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Pinus cembra distribution in the Romanian Carpathians

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Abstract. A map with the distribution of the Swiss stone pine (*Pinus cembra* L.) in Romania was never made. However, long time ago, some poor or confused data collected from the Romanian Carpathians were inserted in a compiled at European level map; but this map do not reflects the species real geographic distribution in the Romanian Carpathians. Consequently, a initiative to build up a not to far from reality map was made. A comprehensive literature and field survey concerning Swiss stone pine natural distribution in Romania was made. Two other sources of information were used, such as: the senior author's direct field survey to localize the species populations and information obtained from people involved in this issue. Based on the acquired data, the species digital distribution map of the Romanian Carpathians, was in premiere made. Because the distribution boundary of the species encompasses a large area, it does not mean that all hachured mountains and valley on the map are fully occupied by species.
Keywords: *Pinus cembra*, natural distribution, digital map, Romanian Carpathians

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Introduction

Swiss stone pine grows at high elevations in the Alps and Carpathian Mountains (Critchfield and Little Jr. 1966). It occurs in Switzerland, Austria, northern Italy, eastern France, Romania, Slovakia (but not in the Czech Republic) and Poland (Schmidt 1994). The species is also met in Ukraine as well (Blada unpublished data).

Initially, a general distribution map was compiled at European level (Critchfield and Little Jr. 1966). Later, with no visible changes, the map was republished by Schmidt (1994). It should be stressed that these maps do not reflect the species real geographic distribution in the Romanian Carpathians. The Romanian Carpathians part of the map for these mountains was compiled taking into consideration only information from old literature, such as: Grecescu 1898, Fekete & Blattny 1913 and Pax 1920. At that time the Carpathians accessibility was extremely limited so that, most information about the occurrence of *P. cembra* was approximately or even confusing. Therefore, elaborating a map with the range of the species in the Romanian Carpathians became an important objective. For this reason, during the last decade a comprehensive field search and available literature survey were made. The obtained results revealed that the Swiss stone pine in Romania occupies a much larger area than that illustrated in the previous vegetation maps previously mentioned.

The objective of this paper is to present, for the first time, the Swiss stone pine distribution map in Romania; this map is based on real data obtained from both available literature and

field survey.

Material and methods

Three sources of information were used to get the basic necessary data for compilation of the *P. cembra* natural distribution map for the Romanian Carpathians: (i) the existing accessible literature; (ii) the senior author's direct field survey; (iii) direct information from other people.

All acquired information was used to elaborate the map of the Swiss stone pine natural distribution across Romanian Carpathians. The map was developed in a GIS format. To facilitate an easier understanding to the reader, the most used information will have an abbreviation or a sign in its front or at the end of it, such as:

- mountainous range;
- the secondary local subdivisions;

Mts. - Mountains;
Mt. - Mountain;
p.c. - personal communication.
u.p.d. - unpublished data;

For the same reason, Swiss stone pine or *Pinus cembra* will only seldom written in the text; instead, the *species* or *population* or *stand* or *trees* or *it* or *its* or *occurs* will frequently used.

Results

During literature investigation, new Romanian publications dealing with the species distribution were found; some of them have recorded the species occurrence in new sites while some others just confirmed or not confirmed the species presence in a certain site. The field survey of the senior author of this paper contributed a great deal to find new native populations and to clarification some aspects in most sites where the species was previously mentioned by literature. A few colleagues or simple friends who know both the mountain and the species, significantly contributed with their information concerning the species occurrence. The range map presented as part of this paper, was elaborated based on the acquired data presented in the text, separately on mountain ranges and on mountains or valley or other geographically forms separately within each range of mountains.

- **Maramureş Mountains Range**

Toroioaga Mt. Fekete & Blattny 1913 were the only authors who have mentioned, in an uncertain manner, the species occurrence on this mountain. According to the local information, in the Maramureşului Mts. took place intensive clear cut of dwarf stone pine (*P. mugo*) bushes and possible *P. cembra* species. Perhaps this could be the reason why the Swiss stone pine is missing from the Maramureşului Mountains (Gheorghe Pânzaru p.c 2008) while it can be found in the Gorganul Mare, Talpeş and Pobita Mts. from the Ukrainian Carpathians (Fekete & Blattny 1913).

- **Rodnei Mountains Range**

Across 25 km west from the Piciorul Moşului Mt., the species is spread as widely scattered clumps (Fekete & Blattny 1913).

Piciorul Moşului Mt. Among the *Pinus mugo* bushes the, species occurs on north-northwest facing slope, above the spring between 1589 and 1620 m elevation. Occurs in the north-facing slope, under the stone at 1629 m elevation (Fekete & Blattny 1913). The *species* occurrence in this site was confirmed by Antonescu (1926). According to credible information, between 1960 and 1970 years, an intensive clear cutting of the dwarf- and Swiss stone pine vegetation has occurred in the Piciorul Moşului area; creating pasture land and turpentine extraction were the two main reason of that wilde action promoted by the Plafar, a state enterprise (Gheorghe Pânzaru p.c. 2008). As consequence, the free of woody vegetation area, has became suitable for avalanches; five young people were killed by the latest one, which occurred in the 1995 year. Only few *trees* are growing now in the Piciorul Moşului zone; one old tree and one much younger and extremely small one (about 1 m height at age 30, approximately) are growing just near the stone; about 40 m distance beneath stone, another not very old tree can be found. Eastward between avalanche area and the Iezerul Meteorological Station only a few

old trees occur (Blada u.p.d).

Căldarea Zănoaga *Occurs* on north-west-facing slope, with its lower limit at 1484 m elevation (Fekete & Blattny 1913). It is not clear which Zănoaga they have referred to. Most likely, the above quoted authors did not survey the Zănoaga Mică Hollow. During a recently survey, two group of trees were identified in the Zănoaga Mică site, such as Group 1 and Group 2. The recorded average geographic coordinates for Group 1 and Group 2 are: 47 36'26" north latitude; 24 37'36" east longitude; 1670 m elevation); and 47 36'29" north latitude; 24 37'24" east longitude; 1650 m elevations), respectively; both groups are in north-facing slope (Ioan Muntean p.c). At present, less than 40 very scattered trees are growing in the Zănoaga Mare. Excepting a clump of about 12 trees from lower side of this site, most trees are very old; they show, non active vegetation, dry top of crowns, very poor or lack flowering, self pollination occurrence, absent natural regeneration. Consequently, after physical disappearance of these last trees, all these phenomena will soon cause the population extinction not only from this site but from the whole Pietrosul Mountain's zone, as well (Blada u.p.d). Nineteen ordinary trees were selected in both Zănoaga Mare and Zănoaga Mică hollows; they were used in provenance tests; because of the selfing phenomenon, the Pietrosul (Borsa) provenance occupied the last place in the rank (Blada 2007 a). Taking into account that the populations from Zănoaga Mare and Piciorul Moşului Mt. are in danger to be lost, a LIFE Nature project was implemented from 2003 to 2007 years period. The major project objective was: *Reintroduction, according to the genetic and ecological principles, of the species Pinus cembra and restoration of Pinus cembra / Pinus mugo / Picea abies natural habitats on 50 ha in Zanoaga Mare Hollow of the Pietrosul Rodnei Biosphere Reserve*; however, the Piciorul Moşului Mt. was not taken into account initially but then it was included in the project. The project objective was fulfilled and conservation and protection measures are currently taken (Blada 2007 b).

Turnu Rosu Mt. *Occurs* on eastern slope of the mountain among the dwarf stone pine bushes; *its* higher limit at 1801 m elevation. On northern slope occurs between 1569 and 1799 m elevations mixed dwarf stone pine bushes and spruce (*Picea abies*) (Fekete & Blattny 1913). The species occurrence in this site was confirmed by Antonescu (1926).

