

***Sphagnum centrale* and other remarkable bryophyte records from the Kaçkar Mountains (Northern Turkey)**

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Abstract – Data on the occurrence of some rare bryophyte taxa in the Kaçkar Mountains in Turkey are presented. Besides, *Sphagnum centrale* C.E.O.Jensen is first reported from Turkey, extending its distribution range to the Caucasus.

Bryophyte / Mosses / Liverworts / *Sphagnum centrale* / Turkey

The Kaçkar mountain range is the third most important glacial region in Turkey, after the Ağrı (Ararat) and Cilo-Sat Mountains (Fındık, 2001) (Fig. 1). A collecting trip was made to the vast granitoid unit of this mountain chain, focusing on the natural biotopes best preserved. The wooded slopes showed a high diversity of aspects with many natural types of oriental spruce, beech, common alder, hornbeam, chestnut, boxwood and Rhododendron species. The northern slopes of the Kaçkar Mountains subject to Oceanic climate are the rainiest parts of Turkey. On the contrary, the climate of the eastern and southern slope boundaries including Yusufeli and its surroundings is sub-mediterranean (Fındık & Melikoğlu, 2001).

The singularity of the area is due to its climate and geographical diversity, and is reflected in the presence of rare or biogeographically interesting bryophytes.

The study was carried out in course of the spring and summer of both 2004 and 2006. Different habitats were prospected (e.g. shaded rock crevices and exposed rocks, tree barks, decayed logs, and stream sides, etc.).

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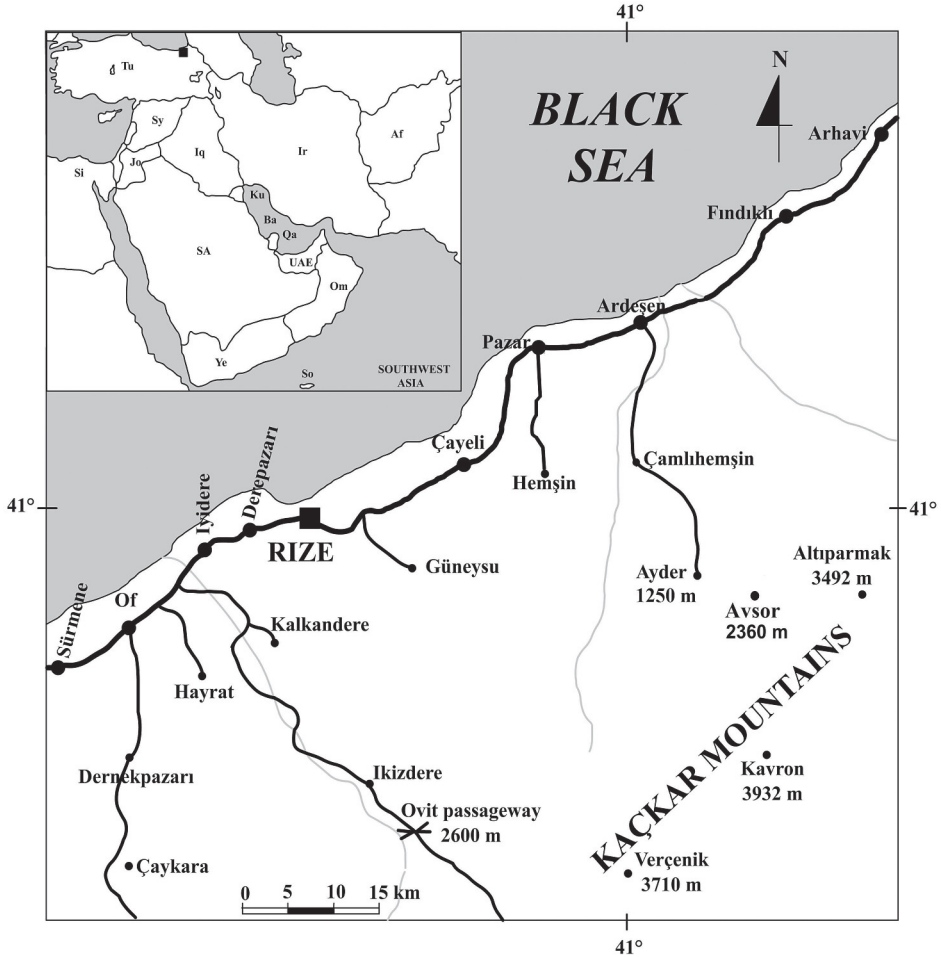


