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The new locality records of *Scorpidium cossonii* and *Cyrtomnium hymenophylloides* (Bryophyta) for Türkiye and Southwest Asia from the Bolkar Mountains

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Abstract

Purpose: In this study, new locality records for the species *Scorpidium cossonii* and *Cyrtomnium hymenophylloises* in Türkiye and Southwest Asia are presented, with the aim of contributing to the bryophyte flora of Türkiye.
Method: During bryological land study to the Bolkar Mountains, wetland moss *Scorpidium cossonii* (Schimp.) Hedenäs, previously known only from Çanakkale, and the arctic-alpine moss *Cyrtomnium hymenophylloides* (Hübener) T.J.Kop., previously known only from Ordu province, were rediscovered in Türkiye.The collected specimens were identified using the relevant literature.
Findings: *Scorpidium cossonii* was collected on wet rocky bank near the Ciğer Lake (Çan-Çanakkale) in 2014. *Cyrtomnium hymenophylloides* was collected on wet soil in Kalıcak and Kadıncık Villages (Ulubey-Ordu) in 2014. Ten years later, both species were found the vicinity of Karagöl and Çiniligöl (Ulukışla-Niğde), glacial lakes located in the Central Anatolian part of the Bolkar Mountains. *Scorpidium cossonii* and *Cyrtomnium hymenophylloides* were recorded for the second time from Türkiye and Southwest Asia with the present study. While, *Scorpidium cossonii* is characterised by strongly curved non-plicate leaves and well developed hyalodermis, *Cyrtomnium hymenophylloides* is characterised erect tuft life form, broadly ovate leaves, acute to apiculate leaf apices.
Conclusion: These new locality records will provide important information about the geographical distribution of both species in Anatolia and will contribute to the bryophyte flora of Türkiye.

Keywords: Bolkar Mountains, Central Anatolia, moss, new locality, Türkiye

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Bolkar Dağları'ndan Türkiye ve Güneybatı Asya için *Scorpidium cossonii* ve *Cyrtomnium hymenophylloides*'in (Bryophyta) yeni lokalite kayıtları

Özet

Amaç: Bu çalışmada, *Scorpidium cossonii* ve *Cyrtomnium hymenophylloises* türlerinin Türkiye ve Güneybatı Asya için yeni lokalite kayıtları sunulmakta ve Türkiye briyofit florasına katkıda bulunulması amaçlanmaktadır.
Metod: Bolkar Dağları'nda yapılan briyolojik arazi çalışması sırasında, daha önce sadece Çanakkale'den bilinen sulak alan karayosunu *Scorpidium cossonii* (Schimp.) Hedenäs ve daha önce sadece Ordu ilinden bilinen arktik-alpin

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karayosunu *Cyrtomnium hymenophylloides* (Hübener) T.J.Kop. Türkiye'de yeniden keşfedilmiştir. Toplanan örnekler ilgili literatür kullanılarak teşhis edilmiştir.
Bulgular: *Scorpidium cossonii*, 2014 yılında Ciğer Gölü (Çan-Çanakkale) yakınlarındaki ıslak kayalık kıyıdan toplanmıştır. *Cyrtomnium hymenophylloides* ise 2014 yılında Kalıcak ve Kadıncık Köyleri (Ulubey-Ordu) yakınlarındaki ıslak toprak üzerinden toplanmıştır. On yıl sonra, her iki tür de Bolkar Dağları'nın Orta Anadolu kesiminde bulunan buzul gölleri Karagöl ve Çiniligöl (Ulukışla-Niğde) civarında bulunmuştur. *Scorpidium cossonii* ve *Cyrtomnium hymenophylloides*, bu çalışma ile Türkiye ve Güneybatı Asya'da ikinci kez kaydedilmiştir. *Scorpidium cossonii*, güçlü kavisli, katlanmamış yaprakları ve iyi gelişmiş hiyalodermisi ile karakterize edilirken, *Cyrtomnium hymenophylloides* dik tuft şeklinde yaşam formu, geniş oval yaprakları ve sivri uçlu yaprak uçları ile karakterize edilmektedir.
Sonuç: Bu yeni lokalite kayıtları, her iki türün Anadolu'daki coğrafi dağılımı hakkında önemli bilgiler sağlayacak ve Türkiye briyofit florasına katkı sunacaktır.