Izvorul Râpilor The *species* occurs beneath the Bătrâna Pick namely in the Izvorul Râpilor which is a tributary of the Dragoş Valley (Gheorghe Pânzaru p.c). The average geographic coordinates of this population are: 47 35'01" north latitude; 24 35'28" east longitude; 1560 m elevation (Ioan Muntean p.c).

Livezile-Momaia zone Ten *trees* were noticed near the production unit UP VI Pietrosul that belongs to the Borşa Forest District. The recorded geographic coordinates are: 47 35'28" north latitude; 24 37'00" east longitude; 1650 m elevation (Ioan Muntean p.c).

Pietrosul Valley The *species* occurrence highest limit is at 1734 m elevation (Fekete & Blattny 1913). Anonymous (1952) has confirmed the species occurrence.

Piatra Rea Mt. A small number of *trees* occur on northern slope from 1623 m elevation upstream (Fekete & Blattny 1913). The species occurrence was confirmed by Antonescu (1926) and Anonymous (1952).

Gropile Pietrosului The *species* occurrence was first mentioned by Anonymous (1952).

Putreda Valley The species occurs beneath the Clăi Pick (Anonymous 1952). Also, its occurrence was reported beneath the Cişia Pick, namely in the Zănoaga Pârâului Putreda (Gheorghe Pânzaru p.c. 2008). The average geographic coordinates of this group of trees are, as follows: 47 34'35" north latitude; 24 48'43" east longitude; 1590 m elevation. The population is distributed in north-facing slope (Ioan Muntean p.c. 2008).

Vişeu and Bistriţa Aurie rivers Nowhere in the Carpathians can be found so many and so nice *P. cembra* trees as on the northern slopes of these rivers, namely at their origin. (Antonescu 1926). The Vişeu River was never mentioned as site for cembra pine species occurrence (Blada u.p.d) and nobody else than (Antonescu 1926) reported many and nice *P. cembra* trees in the Vişeu and Bistriţa Aurie rivers (Georgescu & Ionescu 1932). However, a few scattered trees were reported downstream of the Ştiol Lake, namely along-

side Bistricioara Brook (Gheorghe Pânzaru p.c. 2008). Also, a clump of about 7-8 trees were noticed downstream of the Ştiol Lake, north-facing slope; the average geographic coordinates of this group of trees are, as follows: 47 34'34" north latitude; 24 48'42"east longitude; 1670 m elevation (Ioan Muntean p.c. 2008).

Bila Valley In the valley, the *species* occurs from 1375 m upstream (Fekete & Blattny 1913). Antonescu (1933) has confirmed the species occurrence. Popa (2004) has reported that the average growth curve from dendrochronological site Bila D covers a 329 years period, i.e. the population can reach such an age. Ioan Muntean (p.c. 2008) has recorded the population average geographic coordinates, such as: 47 33'16" north latitude; 24 53'54" east longitude; 1650 m elevation. The population is distributed in west-facing slope. Coldea & Pânzaru (1986) have confirmed the species occurrence in the Bila Valley.

Bila Mt Antonescu (1926) has reported the *species* occurrence on the north-northeastern slope with its lower limit at 1375 m elevation. It is a mistake because there is not a Bila Mt.; the population in question occurs in the Bila Valley origin which is beneath the Ineu Mt.; so, the confusion is evident.

Lala Valley The valley has its spring beneath the Ineu Mt. The *species* is widely distributed alongside the valley, such as: □ on the northern and northeastern slopes with its lower limit at 1543 m elevation; □ upstream towards the valley spring on the northeastern slope with its upper limit at 1708 m elevation; □ on the southeastern slope with its upper limit at 1734 m elevation; □ on the northwestern slope with its upper limit at 1680 m elevation (Fekete & Blattny 1913). The *species* occurrence in this site was confirmed by Antonescu (1926) and Coldea & Pânzaru (1986).

Gaja Mt. The *species* occurs on the north-northwestern and western slopes between 1700-1750 m elevations towards the Lala Valley. Also, the species was reported behind the Gajei Mt. or Dosul Gajei from 1508 m elevation upstream (Fekete & Blattny 1913).

- **Călimani Mountains Range**

Izvorul Călimani Mt. *Occurs* beneath the mountain pick on north-west facing slope towards the: □ Neagra Valley and □ Roşeţ Brook, in north-west facing slope at 1807 m elevation; □ Comărlanţ Brook on the north-west facing slope, at 1771 m elevation; □ Piciorul Poienilor on the western slope with lower limit occurrence at 1458 m elevation (Fekete & Blattny (1913); The species distribution in this site was confirmed by Antonescu (1926); Anonymous (1952); Gubesch (1971). Also, Gubesch (1971) has mentioned the species on both northern and southern-facing slopes of the Izvorul Călimani Mt.

Between the Izvorul Călimani Mt. and the Pietrosul (Calimani) Mt. on the western slope at 1685 m elevation and 47° 06' north latitude, an enormous stump of *tree* was found (Fekete & Blattny 1913).

Negoiul Unguresc After the 1960 year, approximately 35 years period, about 600 ha of forest vegetation, mainly spruce, Swiss stone pine and dwarf stone pine was destroyed by the mining activities. Owing to this, about half of the original Swiss stone pine population has disappeared. In fact, the whole Neagra Valley catchments basin including Pietricelul Mountain, was thrown about by additional mining activities, like geological explorations, road and many buildings constructions, by dumping of no useful rocks on forest area. As consequence, heavy rivers pollution with sulphur acid took place. Some experimental plantations with local species at about 1400 m (Cenuşe u.p.d) and at 1800 m (Blada u.p.d) elevations were established. However, all ecosystems from this zone require urgent restoration.

Negoiul Românesc The *species* occurrence on the southern slope was reported by Gubesch (1971).

Negoi Valley According to the Anonymous (1952), the *species* occurs in this valley while Gubesch (1971) could not confirm the existence of the species in this site; the forest clear cut could be a cause of the species disappearance.

Dumitrelul Valley According to

Anonymous (1952), the *species* has occurred on this valley while Gubesch (1971) could not confirm the existence of the species in this site; clear cut of forest vegetation in the zone was reported.

Pinului Valley Anonymous (1952) has reported the *species* in this valley. Gubesch (1971) has confirmed the species occurrence at 1352 m elevation and according to him, this is the lowest elevation of the species from the Calimani Mts.

Haita Valley According to the Anonymous (1952), the *species* has occurred on this valley while Gubesch (1971) could not confirm the existence of the species in this site; clear cut of forest vegetation in that zone could explain the species disappearance.

Voivodeasa Mt. The *species* was first mentioned by Anonymous (1952) while Gubesch (1971) reported the species occurrence at the foot of the mountain. In addition, the species was noticed beneath the Şaua Voivodeasa, namely in the Pârâul Ursului (Ionel Popa p.c).

Piciorul Bâjbic and Bradul Ciont On these two sites, the *species* reaches its highest elevation (but not specified) from the Călimani Mts., followed by the Negoiul Românesc, Pietricelul and Răchitiş Mts. (Gubesch 1971).

Răchitiş Mt. According to the Management Project of the Vatra Dornei Forest District, the largest population of Swiss stone pine occurs beneath the Răchitiş Mt., namely in the production unit U.P.V / 64; 65; 68; 69. Altogether, in some parts of the area, in these forest units occurs one of the best Swiss stone pine-spruce mixed population from the Romanian Carpathians. Rarely can be found so straight and naturally self-pruned trees Swiss stone pine as in this forest; this is because the Swiss stone pine trees grow in closed stand intimately mixed with spruce. The population was declared as seed stand and within it many plus and non plus trees were selected and used for two seed orchards establishment and for other research objectives in the *P. cembra* breeding program (Blada 1997; 2003; 2007). Part of this population was affected by windfall mainly in the area where the spruce trees occurrence was much higher than the *P. cembra* one (Blada u.p.d). In the last decade, dendrochronological investigations have successfully been carried out in this population. Thus, among other results, through specific techniques, it was identified a sub-fossil tree that reached more than 700 years of age; this tree was collected from the Răchitiş Mt. glacial hollow (Popa 2007).