Fig. 1. The study area.

The locations of the collection sites are listed in the appendix I. The localities belong to A4 grid-square according to Henderson's (1961) system.

The numbers from 21 to 25 correspond to localities in the boundaries of Artvin province, while the others belong to Rize province.

Voucher specimens were deposited in the private herbarium of Abay (Çankırı), Uyar (Zonguldak) and Keçeli (Çankırı). Nomenclature of the species follows Grolle & Long (2000), Ros *et al.* (2007) for liverworts and Hill *et al.* (2006) for mosses.

Atrichum tenellum (Röhl.) Bruch & Schimp. – Site 16 (on non-calcareous soil).

This subboreal species was compiled in former check-list of the mosses of Turkey, based on Walther's collection in Herb. HBG (Çetin, 1988). Until now it

had not been recorded anywhere else in Turkey. Its nearest localities mentioned in southwestern parts of Bulgaria were based on literature before 1956 (Natcheva & Ganeva, 2005), Ukraine, Moldova and southern part of Urals (Ignatov & Afonina, 1992). This report contributes a remarkable range extension of this species towards the Caucasus region.

Brachythecium geheebii Milde – Site 10 (on calcareous rock).

This subcontinental mountain species was first recorded in Turkey from the Province of Bayburt (Müller, 1998). This record contributes to its known range in the Caucasus region (Ignatov & Afonina, 1992).

Campylopus subulatus Schimp. ex Milde – Site 2 (on sandy acid soil).

This rare suboceanic species usually prefers low elevations in distribution pattern in Europe. So in middle Europe it occurs scattered up to 700 meters elevation (Frahm & Vitt, 1978) and its first collecting locality in Turkey; Rize Province, beside mainroad ca 5 km west of Çayeli town, ca. 10 m a.s.l. on moist soil near hillside, was low altitude (*coll. Nyholm*, Herb. S), whereas in this study it was collected from a rather high locality (Ayder high plateau ca 1350 m a.s.l.) than it had been in Turkey.

Cephalozia pleniceps (Austin) Lindb. – Site 18 (on wet soil).

The earliest mention of this arctic mountain species was reported by Walther (1967) from Bursa Province. Since then, it has not been recorded again in Turkey.

Diplophyllum taxifolium (Wahlenb.) Dumort. – Sites 5 (on wet soil) and 19 (on boulders).

Until now, this Mediterranean alpine species was known from only one locality in Eastern Black Sea Region of Turkey (Schiffner, 1907).

Hamatocaulis vernicosus (Mitt.) Hedenäs – Sites 19 (on wet acid soil) and 21 (on wet rocks).

The first report of this rare circumpolar-montane species in Turkey corresponded to Artvin province (Henderson, 1961).

Heterocladium heteropterum (Brid.) Schimp. – Sites 24 and 25 (on damp rock close to stream)

Until now, this temperate-suboceanic species had been recorded in Turkey from only two localities (Keçeli & Çetin, 2000; Çetin, 1993). The new records contribute to its known range in the Caucasus region (Ignatov & Afonina, 1992).

Isopterygiopsis muelleriana (Schimp.) Z.Iwats. – Site 2 (on wet soil in sheltered crevices)

This suboceanic-montane species had been recorded in Turkey by Henderson & Muirhead (1955), and had not been recorded anywhere in Turkey so far.