Anahtar kelimeler: Bolkar Dağları, Orta Anadolu, karayosunu, yeni lokalite, Türkiye

1. Introduction

The Scorpidiaceae was separated from the polyphyletic Amblystegiaceae, one of the large families of mosses, by Ignatov and Ignatova in 2004 [1]. One of the five genera of the family, *Scorpidium* (Schimp.) Limpr. is characterised by a hyalodermis composed of thin-walled, inflated epidermal cells. The members of the genus grow in mineral-rich habitats, particularly rich in calcium [2]. *Scorpidium cossonii* (Schimp.) Hedenäs, one of three species of the genus, grows in margins of alpine lakes and characterized as a species that grows in calcium-rich wetland habitats, particularly in northern Europe [3]. The species was previously recorded on wet rocky banks near the peat bog of Ciğer Lake (650 m a.s.l.) in Söğütalan Village (Çan-Çanakkale) in 2014 by Tonguç Yayıntaş [4]. In the present study, the species was re-collected on wet soil nearby the Karagöl, a glacial lake in the Central Anatolian part of the Bolkar Mountains ten years later.

The moss family Mniaceae, one of the largest families of mosses with more than 75 species worldwide, is typified by comparatively large plants with wide leaves and isodiametric laminal cells, which are often angular and hexagonal in shape. Additionally, a border of elongated cells often differentiates the leaf edges. Members of Mniaceae are common in temperate and boreal regions in the Northern Hemisphere [5,6]. The first record of the genus *Cyrtomnium* Holmen (Mniaceae), which was previously unknown from Türkiye and Southwest Asia, was included in the Turkish bryoflora with the report of *Cyrtomnium hymenophylloides* (Huebener) T.J.Kop. from Türkiye [7].

One of the two members of the genus, *C. hymenophylloides*, grows from the Arctic to the northern part of the boreal zone, particularly on calcareous cliff surfaces [8]. Özdemir and Batan recorded the species on wet soil (approximately 195-540 m a.s.l.) in Kalıcak and Kadıncık Villages (Ulubey-Ordu), situated in the eastern and central Black Sea Region, in 2014. In the present study, the arctic-alpine species was re-collected on wet limestone bedrock around Çiniligöl, a glacial lake in the alpin belt of the Bolkar Mountains ten years later.

Scorpidium cossonii and *C. hymenophylloides* are the second record for Türkiye and Southwest Asia, and the present study will also contribute to the bryoflora of Türkiye.

2. Materials and methods

2.1. Study area

The Bolkar Mountains are located in the eastern portion of the Central Taurus Mountains and stretch southwest-northeast at the meeting point of the Irano-Turanian and Mediterranean Phytogeographic Regions in Türkiye. Covering an area of approximately 1290 km^2 in total, these mountains have a length of approximately 150 km from southwest to northeast and a width of 40-50 km in places [9]. The study area is located within the C13 grid-square according to the grid scheme used by Henderson for Turkish bryophytes [10] (Fig. 1).

Permo-Carboniferous-aged limestones, widely observed as the basic rock unit in the Bolkar Mountains, exhibit a hard, crystallized, and fractured structure, forming the upper parts of the mountain [9]. Additionally, carbonate, siliciclastic, and volcanic rocks with dates ranging from the Upper Permian to the Late Cretaceous are also included in this rock unit, along with associated metamorphic changes. [11]. The soil characteristics of the region encompass terra-rossa and reddish-brown Mediterranean soils in the south, as well as brown forest soils and brown soils in the north. Moreover, high mountain meadow soils are observed at altitudes above 2000 m [9]. The Bolkar Mountains are a region that exhibits marked differences in terms of climate diversity, with the northern part experiencing a semi-arid and cold Mediterranean climate, while the southern part generally displays characteristics of a Mediterranean climate.

Steppe and rock vegetation cover the majority of the study area; however, in the southern part, maquis shrubs and coniferous forests, which are typical of the Mediterranean climate, are observed [12].