Obârşia Pârâului Ilva The *species* occurrence in this site was the first time reported by Popa (p.c. 2008).

- **Bucegi Mountains Range**

Jepii Mici Mt. There is a strip (Brâna Mare) occupied by *P. cembra* population; its name is the *Creasta cu zâmbrii a Jepilor Mici*. This strip area is located in the north-western slope between 1690 and 1750 m elevation where it covers a few hectares. From this site it is possible to see the most beautiful scenery of a forest type from our country, i. e. a mixed stand of *P. cembra* and *L. europaea* var. *polonica* (Rac.) Ostf. et Syr.-Larss. Some authors have created confusions concerning the species occurrence in this part of the Bucegi Mts, such as: by mistake Grecescu (1898) has mentioned the species occurrence on the Jepii Mari; by a similar mistake, Pax (1920) reported 10 hectares of Swiss stone pine on the Caraiman Mt. The above mentioned population from the Jepii Mici Mt. exhibited an acvtive vegetation and a significant variation in age and growth (Cretzoiu & Beldie 1935), Beldie (1940). Anonymous (1952) has confirmed the existence of the population previously mentioned.

Jepii Mari Mt. Grecescu (1898) was among the first who reported the *species* at this site. At 1900 m elevation, Grinţescu (1923) has also reported the species on this mountain. Antonescu (1926) has mentioned scattered pines together with larch on the ridge of the Jepii Mari Mts. at 1750 m elevation while Cretzoiu & Beldie (1935) and Beldie (1940), have reported that definitely no *P. cembra* on this mountain.

. Caraiman Mt. Grecescu (1898) has mentioned the *species* in this site. Pax (1920) has reported that on the Caraiman Mt. towards the Jepilor Valley it covers 10 hectares while Cretzoiu & Beldie (1935) and Beldie (1940)

definitely declared that there is not *P. cembra* on the Caraiman Mt.

Colţei Valley The *species* occurs downstream from the Schitu-Ialomiţa (Grecescu 1898). Pax (1920) has also mentioned the species on the Colţei Valley, while Antonescu (1926) has reported scattered trees at 1680 m elevation on the same valley while Cretzoiu & Beldie (1935) and Beldie (1940) have reported that definitely no *P. cembra* on that valley.

Obârşia Valley The *species* occurrence on this valley was cited by Beldie (1940) and Anonymous (1952) has confirmed it.

Bătrâna Mt. The *species* occurs around the mountain top and then distributed on the west-facing slope; the upper limits occurrence is between 1849 and 1864 m elevation while small groups occur downstream from the mountain pick (Fekete & Blattny 1913, Antonescu 1926, Georgescu & Ionescu 1932).

Gaura Mt. Single *trees* are distributed up to 1810 m elevation on the northern slope towards the Bran locality; scattered trees distributed on the north western slope occur between 1820 and 1860 m elevation. (Fekete & Blattny 1913). The species existence on this mountain was confirmed by several authors, such as Antonescu (1926), Georgescu & Ionescu (1932), Beldie (1940), and Anonymous (1952).

Jepilor Valley The *species* occurrence was cited by Grecescu (1898) and Pax (1920).

Epei Valley On the north-facing slope of the Caraiman Mt. at about 1800 m elevation Antonescu (1926) has reported ten hectares covered with Swiss stone pine. Cretzoiu & Beldie (1935) and Beldie (1940) could not find *P. cembra* in this valley.

Horoabei Valley The *species* grows at about 1590 m elevation not far from the Ialomiţa Hermitage (Antonescu1926) while Georgescu & Ionescu (1932) reported that the population is located at about 1700 m elevation. Later one, the species was mentioned at 1880m elevation (Beldie 1940, according to Borza & Grinţescu in Flora Romaniae Exiccata.515a). Anonymous (1952) has confirmed the *species* in this valley. Above the Ialomiţa Hermitage two trees were found in September 1975 (Blada u.p.d).

Piciorul Babelor A few *trees* occur at about 1900 m elevation among the dwarf stone pine bushes (Antonescu1926). Between 1850-1900 m elevations the species occurrence was confirmed by Cretzoiu & Beldie (1935), and Beldie (1940) (according to Borza & Grinţescu in Flora Romaniae Exiccata.515a) and Anonymous (1952). Three scattered trees among the dwarf stone pine bushes in western facing slope of this site were found during a survey made in September 1975 and then in August 1984 year. Not far from Piciorul Babelor, namely in Sugărilor Valley a single tree was found (Blada u.p.d).

Doamnelor Valley The *species* was first reported by Georgescu & Ionescu (1932) and later one it was confirmed by Cretzoiu & Beldie (1935), Beldie (1940), and Anonymous (1952).

Dichiu Mt. 10 to 12 *trees* up to 30 years of age occur on the mountain stones at about 1400 m elevation. This young population of about 30 years old is considered to be a secondary population, which was born with the contribution of the birds, i. e. presumably, they have transported the seed here from older populations (Georgescu & Ionescu 1932). The species occurrence between 1500-1530 m elevations was confirmed by Beldie (1940) and by Anonymous (1952), as well.

Cheile Dichiului A Swiss stone pine population was found at 1110 m elevation in a glade from the Dichiu Mt.; presumably, it is a secondary population that was born from seed transported here from older populations by the birds' contribution (Georgescu & Ionescu 1932). The species occurrence was confirmed by Beldie (1940).

Zănoaga Mt. Another young *population* was found on this mountain; it is considered to be a secondary population as the previously mentioned one (Georgescu & Ionescu 1932). The species occurrence was confirmed by Anonymous (1952).

Cheile Zănoagei The *species* was noticed in canyon on the right side bank at 1350 m and then at 1480 m elevation just above the Zănoaga Canyon which is a component of the Zănoaga Mt. (Beldie 1940). The species occurrence was confirmed by Anonymous (1952).

Cheile Tătarului During a survey made in September 1975 year, a few *trees* were noticed just above the canyon (Blada u.p.d).

Between the Susaiu and Piatra Mare Mts. a clump of young *trees* was noticed (P. Cretzoiu) on a stony open area and along the foot path that connects the two mountains (Georgescu & Ionescu 1932). As nobody else reported the species occurrence on this site, it should be checked.

Cocora Mt. On this mountain, a mixed Swiss stone pine-larch stand was reported by Cretzoiu & Beldie (1935) and confirmed by Anonymous (1952).

Colţii lui Nicodim Towards the Cheile Urşilor a mixed stand with larch grows in this site (Cretzoiu & Beldie 1935).

Obârşia Valley At this site, the *species* grows mixed with *P. mugo* (syn. *Pinus pumillio*) (Cretzoiu & Beldie 1935). Based on the Grecescu P.V.B. p. 81, the species occurrence was confirmed by Beldie (1940).

Bucşoiul Mt. The *species* occurs at 1700 m elevation on the northern ridge of the mountain which is placed just above the Mălăieşti Valley (Beldie 1940).

Colţii Ţapului The *species* occurrence between 1850-1860 m elevations was mentioned by Beldie (1940).

Guţanu and Colţii Mts. then Mălăieşti and Şuchelniţei Valleys were reported as sites for the *species* (Anonymous 1952).

