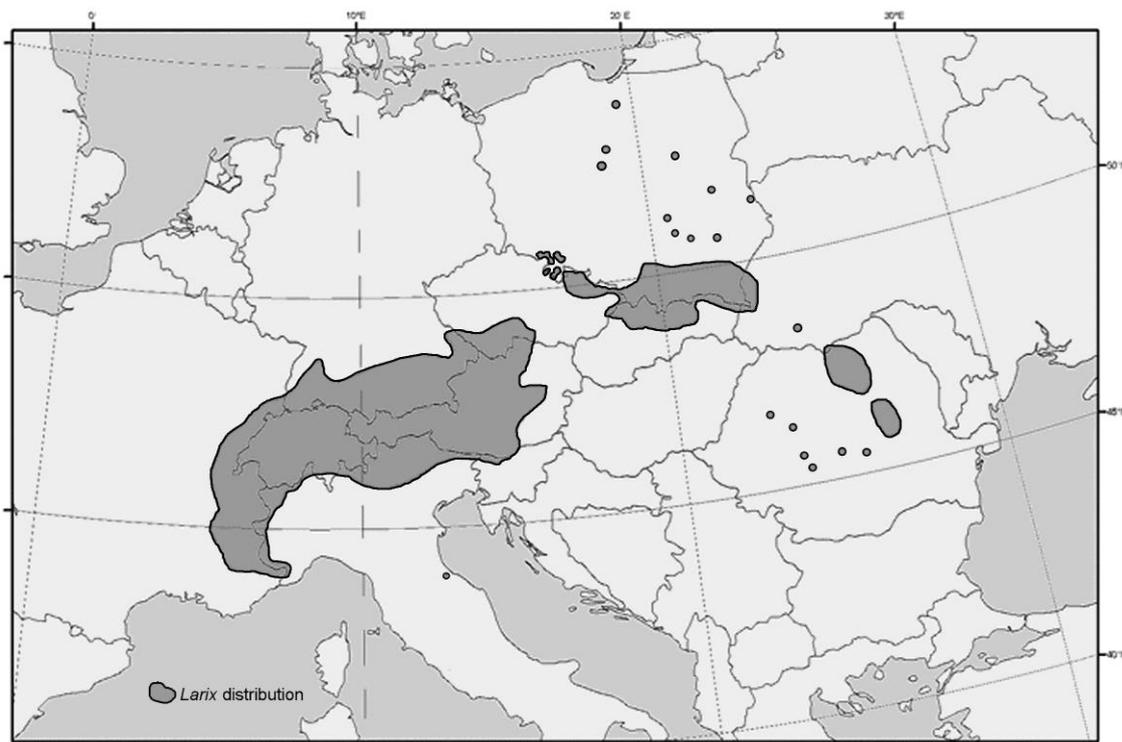


Fig. 2: Distribution map of *Larix decidua* Mill. in Europe. EUFORGEN 2009 - modified

In the Romanian pollen spectra from the LG, where *Larix* was found, its percentages vary from site to site. At Preluca Țiganului in the Gutâiului Mountains, where *Larix* macrorests were also found [23, 24, 26], the taxon is well represented, its existence thus being confirmed “in situ”. In contrast, *Larix* pollen at the other sites is sporadic and at low percentages. In Tăul dintre brazi (Retezat Mts.), macrorests (leaves) of *Larix* from the LG were also found, in lower concentrations, but quite high at the beginning of the Preboreal, an additional proof of the presence of this species at the site.

If we refer to the chronology of these finds, the oldest comes from the Poiana Ruscă Mts, at Peșteana, of the LGM (Last Glacial Maximum), and from the Retezat Mts (Tăul dintre brazi and Galeș lakes), two areas relatively close (Figure 1). They are followed by the occurrences from the Gutâiului Mts (Preluca Țiganului), and Harghita Mts (Luci) almost synchronous, from the Căliman Mts (Iezerul Căliman) slightly delayed, then from the Semenicului Mts (Zănoaga Roșie). Then comes the synchronous ones from the Retezat Mts (Tăul Zănoaguții) and Apuseni (Ic Ponor) of Preboreal age (Table 2). The LG relatively close ages of these records suggest the existence of multiple glacial refugia centres from where *Larix* eventually spread.

It would be necessary in the perspective to fill the gaps, to increase the sampling network and the number of palynological analysis provided with ^{14}C dating, in order to have a complete view of the *Larix* presence during the LGM, LG, and the transition to the Holocene in the Romanian Carpathians.