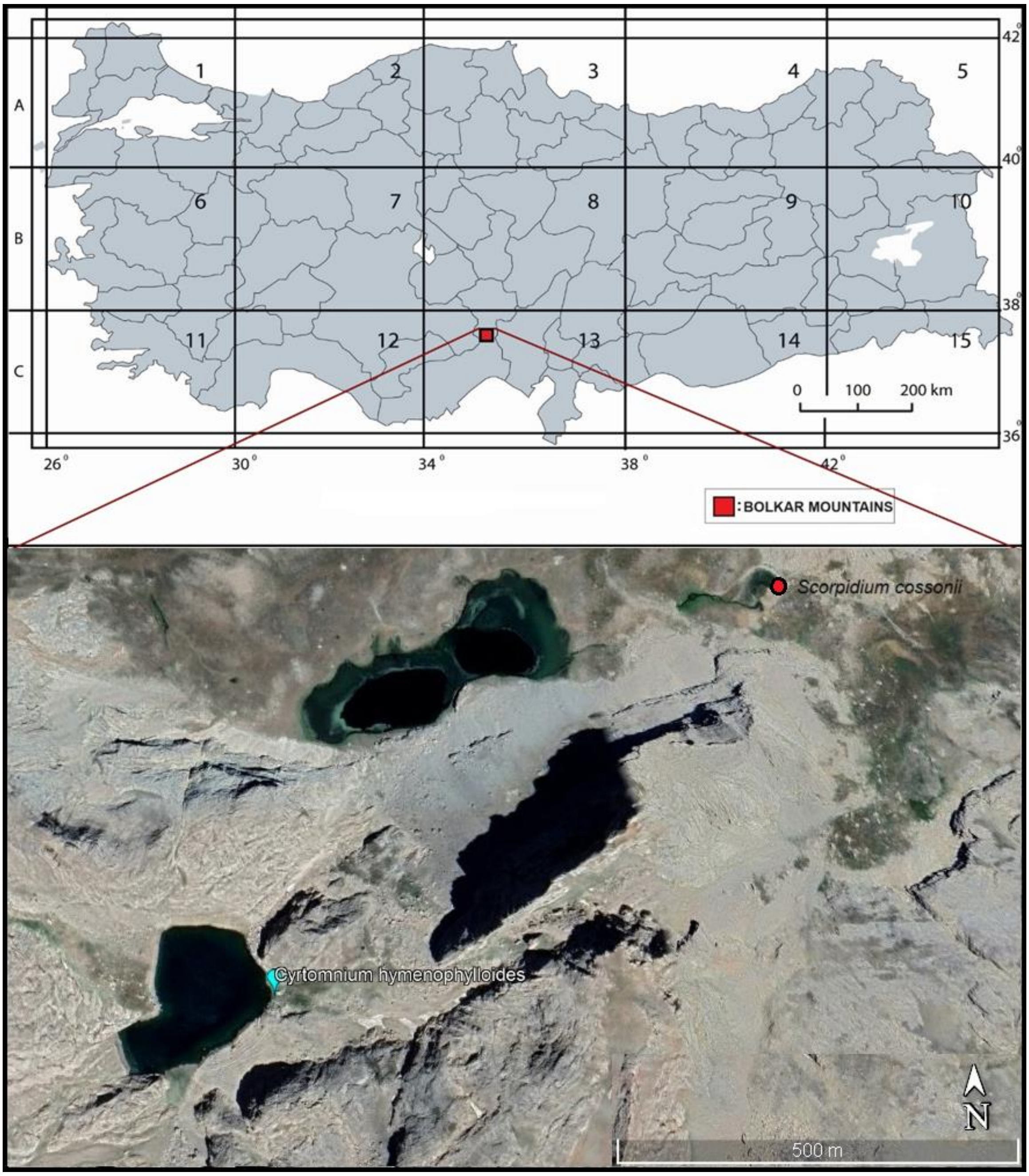

Figure 1. Henderson (1961)'s grid system for Turkish bryophytes and location of *C. hymenophylloides* and *S. cossonii* on the Bolkar Mountains.