- **Făgăraş Mountain Range (northern side)**

Breaza Mts. The *species* occurs in the zone of the Moşuleţa sheepfold between 42° 31' and 42° 37' latitudes. The right side border of the Breaza Valley is the lower limit (1540 m elevation) of the species population while the upper limit is as high as 1830 m elevation; the *trees* exhibited a nice shape (Fekete & Blattny 1913). Pax (1919) and Antonescu (1926) have confirmed the *species* occurrence in this site while Anonymous (1952) reported it in the Brezioarei Valley (Caţavei Mt.) and in the Mogoşu Valley and Moşuleţa Mt., as well.

Mogoşu Valley This valley runs alongside the eastern slope of the Caţavei Mt.; the *species* occurs in this valley closed to the Moşuleaţa sheepfold (Czekelius 1912). The species occurrence in this site was confirmed by Antonescu (1926).

Caţavei Mt. Czekelius (1912) has first mentioned the *species* on this mountain while Antonescu (1926) has confirmed it.

Pojorta Valley Czekelius (1912) has first reported the *species* in this valley; initial occurrence was high but now only seldom scattered trees can be found. Antonescu (1926) and Anonymous (1952) have confirmed the species presence in this site.

Capra Mt. Single scattered *trees* of about 5 to 10 m in height grow on this mountain at 1700 m elevation (Antonescu1926). The species occurrence in this site was confirmed by Georgescu & Ionescu (1932) .

- **Făgăraş Mountain Range (southern side)**

Lespezi Mt. The Lespezi site is located downer Negoiul Mt.; a *tree* of 35 cm in diameter and 20 m in height was noticed at 1680 m elevation on mountain (Antonescu1926). The species occurrence was confirmed by Anonymous (1952).

Paltina Mt. The *species* was found at 1710 m elevation (Antonescu1926) and its occurrence was confirmed by Georgescu & Ionescu (1932) and Anonymous (1952).

Berevoiescu Mic Mt. The *species* was mentioned at 1700 m elevation Antonescu (1926) and its occurrence was confirmed by Anonymous (1952).

Jepii de Argeş The *species* population occurs at 1580 m elevation. (Antonescu1926).

Valea Vladului A large *population* occurs in clumps or single trees on both slopes of the Vladului Valley from its confluence with the Călţunul Brook towards upper stream. The altitudinal span is between 2000 and 2100 m or even higher; the highest occurrence is on the stony slops. Multi-aged trees and natural regeneration occur. With its many hundred trees, the Valea Vladului Valley population could be considered one of the best in Romania (Haralamb 1944-1945). Anonymous (1952) has also mentioned the species in this valley.

Râiosul Mt. The *species* distribution was mentioned on the eastern slope of the mountain towards the Budei Valley (Buia & Todor 1948). The species was also mentioned in this site by Anonymous (1952) and Ionel Popa (p.c. 2008).

Piscul Negru The *species* was noticed by Ionel Popa (p.c. 2008).

Anonymous (1952) has reported the following sites where the *species* grows: Luţele

Mici Mt., □ Bouleţul Mt. (above the Leaota Valley), □ Jorjea Mt., □ Doamnei Valley (at its drainage basin), □ Podul Giurgiului Spring and □ Muşeteica Brook.

Moldoveanu Mt. The *species* occurs on the Izvorul Moldoveanu (Anonymous (1952). In the frame of the Swiss stone pine breeding program, this population was surveyed. The old population covers about one hectare and it is set closed to the Moldoveanu Sheepfold at the upper part of the confluence of the Valea Mircea with the Izvorul Moldoveanu. Very often and abundant fructify. Administratively, belongs to the Vidraru Forest District, production unit U.P.IV, 78; 79b; 80. Seventeen trees were selected to be used in the breeding program. However, it was impossible to get seed because it was entirely eaten by nutcrackers and mice, as well (Blada u.p.d).

- **Iezer-Păpuşa Mountains Range (northern side)**

Colţii lui Andrei Mt. About 20 *trees* were found at 1700 m elevation (Antonescu 1926). Haralamb (1944-1945) has confirmed the species occurrence with the following details: 30 trees occur between the two valleys that run on the western slope of the mountain, at the timberline between 1800-1900 m elevations. Because of the mugo pine dense vegetation it was not possible to count all the trees but their number could be higher than 30. Anonymous (1952) has confirmed the species occurrence in this site.

- **Iezer-Păpuşa Mountains Range (southern side)**

Bătrâna Mt. Ten trees among the mugo pine clumps were found at about 1900 m elevation (Haralamb 1944-1945).

Plaiul lui Pătru This ridge is placed beneath the Bătrâna Mt. Four *trees* were found at the origin of the Anghel Valley (1900 m elevation) which runs towards south alongside the Plaiul lui Pătru ridge (Haralamb 1944-1945). Anonymous (1952) has confirmed the species occurrence in this site.

Iezerul Mare Mt. A population of about 160 *trees* occur from 1570 m elevation upstream, towards the south, alongside the Culmea Iezerul Mare, namely at the origin of the Pârâul Pinarul and Pârâul Sec (Câmpulung Forest District, production unit UP IV lot 47 (Blada u.p.d).

Anonymous (1952) has noticed the *species* in the following sites: □ Iezerul Mare Brook, □ Boteanu Mt. (toward the Izvorul Cascue), □ Dracşinului Mt. and □ Barbului Mt..

Păpuşa Mt. (south-facing slopes) The *species* occurs in three main sites: □ Căldările lui Cascue: these hollows are placed just beneath the Păpuşa Pick; clumps and single trees occur between 1400-1900 m elevation (Rucăr Forest District production unit UP III. □ Izvorul Cascue; a population of about 100 trees occurs in the south-facing slope at about 1650 m elevation; 31 trees were selected and used in the breeding program (Rucăr Forest District production unit UP III lot 88.b) (Blada 1997; 2003; 2007). □ Piscul cu Târlele: many single trees occur alongside ridge, closed to the sheepfold among dwarf stone pine and spruce clumps; this small population is placed in the Rucăr Forest District, production unit UP III lot 89 (Blada u.p.d).

Păpuşa Mt. (north-facing slopes) About 100 trees are spread in the Valea Barbului origin; this valley is a tributary of the Dâmboviţei River (Rucăr Forest District, production unit UP IV) (Blada u.p.d)

- **Cindrel Mountains Range**

Căldarea Iezerul Mare A number of 20 trees were found in this Large Glacial Hollow which is placed downstream from the Cindrelul Pick (Binder 1903). The species occurrence in this site was confirmed by Antonescu (1926). Lupe (1944) reported significant information about the species and site. Anonymous (1952) has mentioned the species occurrence on the Iezerul Mare brook. In the year 1965, the species occurrence was confirmed by Blada (u.p.d).

Căldarea Iezerul Mic (Small Glacial Hollow) This glacial hollow is placed downstream from the Frumoasa Pick, on the north-northwestern and western slopes. About 50 trees were found between 1742 m (lower limit) and 1902 m (upper limit) elevation. A small tree was found on western slope, at 1971 m elevation (Kimakowicz 1896). The species occurrence in this site was confirmed by Antonescu (1926); Lupe (1944) has given more details about the *species* and site and

pointed out that the Small Glacial Hollow and Large Glacial Hollows are placed at the origin of the Cibinului River but not at the Jiului River catchment as Georgescu and Ionescu (1932) have mentioned. Anonymous (1952) has reported the species occurrence on the Iezerul Mic brook. In the year 1965, the species occurrence was confirmed by Blada (u.p.d).

• Şureanu-Parâng-Lotru-Latoriţa Mountains Range

Şureanu Mt. According to Georgescu and Ionescu (1932), the species is missing from Şureanu Mt. However, a small group of about seven old trees (Nicu Hondola p.c) grow around the Şureanu Glacial Lake which is placed on the northern slope, upstream from the mountain pick. This site is located in Paradise Gates area from the Cugir Forest District, production unit U.P.IV (Blada u.p.d.).