Isothecium holtii Kindb. – Site 19 (on dead tree trunk).

This mediterranean hemiboreal species was known in Turkey only from Marmara Region, at lower altitude (Uyar & Ören, 2005), whereas in this study it was collected from a rather high locality (Amlakit plateau, ca 2000 m a.s.l.) than it had been in Turkey. This new finding extends its distribution range to the Eastern Black Sea region in Turkey.

Jungermannia obovata Nees – Site 6 (on wet rock)

This Mediterranean mountain species was first recorded in Turkey from Rize Province, by Henderson & Muirhead (1955).

Lepidozia reptans (L.) Dumort. – Site 19 (on dead tree trunk).

This alpine species was first recorded in Turkey from Eastern Black Sea Region by Schiffner (1907).

Lophozia incisa (Schrad.) Dumort. – Sites 12 (on decaying logs) and 18 (on damp soil).

Until now, this arctic mountain species was known in Turkey only one locality (Crundwell & Nyholm, 1979).

Pedinophyllum interruptum (Nees) Kaal. – Sites 1 (submerged on rock) and 11 (on wet soil).

This mediterranean species previously was known in Turkey only from Western Black Sea Region, at lower altitude. These new findings extend its distribution range to the Eastern Black Sea region in Turkey.

Pseudoleskea radicata (Mitt.) Macoun & Kindb. – Sites 7 (on rock surfaces) and 22 (on exposed boulder).

This subarctic-alpin species was first recorded in Turkey from in Ankara Province; Kızılcahamam Soğuksu National Park (Çetin & Uyar, 1999). This new record extends its distribution range to Northeast Turkey.

Racomitrium ericoides (Brid.) Brid. – Sites 1, 5 and 16 (on rocks)

Although this suboceanic-boreal species is widely distributed in Europe, so far it had been reported from only two localities in Turkey (Henderson & Muirhead, 1955; Walther, 1967).

Racomitrium macounii Kindb. – Sites 11, 13 and 16 (on rocks).

Racomitrium macounii is an altimontane, Euro-American moss species. Nevertheless, it finds in a relatively small area in the western part of North America. Besides, this species has only very recently been recorded in Europe (Ochyra & Szmajda, 1990). In Europe it is relatively frequent in the Alps, where it occurs in alpine zone at elevations between 1900 and 2700 m in Steiermark of Austria and Switzerland respectively. In this study, collected specimens in the area were identified as *R. macounii* subsp. *alpinum* (E. Lawton) Frisvoll but according to Hill *et al.*, (2006), both *R. macounii* subsp. *macounii* and *R. macounii* subsp. *alpinum* are synonyms of *Racomitrium macounii* Kindb. In fact *R. macounii*

subsp. *macouni* does not seem to be known from Turkey. Its closest localities are in Romania and Bulgaria. However, *R. macounii* subsp. *alpinum* has been reported without precise locality information from NE Turkey, and from Caucasus and the Carpathians (Frisvoll, 1988).

**Sphagnum centrale* C.E.O.Jensen – Sites 6, 7, 13 and 26 (on wet soil).

Although this subalpine-montane species is assumed by some authors in Europe as a variety of *S. palustre* L., most authors both in Europe and North America treat it as a distinct species (Hill *et al.*, 2006; Daniels & Eddy, 1985). Actually, in cross section the elliptic and centrally located chlorophyllose cells separate it from *S. palustre* whose triangular shaped cells are exposed on the ventral surface. Close observation of the branch leaf cell structure on both the upper and lower surfaces will eliminate the necessity of cutting cross-sections since the chlorophyllose cells can be seen on the upper surface of *S. palustre* plants. *Sphagnum centrale* can be difficult to distinguish but again examination of both surfaces of branch leaves is critical. The walls of hyaline cells have gaps between the adjacent cells on both surfaces in *S. centrale* which contrasts with those of *S. magellanicum* that has the walls of the hyaline cells in contact throughout their length on both surfaces.