2.2. Data source

The specimens used in this investigation were collected on June 20, 2023, from the Bolkar Mountains (Fig. 1). The specimens were identified using the relevant literature [2,13,14,15,16,17]. The nomenclature of the species follows [18]. The voucher specimens are stored in the special bryophyte collection of Prof. Dr. Tülay EZER and in the Herbarium of Niğde Ömer Halisdemir University.

3. Results

Scorpidium cossonii **(Schimp.) Hedenäs** Lindbergia 15(1): 18. 1989. (Lindbergia) (Fig. 2).

Basionym: *Hypnum cossonii* Schimp. **Turkish name:** Bey akrepçik [15].

Specimen examined: Türkiye: Central Anatolia: Niğde: Ulukışla: Bolkar Mountains, Darboğaz, Karagöl surroundings, on wet soil, alt. c. 2575 m, (37°24'14"N, 34°33'51"E), Ezer 3394, 20 June 2023 (Herbarium of Niğde Ömer Halisdemir University).

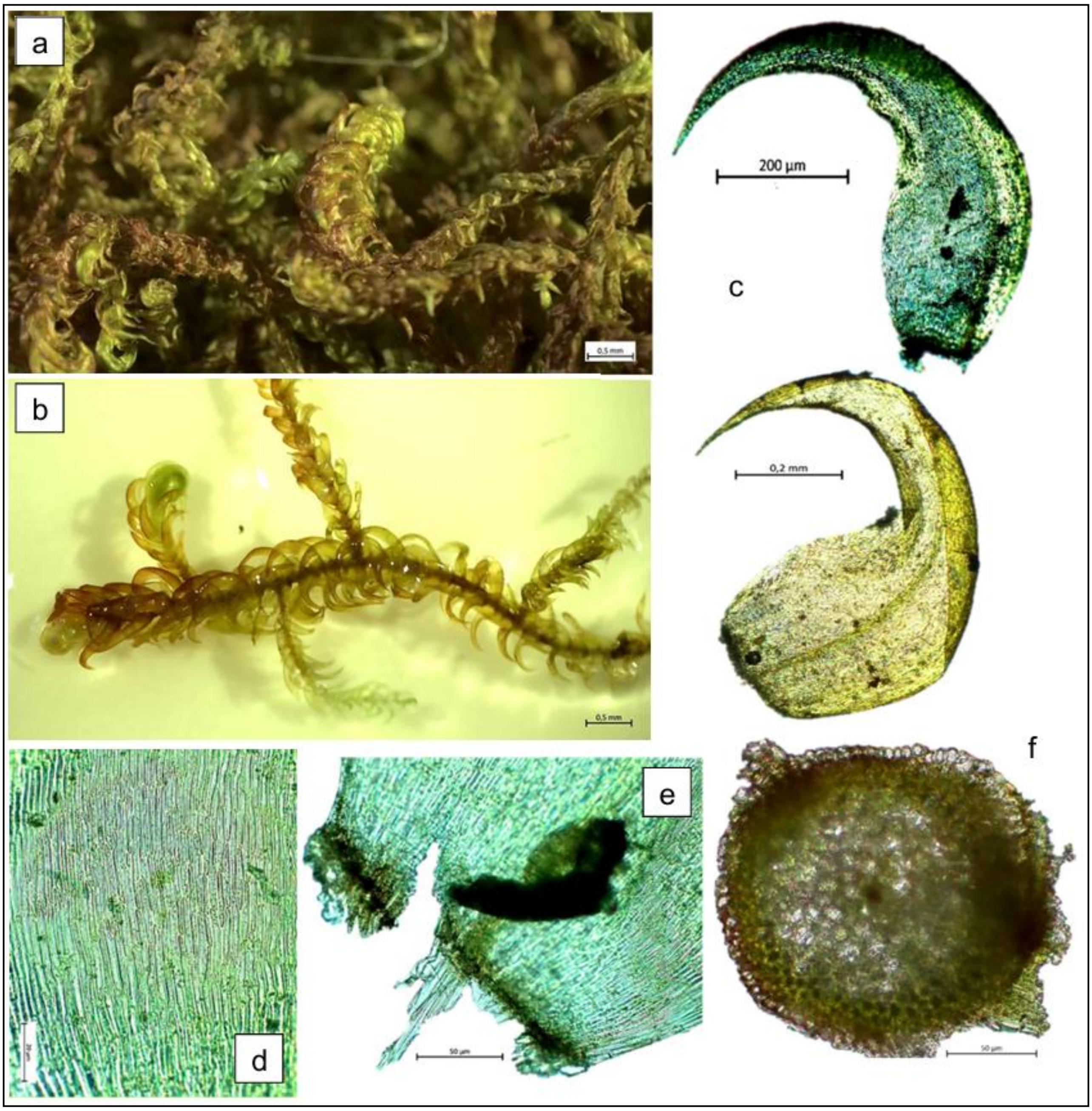

Figure 2. a. Habitus (dry), b. habitus (moist), c. leaves, d. leaf cells, e. leaf base, f. cross-section of stem

***Cyrtomnium hymenophylloides* (Huebener) T.J.Kop.** Annales Botanici Fennici 5(2): 143. 1968. (Ann. Bot. Fenn.) (Fig. 3).

Basionym: *Mnium hymenophylloides* Huebener. **Synonyms:** *Astrophyllum hymenophylloides* (Huebener) Lindb., *Bryum hymenophylloides* (Huebener) Hartm., *Mnium hymenophylloides* Huebener. **Turkish name:** Yeşilce [15].

Specimen examined: Türkiye: Central Anatolia: Niğde: Ulukışla: Bolkar Mountains, Darboğaz, Çiniligöl surroundings, South-eastern slopes, on limestone rock, alt. c. 2680 m, (37°23'54"N, 34°33'18"E), Ezer 3436, 20 June 2023 (Herbarium of Niğde Ömer Halisdemir University).