Slivei Mt. This mountain is not far from the Parâng Mt. Only one *tree* was found at 1502 m elevation on the back of the mountain, i. e. on the Dosul Slivei. This is the lowest elevation occurrence of the *species* that can be found in both Parâng and Retezat mountains, as well. (Fekete & Blattny 1913). Pax (1919) has confirmed the *species* occurrence in the Parâng Mt. Anonymous (1952) has confirmed the species occurrence on the Slivei Mt.

Obârşia Lotrului Only one tree was noticed (September 1975) in the Câlcescu Glacial Lake area located in the Voineasa Forest District (Blada u.p.d)

Ştefleşti Mt. Without any detail, Pax (1919) has first mentioned the *species* occurrence in the Ştefleşti Mt. Important details were given by Haralamb (1948), as follows: there are two glacial lakes close to the Ştefleşti Mt. (2244m elevation), i. e. Zănoaga Juncanilor and Zănoaga Ujbei. Forty old trees and a few young ones grow closed to the Zănoaga Juncanilor while only one in the Zănoaga Ujbei. Anonymous (1952) has confirmed the species occurrence in the Ştefleşti Mt.

Muntinul Mare and Muntinul Mic Mts. A few *trees* occur at about 1750 m elevation on the saddle between the two mountains (Antonescu 1926). Anonymous (1952) has confirmed the species occurrence on the Muntin but he did not mentioned which one.

Găurele Mt. A single *tree* of 20cm in diameter and 8 m in height growths in the vicinity of the sheepfold was reported (Antonescu 1926).

Urdele Mt. Haralamb (1943) has noticed many *trees* occurring towards the Urdele and Cioara brooks and Anonymous (1952) has confirmed the species occurrence.

Cioara Mt. Twenty five *trees* occur on both eastern slope towards the Cioara-Bălescu Brook and on the western slope towards the Urdele Mt.. The scattered trees among the mugo pine bushes occur above 1680 m elevation to the mountain crest (Haralamb 1943). Anonymous (1952) has confirmed the species occurrence.

Bălescu Mt. Five *trees* on the western slope towards the Cioara-Bălescu Brook were found (Haralamb 1943). Anonymous (1952) has confirmed the species occurrence.

• Retezat Mountains Range

The *species* occurs almost allover the Retezat Mts. (Anonymous 1952).

Mormântul Fetii The *species* occurs on north-eastern slope at 1624 m elevation (Fekete & Blattny 1913). The species occurrence was confirmed by Antonescu (1926).

Radeşul Mt. The *species* was noticed between 1666 and 1774 m elevation (Fekete & Blattny 1913).

Zănoaga Mt. Occurs in clumps or single trees between 1870 and 1981 m elevation, on eastern, southern, southwestern and northeastern slopes; active natural regeneration takes place (Fekete & Blattny 1913). The species occurrence in this site was confirmed by Antonescu (1926) while Nyarady (1958) found the species between Zănoaga Glacial Lake and Judele Valley, from 1800 to 1970 m elevation.

Zănoguţa brook including its hollow and glacial lake *Occurs* on the southern slope; upper limit at 1960 m elevation (Fekete & Blattny 1913). Borza (1934) has reported many trees in this site but most of them are dead.

Judele Valley Lower limit of the *species* occurrence is about 1660 m elevation; many nice trees were found on the northern slope at 1680 m elevation (Fekete & Blattny 1913). Borza (1934) and Nyarady (1958) have confirmed the species occurrence in this val-

ley. Also, the species occurs in the vicinity of the Judele Glacial Lake (Lasc Doru p.c).

Slăvei Mt. The *species* upper limit elevation is as high as 1892 m; it is distributed on western slope (Fekete & Blattny 1913). Nyarady (1958) has mentioned the species occurrence above the Lăpuşnicul Mare Valley towards the Slăvei Mt.; the occurrence upper limit is as high as 1880 m elevation.

Şesele Occurs on northern slope, at 1860 m elevation upper limit (Fekete & Blattny 1913). Population from the Şesele Mt. is located in the Retezat National Park and belongs to the Retezat Forest District, production unit U.P.V (Adrian Ursu p.c.).

Strugar Peak The *trees* occur around the mountain peak; the species lower elevation at 1565 m (Fekete & Blattny 1913). The species occurrence in this site was confirmed by Antonescu (1926);

Lolaia The *species* upper limit is at 1759 m elevation; it is distributed on eastern and southeastern slopes (Fekete & Blattny 1913).

Stânişoara The *species* occurs on east-facing slopes from 1637 to 1899 m elevation (Fekete & Blattny 1913). Nyarady (1958) has confirmed the species presence in the Stânişoara Valley and Stânişoara Mt., as well; occurs up to 1700 m at altitude; at lower elevation grows mixed *P. abies*. The Stânişoara Basin is very rich in Swiss stone pine species; administratively belongs to the Pui Forest District, production unit U.P. VI, 158 b; 159 a, n; 160 b (Mihăilescu p.c.).

Valereasca *Occurs* in north-eastern slope, between 1668 and 1800 m elevations (Fekete & Blattny 1913). Nyarady (1958) has confirmed the species presence in the Căldarea Valereasca; this glacial hollow is placed at the origin of the Râuşor Valley at about 1620 m elevation; in the narrow hollow closed to the Valereasca sheepfold a lot of cembra pines grow among the mugo pines bushes.

Tăul Negru Glacial Lake In the surrounding area, clumps of nice *trees* were noticed by Borza (1934). This glacial lake is placed at 2045 m elevation towards west from the Căldarea Văii Pişăturile. A population of scattered trees is growing near by.

Faţa Retezatului- Zlătuia -Gemenii group This three sites form a single large population. The population is located at the Zlătuia catchments, above the Academy Laboratory House, in different facing slopes, beneath the Retezat Mt.-Bucura Gate-Judele Mt. arch (Blada u.p.d). Fekete & Blattny (1913) have first mentioned that on the Faţa Retezatului the species climbs up to 1986 m elevation. However, a few very young trees naturally regenerated were found in the upper side of the Faţa Retezatului, at about 2050 m elevation (Blada 2007). Then Nyarady (1958) reported, the species occurrence in the Zlătuia Valley and in the Gemenele Glacial Lake area, as well. Upper from the Gemenele Lake, there is another lake, namely Gemenele de Sus (perhaps Tăul Caprelor and Tăul Iedului?) at 2066 m elevation; beneath these two lakes, a few scattered trees growth mixed dwarf stone pine. Oarcea (1966) has offered more information about the species in the Zlatuia-Gemenii hydrographic basin, such as: very good state of vegetation; periodical abundant fructification; very active natural regeneration; multi-age population; variable tree heights between 15 and 17 m, occasionally higher; population area 134.5 hectares; yield 60 cubic meters per hectare or a total of 8020 cubic meters wood mass. More recently field investigations carried out (2006 year) in this site have yielded new information about the population from the Faţa Retezatulu slope. In brief, it should be stressed that (Blada u.p.d):

- Fekete & Blattny have erroneously place the Faţa Retezatulu in the eastern slope; it is exposed in a south-western facing slope;
- this site forms a common body with the Gemenele Glacial Lake area being separate by the Zlătuia Brook;
- these two sites host a very nice and large and multi age virgin population distributed across them;
- it is roughly estimated that the whole population incorporates more than 4000 trees including the younger ones;
- natural regeneration is very active, mostly across the pasture land free of dwarf stone pine bushes from the Faţa Retezatulu (Blada u.p.d).
- 150 plus trees or ordinary trees were selected within this population; in order to test their genetic worth, the selected trees were used in provenance, half-sib and full-sib trials (Blada, 1994, 1997; 1999; 2003 ; 2007).
-thanks to the Academy Laboratory House

presence in the heart of the area, many research activities were carried out in this and some other populations from the Retezat Mts.