Although the Turkish materials match the available descriptions of *S. centrale*, it differs by its stem leaves with notched apex (Figs 2-11). This plant is common in northernmost areas and has a subcontinental distribution in Europe. Nevertheless, it is new to Turkey (Uyar & Çetin, 2004). The nearest localities of *S. centrale* are situated in the Caucasus (Ignatov & Afonina, 1992) and Bulgaria (Natcheva & Ganeva, 2005; Hájková & Hájek, 2007).

Sphagnum compactum Lam. & DC. – Sites 6 (on wet soil at margins of pools) and 14 (on damp soil in subalpin grassland).

This oceanic boreal species is was previously known in Turkey only one locality in A4 grid-square (Handel-Mazzetti, 1909). Here it is reported two localities in the same grid after one century.

Sphagnum platyphyllum (Lindb. ex Braithw.) Warnst. – Sites 7 (in peat bog) and 14 (on wet soil in subalpin meadows).

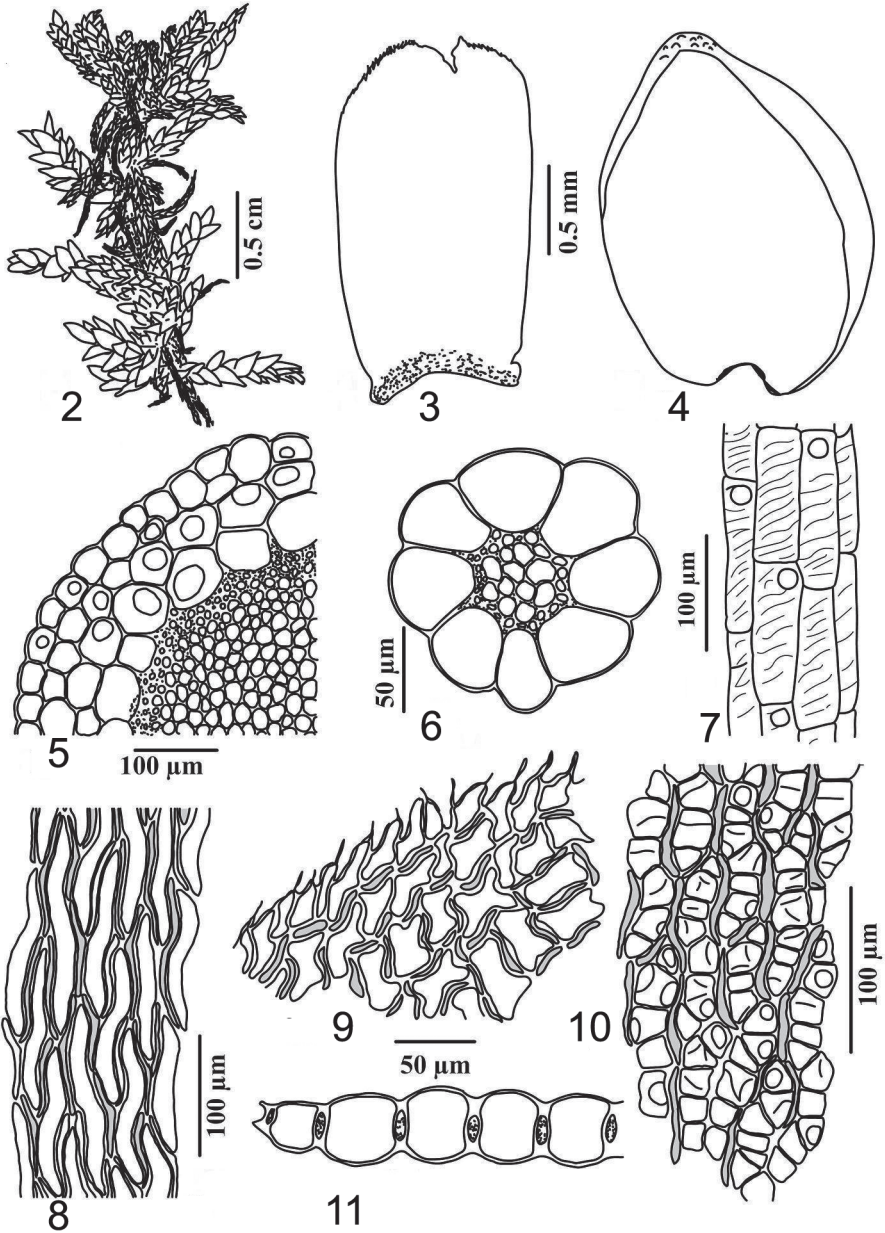
This montane-alpine species until now had been recorded in only one locality (Walther, 1967).