In Romania *Larix decidua* stands occupy about 30,000 ha [43], mostly plantations established from seed imported from Austria. Only about 4,500 ha are considered as natural

Table 2: The presence of *Larix* in the Romanian palynological sites

Nr.	Site name	Geographical Coordinates		Elevation (m)	Sedimentary environment	Type of fossil material	First occurrence ¹⁴ C Dating (cal. yr. BP)	Chronozones (after Ravazzi, 2003)	Data source
		Latitude N	Longitude E						
1	Preluca Țiganului	47°48'83"	23°31'91"	730	Peat bog	Seeds/ needles/ macrocharcoal	14100 - 13900	Lateglacial	Feurdean & Bennike 2004, Feurdean <i>et al.</i> 2008, Feurdean <i>et al.</i> 2012
2	Bardău	47°50'09"	24°36'01"	1850	Peat bog	Pollen	4335 - 3360	Subboreal	Fărcaș <i>et al.</i> 2008, Fărcaș <i>et al.</i> 2013
3	Cristina	47°50'07"	24°37'07"	1573	Peat bog	Pollen	8000 - 7400	Atlantic	Fărcaș <i>et al.</i> 2009, Fărcaș <i>et al.</i> 2013
4	Poiana Stampei Pilugani	47°20'	25°9'47"	880	Peat bog	Pollen	-	Boreal- Atlantic	Fărcaș & Tanțău 1999, Fărcaș 2008
5	Iezerul Căliman	47°19'40"	25°16'25"	1650	Lake	Pollen	12900	Lateglacial	Fărcaș 1995-1996, Fărcaș 2008
6	Poiana Puturosul	47°05'40"	25°15'33"	1600	Peat bog	Pollen	-	Subatlantic	Fărcaș <i>et al.</i> 1999-2000, Fărcaș 2008
7	Între afini	47°05'37"	25°15'42"	1660	Peat bog	Pollen	-	Boreal- Atlantic	Fărcaș & Tanțău 1999, Fărcaș 2008
8	Toplița	46°57'	25°15'	640	Mire	Pollen	-	Boreal- Atlantic	Fărcaș <i>et al.</i> 1997, Fărcaș 2008
9	Luci	46°17'49"	25°44'15"	1080	Peat bog	Pollen	14000 - 13500	Lateglacial	Tanțău <i>et al.</i> 2003, Tanțău 2006, Feurdean <i>et al.</i> 2007
10	Tăul dintre Brazi	45°23'47"	22°54'06"	1740	Lake	Pollen/macros	15750 - 14500 12500	Lateglacial	Feurdean <i>et al.</i> 2012, Magyari <i>et al.</i> 2012
11	Galeș	45°23'6"	22°54'33"	1990	Lake	Pollen/macros	15750 - 14500	Lateglacial	Magyari <i>et al.</i> 2012
12	Tăul Zănoaguții	45°19'40"	22°48'10"	1840	Lake	Pollen	11200	Preboreal	Fărcaș <i>et al.</i> 1999, Feurdean <i>et al.</i> 2007
13	Zănoaga Roșie	45°09'	22°05'	1400	Peat bog	Pollen	11400	Preboreal	Fărcaș <i>et al.</i> 2005
14	Peșteana	45°32'36"	22°48'22"	480	Peat bog	Pollen	16800	Last Glacial Maximum	Fărcaș <i>et al.</i> 2006, Fărcaș & Tanțău 2012
15	Ic Ponor	46°37'51"	22°48'18"	1050	Peat bog	Pollen	11200	Preboreal	Coldea <i>et al.</i> 2008
16	Molhașul Mare	46°35'24"	22°45'51"	1224	Peat bog	Pollen	3700	Subboreal	Feurdean & Willis 2008
17	Călineasa	46°33'47"	22°49'45"	1360	Peat bog	Pollen	2450	Subatlantic	Feurdean <i>et al.</i> 2009
18	Pașiș Sondori	46°35'54"	22°43'56"	1290	Mire	Pollen	1750	Subatlantic	Feurdean <i>et al.</i> 2009
19	Scărișoara Cave	46°29'23"	22°48'34"	1165	Ice cave	Pollen	850	Subatlantic	Feurdean <i>et al.</i> 2011
20	Căpățâna	46°28'45"	23°06'50"	1600	Peat bog	Pollen	4100	Subboreal	Fărcaș <i>et al.</i> 2005
21	Dameș	46°31'	23°01'	1380	Peat bog	pollen	-	Atlantic	Fărcaș <i>et al.</i> 2005

thickets [32, 51]. It is possible that in the past larch was more widespread than today. The reduction in its extent has been caused by intense exploitation, as a consequence of the quality of the wood [47].

In parallel with felling there was a concern for afforestation with this species. Due to its high resistance to cold (ensured by the thick rhytidome or outer bark), tolerance to heat and rapid juvenile growth, larch can be cultivated in open areas, following deforestation. Its mixed rooting and deciduous canopy determines a higher resistance than spruce or pine to wind action and snow disruption. Expansion of larch culture intensified in the late 19th century, especially in the mountainous areas at 600-1500 m a.s.l., and the area of these plantations now extends to nearly 18,000 ha [46].

After consulting the literature, we observed the current spread of natural *Larix decidua* formations in Romania to be fragmented into five major cores, which are the Ceahlău, Ciucaș (Zăganu-Teleajen), Bucegi, Lotru, and Trascău mountains [40, 50]. Most commonly larch occurs at altitudes above 1000 m, with the exception of areas in the Lotru and Trascăului mountains (600 m). Substrate varies depending on the area, the species not being restricted to a specific type. It can form compact, pure clusters, where it is dominant, but most often it occurs in mixed forests, associated with spruce, fir, pine and beech, providing an indication of its relict character.