Dosul Retezatului The *species* population in this site is placed in a north east-facing slope and it is connected to the scattered population which occurs along the Lolaia Ridge (Blada u.p.d). It climbs upper than the Fața Retezatului population; a few trees group have reached about 2200 m elevation; this is the highest elevation of the species from the Retezat Mountains Range (Geo Sârbu p.c).

Râușor Valley The species occurs towards origins of the Ştevia and Valereasca Valleys and Ştevia Lake, as well; this zone is placed in north-facing slope beneath the Retezat Massif. Main detail about population: very good and active state of vegetation; periodical abundant fructification and very active natural regeneration; multi-age population; tree height vary between 15 and 17 m, occasionally higher. The population covers 5.9 hectares and standing volume 105 cubic meters per hectare or a total of 620 cubic meters wood mass (Oarcea 1966). This site belongs to the Retezat Forest District, production unit U.P.I, lot numbers 19 B; 20 B; 21 B; 23 B (Adrian Ursu p.c).

Căldarea Văii Pişăturile This glacial hollow is placed towards west from the Judele Mt. and closed to the Tăul Negru: the *species* occurs from 1700 to 1930 m elevations (Nyarady 1958).

Vasiel *Occurs* in southern slope, upper limit at 1708 m elevation (Fekete & Blattny 1913). The species occurrence on the Vasiel meadow was confirmed (Vonica Iancu jr. p.c).

Vârful Mare Mt. *Occurs* beneath the mountain pick in the south-west facing slope; upper limit at 1790 m elevation (Fekete & Blattny 1913).

Râul Bărbat Valley *Occurs* in the eastern and north-eastern slopes, at altitudes from 1650 to 1873 m elevations. Ciumfu Lake: the species upper limit is at 1884 m elevation, in north-eastern slope; at 1813 m upper elevation limit in north-western slope; at 1878 m upper elevation limit in south-eastern slope; at 1750 m upper elevation limit when grows on the bottom of the main river (Fekete & Blattny 1913). Later on, metric and other useful data about the population performances were reported, such as: very good and active state of vegetation; periodical abundant fructification; active natural regeneration; multi-age population. The trees heights varied between 15 and 17 m, occasionally higher. The population covers 21.3 hectares and standing volume 87 cubic meters per hectare or a total of 1850 cubic meters standing volume (Oarcea 1966). At its origin or catchment, namely upstream from the Stâna de Râu Sheepfold, the population occurs on both side of the valley were 25 plus trees were selected and used in the breeding program (Blada u.p.d); at the origin of the Râul Bărbat Valley, namely on its right slope, on the Custurii Brook towards the Ciumfu and Custurii lakes, many trees were noticed; the whole area belongs to the Pui Forest District, production unit U.P.V lot 95c; 95d; 96d; 97; 102b; 102c (Iancu Vonica jr. p.c).

Păpuşa Mt. *Occurs* in north-western slopes; upper limits varying between 1789 and 1824 m elevation (Fekete & Blattny 1913).

Pleaşa Mt. Occurs on calcareous rocks in both north-eastern and southern slopes; upper limits at 1778 and 1830 m elevation, respectively (Fekete & Blattny 1913).

Piatra Albă Piule *Occurs* on north-eastern slopes; 1860 m upper limit associated with calcareous rocks (Fekete & Blattny 1913).

Colțul de la Scoaba Retezatului When grows between 1600-1750 m elevation, the *P. cembra* occurs mixed other species, such as *P. abies* and *P. mugo*. The cembra pine trees occurrence is about three times less than those of the other two species (Nyarady 1958).

Nucşoara Valley The valley origin is placed beneath the Vârful Mare Mt. The field data collected by Oarcea (1966) are: very good and active state of vegetation; periodical abundant fructification and very active natural regeneration; multi-age population; variable height trees from 15 to 17 m, occasionally higher. The population covers 4.6 hectares and standing volume 152 cubic meters per hectare or a total of 700 cubic meters wood mass. New investigation (Blada u.p.d) revealed that the Nucşoara Valley starts downstream from the confluence of the Pietrele and Stânişoara Valleys; however no Swiss stone pine occurs down the Nucşoara Valley. A very large and nice population formed of many hundreds old

trees is distributed on the left side slope of the Pietrele Valley, across the whole north-facing slope of the Stânişoara Ridge. Most likely, this could be the Pietrele population reported by Nyarady (1958) and described by Oarcea (1966). In the previously described population (Pietrele), a lot of plus and non plus trees were selected and used in the Romanian Swiss stone pine breeding program that the provenance test data revealed out of 12 provenances, the Pietrele one exhibited the fastest height growth (Blada 1997). The Pietrele population is distributed in the Pui Forest District, production unit VI 154 b; 155 a, b (Mihăilescu p.c).

Rea Valley The *species* climbs up towards its glacial lakes at about 1870 m elevation (Nyarady 1958). A rich population consisting in clumps and scattered trees can be found in this site that administratively belongs to the Pui Forest District, production unit VI, lot 150 a, b and 151 a, b (Mihăilescu p.c.).

Galeşul Valley and Galeşul Glacial Lake The species occurs in these two closed sites which administratively belong to the Pui Forest District, production unit VI lot 149 b (Doru Lasc p.c).

Piciorul Colţului The species was noticed by Nyarady (1958) and confirmed by Lasc Doru (p.c 2008 year).

Bucura Valley Nyarady (1958) has notice the *species* downstream from the Bucura Glacial Lake and Lasc Doru (p.c) has noticed it in the surrounding area of the Bucura Glacial Lake.

Zlata Mt. zone Recently, Lasc Doru (p.c) has reported the species occurrence in the above mentioned site.

Crligul Valley beneath the Ardeş Pick The *species* distribution in this site was reported by Lasc Doru (p.c).

Lăpuşnicul Mare Valley-Borăscu Mare Mt. This population is less performing than those from Zlatuia-Gemenii hydrographic basin, Râuşor and Râuşor Valleys. Anyway, the multi-age population grows actively, periodical abundant fructification, very active natural regeneration. Individual tree height varies between 15 and 17 m, occasionally higher. The population covers 44.5 hectares and standing volume 42 cubic meters per hectare or a total of 1890 cubic meters wood mass. Note: Lăpuşnicul Mare Valley and Borăscu Mare Mt belong to different mountain ranges but they belong to the same environment; this is the reason why they were put together (Oarcea 1966). Administratively, the whole area belongs to the Retezat Forest District, units 27; 28, 29; 30; 31; 32; 33; 34; 35; 36; 37; 38; 39; 40; 41; 45; 46; 47; 48; 49; 52 (Adrian Ursu p.c).

- **Ţarcu Mountains Range**

Groapa The *species* occurs on northeastern facing slope; upper limit at 1729 m elevation. (Fekete & Blattny 1913).

Mătania Mt. The *species* occurs from 1628 to 1870 m elevations, on the north-eastern slope (Fekete & Blattny 1913). Pax (1919) has reported the species occurrence in the same site without details. Antonescu (1926) has erroneously attributed the Mătania Mt. and Mătania Brook to the Cernei Mts.; they belong to the Godeanu Mts. Range (Georgescu & Ionescu 1932). On the north-northeastern slope of the mountain, the species occurs between 1628 and 1870 m elevations while at the origin of the Mătania Brook the species climbs up to 1851 m elevation (Antonescu 1926). Anonymous (1952) has confirmed the species occurrence on this mountain. On the north-northeastern slope of the Custura Mătaniei, Popova-Cucu, Niculescu, (1961) have reported the most compact populations of *P. cembra* in that zone.