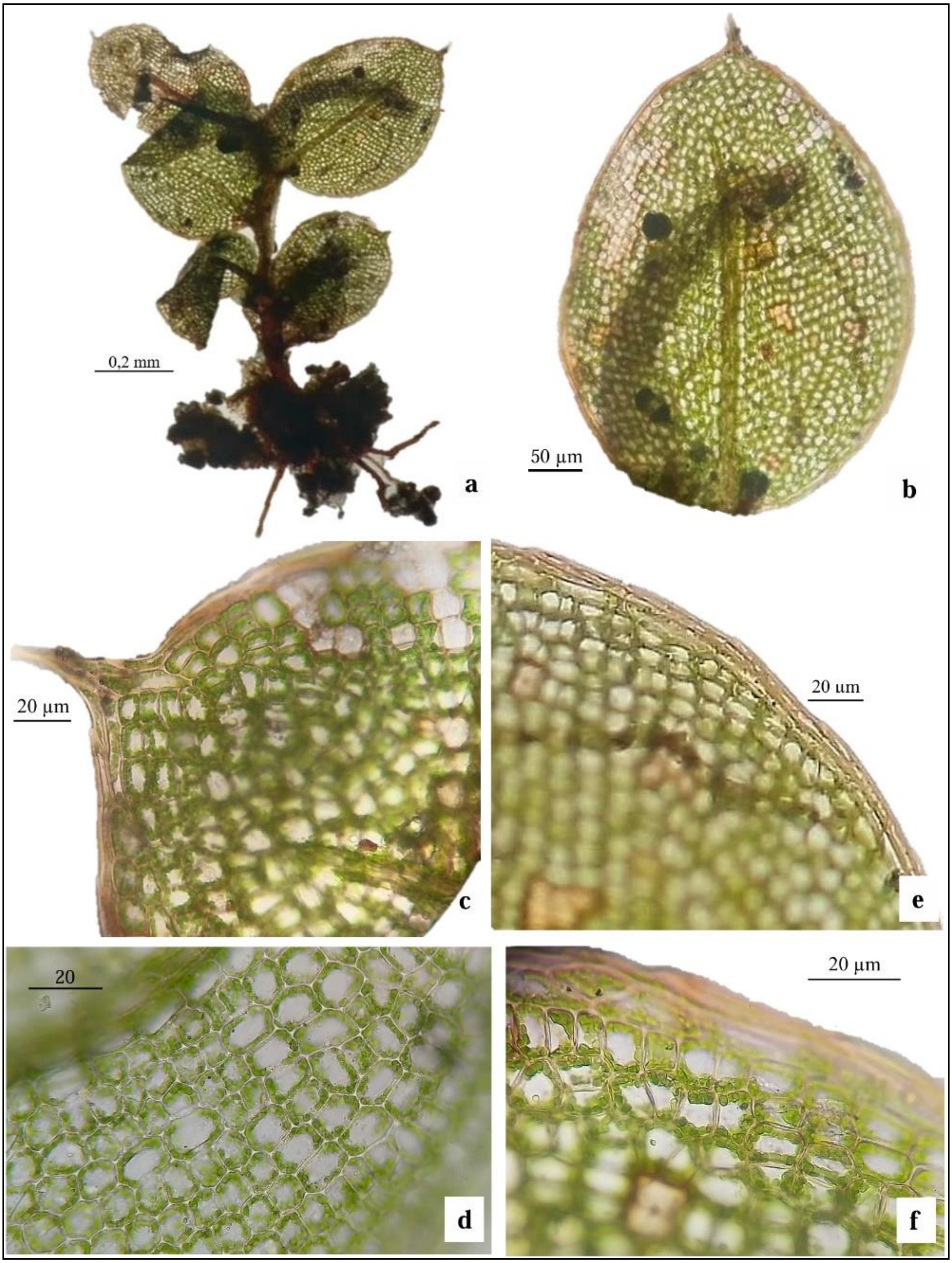

Figure 3. a. Habitus, b. leaf, c. leaf apex, d. median leaf cells, e. leaf border cells, f. leaf margin

4. Conclusions and discussion

4.1. Description of the Turkish specimens

Scorpidium cossonii

Plants medium-sized to large, up to 4 cm, green, yellowish green or brown. **Stem** irregularly branched, brownish green at apex, hyalodermis well developed. **Leaves** strongly falcate-secund, ovate to lanceolate, gradually or sometimes abruptly narrowed to apex, concave, 1-2 mm. **Costa** single, slender, ending beyond mid leaf. **Leaf cells** linear, thick-walled, 50-80 x 3-4 µm. **Basal laminal cells** shor, strongly porose. **Alar cells** slightly differentiated. **Paraphylla** absent. **Sporophyte** not seen in Turkish material (Fig. 2)

Cyrtomnium hymenophylloides

Plants complanate, up to 0.5-2 cm in length. **Stems** erect, curved, simple or irregularly and rarely branched. **Leaves** slightly crisped when dry, bluish green, rounded to broadly elliptic, 1-2 mm, apex acute to apiculate, short decurrent. **Costa** ending below apex. **Median leaf cells** (18)20-22 µm, rounded to hexagonal. **Leaves margins** are yellowish, marginal cells linear, sometimes short-linear, or rarely rhomboidal, in (1-)2-3 rows forming a distinct border. The Turkish specimens was recorded sterile and sporophytes not seen in material (Fig. 3).

4.2. Ecology and distribution

Scorpidium cossonii grows in mineral-rich calcareous habitats, typically in marshes, periodically flooded depressions, and springs [19]. It was growing on wet soil surface nearby Karagöl in the alpine belt of the Bolkar Mountains. Distinct falcate-secund leaves, strong pigmentation and growth specially in alpine seepages are characteristic of the species [3]. *Scorpidium cossonii* is similar to *S. revolvens* and *Hamatocaulis vernicosus*. But, it differs from these species in having a hyalodermis and central strand of the stem, hyaline and inflated alar cells, and non-plicate leaves. The species widespread in Northern Europe, North America and South America [2].