In terms of phytosociology, some authors assign the larch communities in some massifs of the Southeastern Carpathians such as Bucegi (i.e. *Saxifrago cuneifoli-Laricetum* Beldie 1967, *Vaccinio-Piceetea* class) to distinct associations. In many other places their classification is still questionable (e.g. Trascău Mountains) [50], probably because the presence of larch at lower altitudes, where it interacts with types of deciduous woodland formations (i.e. *Quercus-Fagetea*), as a result of its reduced area, or of the relatively low altitudes and drier climate. Therefore, we suggest in perspective an exhaustive analysis by numerical phytosociological methods, which include both major communities of the Alps region, those intermediate from high altitude of Romanian Carpathians, and the extreme ones, at low altitudes in the Trascăului Mountains.

Conclusions

Although *Larix decidua* does not appear in the Red Lists of Romania to be a conservation problem, it does deserve more attention, because the natural distribution of this species in the country is very localized. We therefore suggest the monitoring of existing natural stands, especially in areas subject to forest exploitation, where the number of past locations has been strongly reduced [50]. Since in Romania the species is nearly at the eastern limit of its distribution, and it occurs in fragmented populations, we propose that the species to be included in the “*Near Threatened*” (NT) IUCN species category.

Synthesizing the distribution data of *L. decidua* in Natura 2000 sites provides a clear picture, though the mapping process in Romania is not finalized. However, confirmation of species in some sites which coincides with the areas mentioned in ancient literature as major core spreading is welcomed, in the context of reducing biodiversity at European level, due to various natural and anthropogenic long-acting influences. In the sites where the species will prove still present, we suggest the surveillance of the stand structure, which can provide clues about their dynamics, and also studying the comparison of populations in terms of molecular evidence of their native status (i.e. local populations vs. plantations).

The phytosociological literature reveals the presence of this species as dominant but mostly as a companion element, in various plant associations, of uneven, fragmented distribution, due to its ecological requirements (cold climate, strong insolation), as well as by human intervention, through actions of both deforestation and reforestation, related to the economic importance of larch wood. It is assumed, based on the available data, that natural populations of *Larix decidua* are concentrated in five major centres, namely the Ceahlău, Ciucaș, Bucegi, Lotru and Trascău mountains.

From the zoological perspective, *L. decidua* is listed as a Carpathian endemic species, and as a globally, European and nationally endangered taxa. The protection status also applies to stands of the Natura 2000 habitat 9420 *Alpine Larix decidua and/or Pinus cembra forests*.

L. decidua is a very cold-tolerant species, being one of the trees that has survived in glacial refugia during the LGM and LG. The review of the past presence of *Larix* pollen spectra from Romania reveals a fragmented distribution. It appears that stands of *Larix* were present in the LG and early Holocene in the montane belt from the Gutâiului, Căliman, Harghita, Retezat, Semenic, Poiana Ruscă, and Apuseni mountains. When comparing the ancient to the present distribution, we can conclude that the species has strongly declined in distribution.

The monitoring of the existing natural stands of *Larix decidua* deserves more attention, because the natural distribution of the species in the country is very localized and subject to exploitation.

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LARIX DECIDUA (MILL.) ÎN ROMÂNIA: DISTRIBUȚIA ACTUALĂ ȘI TRECUTĂ, VEDERE DE ANSAMBLU FITOSOCIOLOGICĂ, ȘI STATUT DE CONSERVARE

(Rezumat)

Lucrarea își propune să prezinte o vedere de ansamblu asupra formațiunilor cu *Larix decidua* Mill. din România, din punct de vedere fitosociologic, sozologic și fitoistoric.

Au fost analizate datele din literatură referitoare la asociațiile cu larice, identificându-se atât formațiunile în care este dominant cât și specie însoțitoare, precum și răspândirea actuală a lor. În total au fost identificate în literatură 9 asociații vegetale unde laricele apare.

Referitor la statutul de conservare au fost extrase informațiile referitoare la prezența speciei *Larix decidua*. Specia se regăsește printre endemitele carpatice, fiind citată în listele globale, europene și naționale ca „taxon amenințat” (criteriul A; „The World List of Threatened Trees”).

Din punct de vedere al clasificărilor Natura 2000 (formularele standard ale siturilor), habitatul de interes comunitar 9420 *Păduri alpine de Larix decidua și/sau Pinus cembra* se regăsește în 10 dintre cele 408 situri din România. În 6 din cele 10 situri taxonul este menționat la categoria „*Alte specii importante de floră și faună*”, menționată și în alte 9 situri, iar în celelate 4 situri specia este fie omisă (Târnovu Mare – Latorița, Trascău), fie nu apare (Călimani – Gurghiu, Retezat, unde doar *P. cembra* este prezent).

S-a confirmat statutul de relict glaciatic al taxonului prin analiza siturilor palinologice în care a fost înregistrat, atât în timpul Tardiglaciaticului cât și în Preboreal. În ceea ce privește compararea situației din trecut cu cea prezentă evidențiem că distribuția naturală a acestei specii lemnoase s-a restrâns, probabil datorită atât schimbărilor climatice, cât mai degrabă intervențiilor silviculturale.