Dealul Negru Mt. The *species* occurs on the north-eastern slope, at 1694m elevation where, Kofalusi found, only one tree (Fekete & Blattny 1913). In the same site, Pax (1919) and Anonymous (1952) have mentioned the species occurrence without details while Antonescu (1926) has erroneously attributed the Dealul Negru Mt. to the Cernei Mts.; it belongs to the Godeanu Mts. Range (Georgescu & Ionescu 1932).

Baicu Mt. The *species* climbs up to 1800 m elevation (Fekete & Blattny 1913). Pax (1919) has mentioned the species occurrence without details. Antonescu (1926) has erroneously attributed the Baicu Mt. to the Cernei Mts.; it belongs to the Godeanu Mts. Range (Georgescu & Ionescu 1932). The species occurs on the northern slope of the Baicu Mt (Georgescu & Ionescu 1932) while Anonymous (1952) has confirmed the species occur-

rence on this mountain but without any detail.

Şaua Iepii (between Baicu and Custurii Pick) The species occurs as singly trees on this site (Lasc Doru p.c).

Ştevia Valley and Ştevia Hollow The species occurrence was reported by Lasc Doru (p.c).

- **Godeanu Mountains Range**

Paltina Mt. and Paltina Valley The *species* occurs in northern-facing slope; its upper limit is at 1795 m elevation (Fekete & Blattny 1913).

Borăscu Mt. On the western slope the *species* reaches 1948 m elevation, and 1837 m on the northwestern one (Fekete & Blattny 1913). The species occurrence was noticed in two glacial hollows from Borăscu Mt., i. e. Caldarea Mica and Caldarea Galbena; at 1800 m elevation in each of these two glacial hollows only few trees were found among the dwarf stone pine clumps (Popova-Cucu, Niculescu, (1961).

Stâna din Borăscu The lower limit of the *species* occurrence was found at 1640 m elevation (Fekete & Blattny 1913). In the same site, a few old trees occur above the timberline at about 1700 m elevation; then the species is distributed on the left side slope of the valley, above the glacial hollow, from 1740 to 1800 m elevation, (Popova-Cucu, Niculescu 1961).

Branu Mt. The *species* occurs on northern and eastern slopes with upper limits at 1814 and 1775 m, respectively (Fekete & Blattny 1913). Popova-Cucu, Niculescu, (1961) has reported the species in the Branu Sheepfold and Zănoaga din Branu.

Mâţului Valley The *species* occurs in the valley origin and between 1650 and 1800 m elevation in the vicinity of the glacial lake. A lot of trees were spread alongside the path that climbs on the left side slope of the Valley towards the Branu Sheepfold in southeastern facing slope. Some other clumps were found on the right side slope of the valley in north-northeastern facing slopes, i. e. upstream and downstream from the glacial lake (perhaps Moraru Lake ?). A number of about 200 trees were counted on the whole valley (Popova-Cucu, Niculescu 1961).

Gugu Mt. The *species* occurs in the zone of the Gugu Glacial Lake (Doru Lasc p.c).

Distribution Map

Based on the previously presented data concerning the *P. cembra* species occurrence on locations, a digital map (GIS) of the Romanian Carpathians was elaborated (Map 1). Then the digital map of the *P. cembra* natural distribution at European level was compiled (Map 2); this map was taken from Schmidt (1994) and updated with the species distribution in the Romanian Carpathians taken over from the Map 1. It is stressed that the species range from outside Romania belongs to Schmidt (1994). The digital operations were made by forest engineer Adrian Lorenţ from the Geoinformatics Laboratory of the Bucharest Forest Research & Management Institute. The range map in the article shows in general where the species grows naturally; the exact boundary of its range is often uncertain. Within the range, the species abundance varies from place to place i.e. not all drawn or hachured mountains and valleys on the map are fully occupied by species. Also groups of few individuals or even small populations might be located outside of the boundary depending on local environment conditions and on the precision of the information source.

Conclusions

A comprehensive survey of literature concerning the *P. cembra* distribution across the Romanian Carpathians was done. In addition, data recorded by the author during his field survey and information supplied by other people, were incorporated in this paper.

Based on all acquired data, a GIS digital map of the species distribution in the Romanian Carpathians was elaborated.

By incorporating the Romanian updated map in the Schmidt's (1994) map, resulted the updated digital map at European level.

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ple who contributed to this paper, such as: Forest engineer Adrian Lorenț (who has prepared the digital map); Dr. Gheorghe Pânzaru, Dr. Ionel Popa, Forest engineer Ioan Muntean, Forest engineer Adrian Ursu, Forest engineer Alexandru Mihăilescu, Forest engineer Iancu Vonica Jr., Technician Geo Sârbu and Mr. Doru Lasc contributed with useful information concerning the species occurrence in different zones of the Carpathians Range.

Supplementary Notice

For the author of this paper, is extremely unpleasant to let the readers know that his data concerning *P. cembra* distribution map across Romanian Carpathians were plagiarized. Perhaps, the next, not too long story, explains enough the situation.

In 2003, a draft of a leaflet entitled "Technical guidelines for genetic conservation and use of Swiss stone pine (*Pinus cembra*)" was received from Drs. Marcus Ulber[1], Felix Gugerli[1] & Gregor Bozic[2]. The draft was sent on behalf of the EUFORGEN program, which runs under the International Plant Genetic Resources Institute (IPGRI) located in Rome;

. they have asked me to check and improve that draft;

. my answer was positive but only if my name is included among the coauthors;

. after a month or so, the condition to be accepted as coauthor was rejected;

. a few months later, a *P. cembra* distribution draft map at European level (the Schmidt 1994 variant) was received from Dr. Michelle Bozzano who is the EUFORGEN and IPGRI representative; he asked me to update that map for Romania;

. the Michelle's request was the guarantee that I was accepted as coauthor of the leaflet; consequently, based on my unpublished data, the *P. cembra* distribution map in the Romanian Carpathians was updated and sent it to him; as evidence, a copy from that map, was inserted in this paper (Map 3);

. under the EUFORGEN logo, the leaflet containing the map without mentioning my contribution for the Romanian Carpathians was published (Ulber[1], Gugerli[1] & Bozic[2] 2004); it means that the leaflet authors together with Dr. Bozzano, have plagiarized my work; in such cases, the BBS English Dictionary says: *if someone plagiarizes another person's idea or work, they use it or copy it and pretend that they thought of it or created it.*

To demonstrate that my map was plagiarized, four types of maps are presented in this paper, such as;

. Map 1 which represents the author's digital map of the *P. cembra* natural distribution in the Romanian Carpathians whose elaboration was based on all data previously presented in this paper;

. Map 2 is the digital map of the *Pinus cembra* natural distribution at European level; this map was taken from Schmidt (1994) and updated with the species distribution in the Romanian Carpathians taken over from Map 1. It is stressed that the species range from outside Romania belongs to Schmidt (1994).

. Map 3 is the scanned draft map received from M. Bozzano in which the species range in Romanian Carpathians was updated by the author of this paper.

. Map 4 is a segment of the last page of the published leaflet by Ulber, M., Felix Gugerli, F. & Gregor Bozic, G. (2004).

The comparison of these maps reveals the previously mentioned plagiarism.

In conclusion, the author of the present paper is expecting written apology in Silvae Genetica or Forest Genetics, from Doctors Marcus Ulber[1)], Felix Gugerli[1)] & Gregor Bozic[2)]& Michelle Bozzano, as well. Conversely, they may prove, through a similar published paper, that their map was based on their own data; otherwise, their action of plagiarizing remains validated and notice will be circulated by the senior plagiarized author to the main international journals and forest research institutes.