Cyrtomnium hymenophylloides, a rare arctic-alpine small species, grows in, dry or moist calcareous sites, rock ledges, crevices, under forest cover, in the on low hummocks in wetlands or in cracks in dry to mesic soil, low to moderate elevations in basic habitats [14]. The species grows on mesic limestone rock surfaces and crevices in the alpine belt of the Bolkar Mountains. *Cyrtomnium hymenophylloides* is similar to *Rhizomnium* (Broth.) T.J.Kop. members, but it is easily recognized by its ovate to broadly elliptic leaves and unistratose entire leaf margins. The species is known from Asia (China, Japan, Russia), Europe (Bosnia-Herzegovina, Croatia, France, Italy, Macedonia, Montenegro, Romania, Serbia, Slovenia), North America, Greenland, Alaska, Eurasia, and Türkiye [7,16,21,22,23].

Scorpidium cossonii and *C. hymenophylloides* are included in the IUCN Red List Category (Europe) as Least Concern (LC) [24]. In addition, *C. hymenophylloides* is classified as Endangered (EN) in Switzerland and Romania, Vulnerable (VU) in Slovakia, Data Deficient (DD) in Montenegro and Serbia [25].

In this study, *S. cossonii* and *C. hymenophylloides* were recorded for the second time from Türkiye and Southwest Asia with these records from Central Anatolia after the record from Çanakkale province in the Marmara Region and Ordu province in the Black Sea Region. These new locality records will provide important information about the geographical distribution of the both species in Anatolia and will contribute to the bryophyte flora of Türkiye.

Cyrtomnium hymenophylloides was presented as an oral presentation at the conference titled 'Elegans International Scientific Conference Series, First International Conference on Life Science' and its abstract was published in the conference proceedings.

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Ethical statement: This study does not require ethical approval.

Author contributions: All authors contributed to the study conception and design. All authors read and approved the final manuscript.

This study was presented as an oral presentation at the conference titled 'Elegans International Scientific Conference Series, First International Conference on Life Science' and its abstract was published in the conference book.

References

[1] Ignatov, M. S. & Ignatova, E. A. (2004). Flora mkhov srednei chasti evropeiskoi Rossii. Tom 2. Fontinalaceae-Amblystegiaceae. Moss flora of the Middle European Russia. Volume 2: Fontinalaceae-Amblystegiaceae. *Arctoa*, 11 (Supplement 2), 609-960.

[2] Hedenäs, L. (2014). *Scorpidium*. In: Flora of North America Editorial Committee, ed. *Flora of North America, north of Mexico*. Volume 28. Bryophyta, Part 2. New York & Oxford: Oxford University Press, pp. 387-389.

[3] Fife, A. J. (2014). Amblystegiaceae. In: Heenan, P.B.; Breitwieser, I.; Wilton, A.D. (ed.) *Flora of New Zealand-Mosses.* Fascicle 1. Manaaki Whenua Press, Lincoln.

[4] Tonguç Yayıntaş, Ö. (2014). Contributions to the Moss Flora of Western Turkey: Biga Peninsula (Çanakkale) and Thrace Region of Turkey. *Global Journal of Science Frontier Research: C Biological Science*, 14(3), 1-25.

[5] McIntosh, T. T. (2014). Mniaceae. In Flora of North America Editorial Committee (Eds.), *Flora of North America, North of Mexico* (Vol. 28, Bryophyta: Mosses, part 2). New York and Oxford: Oxford University Press.

[6] Stoneburner, A., & Wyatt, R. (2023). New and confirmed chromosome counts for the Mniaceae. *The Bryologist*, 126(3), 385-397. https://doi.org/10.1639/0007-2745-126.3.385

[7] Özdemir, T., & Batan, N. (2014). New and noteworthy moss records for Turkey and Southwest Asia. *Telopea*, 17, 35-42. https://doi.org/10.7751/telopea20147546

[8] Koponen, T., & Sun, Y. (2016). Preliminary study on phylogenetic position and delimitation of the ciliate arthrodontous genera of the moss family Mniaceae. *Journal of Bryology*, 39(1), 23-38. https://doi.org/10.1080/03736687.2016.1177160

[9] Ünaldı, Ü. E., & Kömüşcü, A. Ü. (2007). Topografya ve vejetasyon arasındaki ilişkiler: Bolkar Dağları (Ereğli-Dümbelek düzü-Mersin arası) örneği. *Fırat Üniversitesi Sosyal Bilimler Dergisi*, 17(1), 1-15.