Sphagnum subsecundum Nees – Sites 7 (in peat bog) and 15 (on wet rock).

The previous records of this mountane-boreal species in Turkey have been reported from A1 grid-square (Walther, 1967) and A4 grid-square (Handel-Mazzetti, 1909). The nearest localities of *S. centrale* are situated in the Caucasus (Ignatov & Afonina, 1992) and Bulgaria (Natcheva & Ganeva, 2005; Hájková & Hájek, 2007).

Tritomaria exsecta (Schmidel ex Schrad.) Loeske – Sites 5, 6, 7 (on rock in peaty banks); 11, 15 (on wet soil).

This oceanic montane boreal species was first recorded in Turkey from the province of Giresun (Crundwell & Nyholm, 1979).



Figs 2-11. *Sphagnum centrale* C.E.O.Jensen – 2. Habit. 3. Stem leaf. 4. Branch leaf. 5. Cross section of stem. 6. Cross section of branch. 7. Hyalodermis cells of branch. 8. Cells at middle of stem leaf. 9. Cells near apex of stem leaf. 10. Cells at the middle of branch leaf. 11. Cross section of branch leaf.

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APPENDIX I

- 1 Turkey: Rize province, Çamlıhemşin town, in the district of Ayder plateau, 40° 57' 20.4" N 41° 05' 57.4" E, 1230 m a. s. l., near stream bed in dense woodland.
- 2 Turkey: Rize province, Çamlıhemşin town, in the vicinity of Ayder plateau, 40° 57' 25.5" N 41° 06' 10.9" E, 1350 m a. s. l., in oriental spruce forest.
- 3 Turkey: Rize province, Çamlıhemşin town, around of the Firtına stream, 40° 57' 16.3" N 41° 05' 83.9" E, ca 1150-1200 m a. s. l., riverbed with common alder.
- 4 Turkey: Rize province, Çamlıhemşin town, around of Palovit waterfall, 40° 56' 38.5" N 41° 59' 17.1" E, 925 m a. s. l., mixed deciduous forest.
- 5 Turkey: Rize province, Çamlıhemşin town, between Çat village and Elevit plateau, 40° 51' 39.9" N 40° 59' 56.0" E, ca 1750-1800 m a. s. l., steep slopes covered with oriental spruce.
- 6 Turkey: Rize province, Çamlıhemşin town, upwards from Kavron plateau, 40° 53' 00.1" N 41° 07' 52.6" E, 2300 m a. s. l., subalpine meadows sometimes with *Sphagnum* peats.
- 7 Turkey: Rize province, Çamlıhemşin town, between Kavron plateau and Kaçkar summits, around Mezovit pond, 40° 51' 0.89" N 41° 08' 67.7" E, 2850 m a. s. l., subalpin meadows occasionally with *Sphagnum* peats.
- 8 Turkey: Rize province, Çamlıhemşin town, between Çiçekli and Kale plateaus, 40° 48' 41.6" N 40° 56' 15.0" E, ca 1800-1850 m a. s. l., mixed orientalis spruce and deciduous forest.
- 9 Turkey: Rize province, Çamlıhemşin town, Kale village, Upper parts of Kale plateau, 40° 47' 11.4" N 40° 58' 29.1" E., ca 2270-2300 m a. s. l., meadows and marshy places.
- 10 Turkey: Rize province, Çamlıhemşin town, Verçenik mountain, 40° 47' 00.4" N 40° 54' 08.2" E, 2300 m a. s. l., subalpine meadows.
- 11 Turkey: Rize province, Çamlıhemşin town, Kemerli Kaçkar mountain, 40° 56' 17.2" N 41° 12' 01.1" E, ca 2650-2700 m a. s. l., around of a glacier lake on northern slope of the mountain.
- 12 Turkey: Rize province, Çamlıhemşin town, between Kavrun plateau and Galerüzü district, 40° 55' 02.7" N 41° 08' 46.1" E, 1950 m a. s. l., mixed oriental spruce and Caucasian fir.
- 13 Turkey: Rize province, Çamlıhemşin town, Meydan village, Kolona district, 40° 54' 21.9" N 40° 56' 52.4" E, ca 950-1000 m a. s. l., deciduous trees, Caucasian fir and especially with *Buxus sempervirens* mixed forest in this locality.