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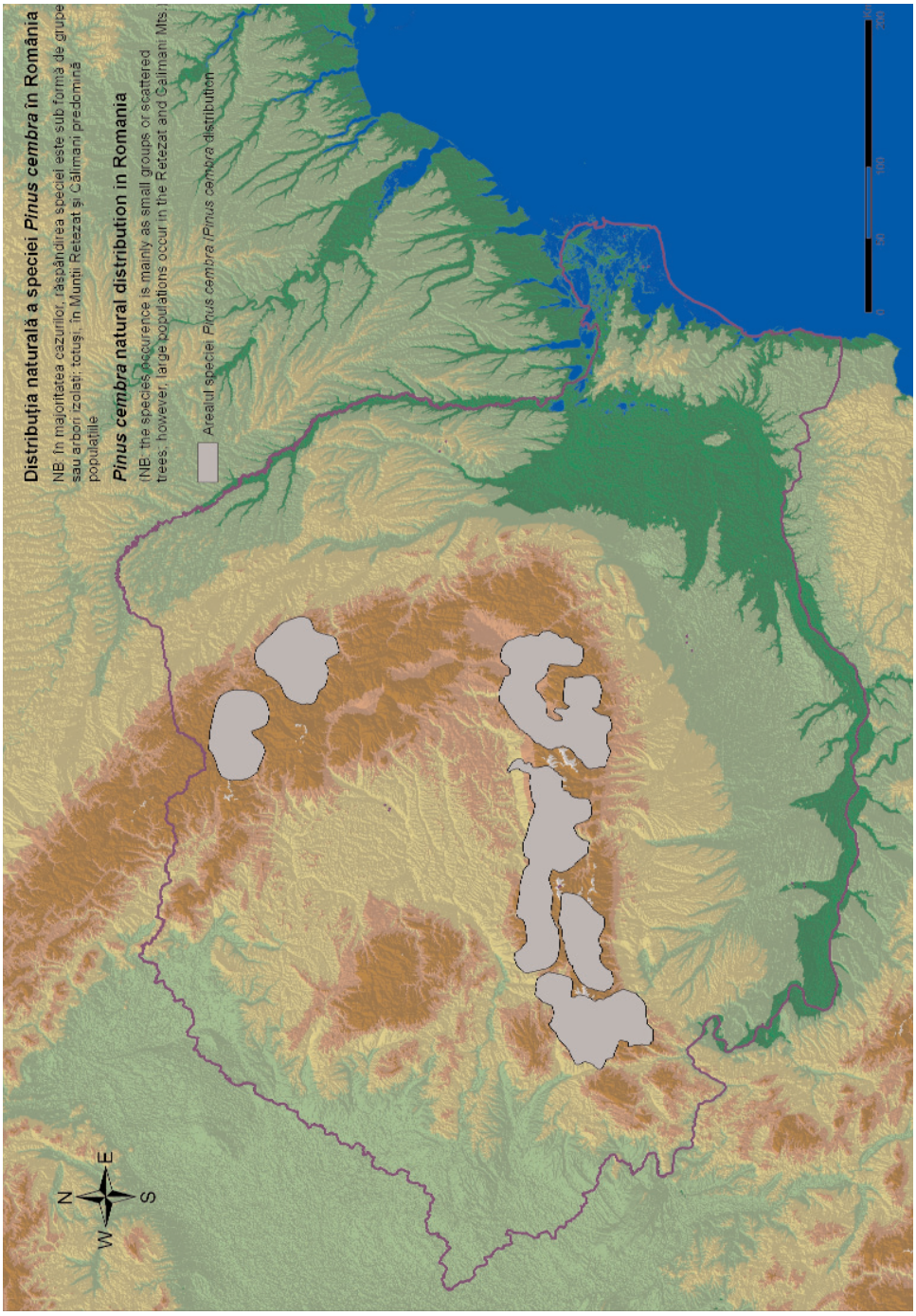
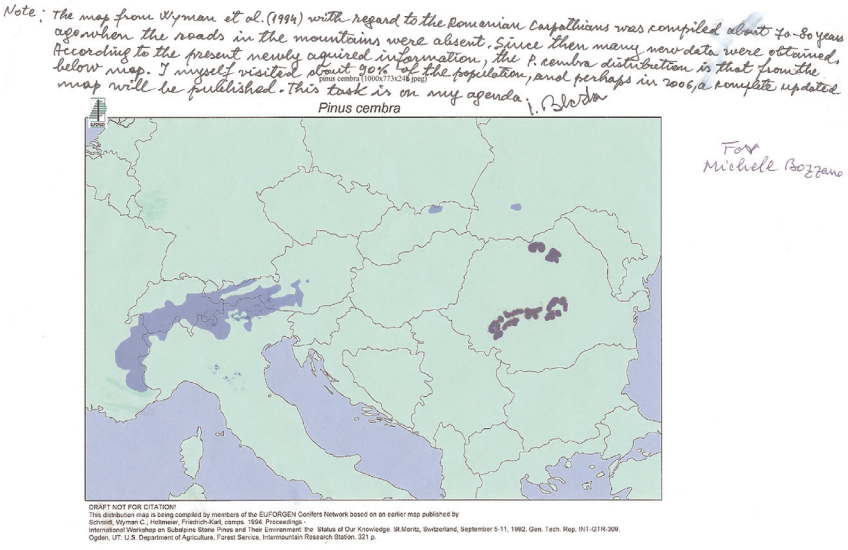
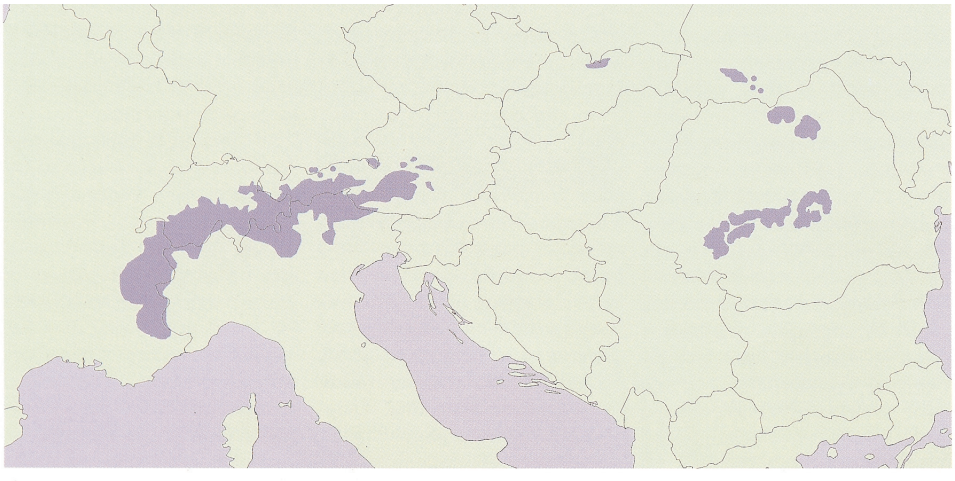


Map 1 Digital map of the *Pinus cembra* natural distribution in the Romanian Carpathians (Original I. Blada). The map shows where the species grows in general; however, it does not mean that all hachured mountains and valleys are fully occupied by species.

Map 2 Digital map of the *Pinus cembra* natural distribution at European level; this is the Schmidt's (1994) map updated with the species distribution in the Romanian Carpathians taken over from the Map 1. It is stressed that the species range from outside Romania belongs to Schmidt (1994).



Map 3 The scanned draft map received from M. Bozzano in which the species range across Romaian Carpathians was updated by the author of this paper (see the difference in the color intensity). In this form, the map was mailed to M. Bozzano. The hand written text above the map demonstrates the originality of the improved species range.



protection purposes. For plantations near the tree limit, the venances can facilitate a more regular supply of seeds.

Static *ex situ* conservation of reproductive material of *P. cem-*

Map 4 A scanned segment from the last page of the published leaflet by Ulber, Gugerli & Bozic (2004)