[10] Henderson, D. M. (1961). Contributions to the bryophyte flora of Turkey IV. *Notes Royal Botanical Garden*, 23, 263-278.

[11] Karaoğlan, F. (2016). Tracking the uplift of the Bolkar Mountains (south-central Turkey): Evidence from apatite fission track thermochronology. *Turkish Journal of Earth Sciences*, 25(1), 64-80. https://doi.org/10.3906/yer-1504-17

[12] Kürschner, H. (1984). Der Östliche Orta Toroslar (Mittlerer Taurus) und angrenzende Gebiete. Eine formationskundliche Darstellung der Vegetation Südost-Anatoliends. *Beihefte zum Tübinger Atlas des Vorderen Orients*. Wiesbaden.

[13] Miller, N. G., & Mogensen, G. S. (1997). *Cyrtomnium hymenophylloides* (Bryophyta, Mniaceae) in North America and Greenland: Male plants, sex-differential geographical distribution and reproductive characteristics. *The Bryologist*, 100, 499-506.

[14] Miller, N. G., & Mogensen, G. S. (2014). *Cyrtomnium*. In Flora of North America Editorial Committee (Eds.), *Flora of North America, north of Mexico* (Vol. 28, Bryophyta: Mosses, part 2). New York and Oxford: Oxford University Press.

[15] Lüth, M. (2019). *Mosses of Europe: A photographic flora* (Vols. 1-3). ISBN 978-3-00-062952-5.

[16] Kürschner, H., & Frey, W. (2020). Liverworts, mosses and hornworts of Southwest Asia (Marchantiophyta, Anthoceratophyta, Bryophyta). *Nova Hedwigia*, 149, 1-267.

[17] Casas, C., Brugués, M., Cros, R. M., Sérgio, C., Barron, A., Filella, I., & Ruiz, E. (2020). *Handbook of mosses of the Iberian Peninsula and the Balearic Islands*. Barcelona: Institut d'Estudis Catalans.

[18] Hodgetts, N. G., Söderström, L., Blockeel, T. L., Caspari, S., Ignatov, M. S., Konstantinova, N. A., ... Sim-Sim, M. (2020). An annotated checklist of bryophytes of Europe, Macaronesia and Cyprus. *Journal of Bryology*, 42(1), 1-116. https://doi.org/10.1080/03736687.2019.1694329

[19] Hedenäs, L., & Eldenäs, P. (2008). Relationships in *Scorpidium* (Calliergonaceae, Bryophyta), especially between *S. cossonii* and *S. scorpioides*. *Taxon*, 57(1), 121-130.

[20] Erdağ, A., & Kürschner, H. (2017). *Türkiye bitkileri listesi (Karayosunları)*. İstanbul: Ali Nihat Gökyiğit Vakfı Yayını.

[21] Sabovljević, M., Natcheva, R., Gheorghe, D., Tsakiri, E., Dragićević, S., Erdağ, A., & Papp, B. (2008). Check-list of the mosses of SE Europe. *Phytologia Balcanica*, 14, 207-244.

[22] Kürschner, H., & Erdağ, A. (2021). *Bryophyte locality data from the Near and Middle East 1775-2019. Bryophyta* (Vol. 4). İstanbul: Hiperyayın.

[23] Bučar, M., Šegota, V., & Alegro, A. (2023). Novi nalazi rijetke arkto-alpske mahovine *Cyrtomnium hymenophylloides* (Huebener) T. J. Kop. u Hrvatskoj. *Glasnik Hrvatskog Botaničkog Društva*, 11(2), 139-144. https://doi.org/10.46232/glashbod.11.2.6

[24] Hodgetts, N., Cálix, M., Englefield, E., Fettes, N., García Criado, M., Patin, L., ... Bergamini, A. (2019). *A miniature world in decline: European Red List of Mosses, Liverworts and Hornworts*. Brussels, Belgium: IUCN. https://doi.org/10.2305/IUCN.CH.2019.ERL.2.en

[25] Hodgetts, N. G., & Lockhart, N. (2020). Checklist and country status of European bryophytes – Update 2020. *Irish Wildlife Manuals* (No. 123). Dublin: National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.