- 14 Turkey: Rize province, Çamlıhemşin town, Tirovit plateau, 40° 51' 37.3" N 41° 04' 01.8" E., ca 2450-2500 m, subalpine meadows.
- 15 Turkey: Rize province, Çamlıhemşin town, Yukarı Ceymakçur plateau, 40° 53' 34.7" N 41° 10' 27.5" E., ca 2300-2400 m, subalpine meadows.
- 16 Turkey: Rize province, Çamlıhemşin town, Yukarı Ceymakçur plateau, 40° 53' 08.3" N 41° 10' 22.6" E., ca 2550-2600 m, subalpine meadows.
- 17 Turkey: Artvin province, Yusufeli town, northern slopes of Altıparmak mountains, 40° 57' 21.7" N 41° 13' 20.1" E., ca 2800-2850 m, subalpine bare rocky place.
- 18 Turkey: Artvin province, Yusufeli town, northeastern slopes of Altıparmak mountains, 40° 57' 53.0" N 41° 13' 85.2" E., ca 3050-3070 m, cliff places.
- 19 Turkey: Rize province, Çamlıhemşin town, Amlakit plateau, 40° 54' 06.7" N 41° 04' 41.5" E., ca 1950-2000 m, *Picea orientalis* woods.
- 20 Turkey: Rize province, Çamlıhemşin town, Kito forests, 40° 55' 20.6" N 40° 55' 24.2" E., ca 1555 m, riverbed.
- 21 Turkey: Artvin province, Yusufeli town, Ombhole district, 40° 57' 49.9" N 41° 13' 10.2" E., ca 2720-2750 m, marshy place.
- 22 Turkey: Artvin province, Yusufeli town, upper districts of Olgunlar village, 40° 48' 90.8" N 41° 14' 08.6" E., ca 3200-3400 m, subalpine meadows.
- 23 Turkey: Artvin province, Yusufeli town, Deniz lake, 40° 49' 08.5" N 41° 09' 75.6" E., ca 3600 m, subalpine bare rocky place and sometimes meadow.
- 24 Turkey: Artvin province, Yusufeli town, Dilberdüzü district, 40° 49' 23.2" N 41° 10' 58.8" E., ca 2882 m, subalpine marshy meadows.
- 25 Turkey: Artvin province, Yusufeli town, between Yaylalar and Barhal villages, 40° 51' 97.8" N 41° 20' 06.6" E., ca 1700 m, *Picea orientalis* woods.
- 26 Turkey: Rize province, Çamlıhemşin town, Avusor high-plateau, 40° 58' 08.8" N 41° 11' 34.7" E, ca 2360 m a. s. l., in places subject to seasonal fluctuations of the water table, on wet soil.