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THREE LICHEN TAXA NEW FOR TURKEY

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Abstract

Three lichen taxa viz. – *Aspicilia asiatica* (H. Magn.) Yoshim., *Lecanora subcarnea* (Sw.) Ach. var. *soralifera* H. Magn., and *Thelidium minutulum* Körb. were identified as new to Turkey as a result of a lichenological survey in the Bitlis and Muş regions Turkey. In addition, *Lecanora subcarnea* var. *soralifera* is also new to Asia. A detail taxonomic account, notes on known distribution, substrates, and chemistry under each taxon and comparisons with morphologically similar taxa are furnished under each taxon.

Introduction

Recently, a lot of lichen taxa have been recorded for Turkey since the surveys about lichen flora are poor (Aptroot and Yazici, 2012; Arslan *et al*., 2011; Yazici *et al*., 2010a, b, c, 2011a, b, 2012, 2013; Karagöz and Aslan, 2012; Karagöz *et al,*. 2011; Kinalioğlu and Aptroo, 2011; Osyczka *et al.,* 2011) but more surveys are still needed of unexplored regions in the country.

Aspicilia A. Massal (*Hymeneliaceae*) contains approximately 230 species (Nordin *et al*., 2010). *Lecanora* Ach. (*Lecanoraceae*) comprises about than 600 species (McCarth and Mallett, 2004), while *Thelidium* A. Massal (Verrucaraceae) has about 100 lichen taxa (Orange, 1991). From Turkey 42 taxa of *Aspicilia,* 105 taxa of *Lecanora*, and 4 taxa of *Thelidium* have thus far been reported. Of approximately 1650 lichen taxa that have been recorded for the country only 6 lichenized fungi have been reported from Muş Province (Yazici and Aslan, 2016a,b). On the other hand, 31 lichen species were noted from Bitlis region (Çobanoğlu, 2005; Çobanoğlu and Yavuz, 2007; Vondrak *et al*., 2012). The present study aims at exploring the lichens in the regions of Muş and Bitlis, eastern Turkey. We report here three lichen taxa which are new records for Turkey and Asia.

Materials and Methods

The present study is based on collections from the Bitlis and Muş regions made in 2015-2016. Air-dried samples were examined with a Nikon SMZ1500 stereomicroscope and a Nikon Eclipse 80i compound light microscope. Relevant keys were consulted (Dickhäuser *et al*., 1995; Ceynowa-Giełdon and Adamska, 2014; Orange, 2008; Thüs and Nascimbene, 2008; Poelt and Wirth, 1968; Poelt and Vězda, 1981) for the identifications. Vouchers are stored in the Herbarium of the Biology Department, Karadeniz Technical University, Trabzon, Turkey (KTUB). The diagnosis are based on Turkish specimens.

Study area

Muş: Center, mostly formed by vast areas of meadow and steppe, and high mountains, are mountainous by *Quercus* L. communities locally and *Salix* L. trees are rarely seen in some areas in this region (Baytop and Denizci, 1963). Muş region has a climate characterized by very cold and

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very snowy winters, and hot, dry and short summers, with temperatures ranging from –29 to 41.6°C. Annual rainfall ranges from 350–1000 mm and the average humidity is 60.3% (Akman, 1999).

Bitlis region (Tatvan: Nemrut mountain and Adilcevaz) are mountainous with vast open areas, large plain and sometimes *Quercus*, *Populus* and *Salix* trees are seen in some places. Nemrut mountain is a second large extinct crater of the World. There is a lake, many rocks and trees such as *Quercus* and *Populus* (Baytop and Denizci, 1963). Thence crustose and foliose lichens are predominantly seen. Collecting localities are well-lit, windswept, treeless areas with gently sloping terrain containing streams, grass, and calcareous and siliceous rocks. The climate is characterized by very cold snowy winters and short hot dry short summers, with a temperature range of -21.3°C to 37°C, a mean annual rainfall is around 822.9 mm, and mean annual humidity of 61% (Akman, 1999).

Results

Aspicilia asiatica (H. Magn.) Yoshim., Nov.Sist. Niz. Rast. 9: 286 (1972). **(Fig. 1).**

Thallus crustose, up to 5 cm diam, ± cycloid or ± elliptic, gray, gray-beige, with deep cracked, and areolate; areoles uneven, blistered, corrugated, areolae up to 800 µm diam; lobes thin and narrow towards the ends, ± contiguous, or with light space, sometimes ± partly overlapping, rarely dichotomic, about 165 µm, bulky, lobe tips black-brown as if burned. Apothecia up to 1.25 mm diam, regular or sometimes irregular and with depressed proper margin, aggregated mostly in the middle, scarce towards the lobes, constricted at the base, one per even fertile areol; thallin exciple more or less distinct, thick, 125 µm diam, gray, concolorous with the thallus, large; disc concav, pruinose, dark red or dark brown-black, to 900 µm diam; epihymenium yellow-brown; hypothecium 50-60 µm, yellow brown-gray; hymenium 90-100 µm; paraphyses contiguous, apices subglobe, upper part filiform. asci 8-spored, clavate, 65-75 × 18-20 µm; ascospores 17 × 10 µm, more or less ellipsoid Thallus and medulla K-, C-, KC-, P-, under upper cortex K more or less yellow-orange.

A detailed description is provided by Oxner (1972).

Aspicilia asiatica grows on calcareous rocks. Previously known from Austria, Afghanistan, Altai-Sayan, China, Mongolia, Tajikistan, Kazakhstan, Kyrgyzstan (Poelt and Wirth, 1968; Abbas *et al*., 2001; Bredkina and Makarova, 2005; Sedelnikova, 2013). New to Turkey.

Specimen examined: Turkey. Muş: Center, between Üçevler and Muş mainroad, roadside, 38°40′49.85″N 41°25′30.87″E, 2585 m, on calcareous rock, 29.05.2015, leg. K.Yazici. (KTUB–2452).

Accompanying species were: *Aspicilia cinerea* (L. Körb.), *Acarospora fuscat* (Nyl.) Th. Fr., *Acarospora impressula* Th. Fr. var. *hospitans* (H. Magn.) Clauzade & Cl. Roux, *Candelariella vitelline* (Hoffm.) Müll..Arg., *Immersaria athroocarpa* (Ach.) Rambold & Pietschm., *Protoparmeliopsis muralis* (Schreb.) M. Choisy, *Rhizocarpon geographicum* (L.) DC., *Rhizoplaca melanophthalma* (DC.) Räsänen, *Rinodina milvina* (Wahlenb.) Th. Fr. and *Xanthoria elegans* (Link) Th. Fr.

Lecanora subcarnea (Sw.) Ach. var. **soralifera** H. Magn., Bot. Notiser: 433 (1932). **(Fig. 2).**

Thallus crustose up to 5 cm diam, thick, more or less gray, grayish or yellowish white, epruinose, deeply cracked, areolate; areola blistered, more or less verrucose, surface uneven, margins indistinct. Apothecia up to 1.25 mm diam.; disc light red-brown, light brown or red-brown, slightly pruinose, slightly concave, P+ orange-red, C-; soralia 0.5-0.7 mm, blue-grey, ±

hemisphaerical, occurring on areola, side of apothecia, also on exciple and disc hymenium 90-95 µm high, yellow, yellow-gray, hyaline, clear; paraphyses with thickened upper cells; epihymenium greenish gray-brown; hypothecium hyaline, 150-190 µm, not oil droplets thallin exciple concolous with the thallus, smooth, entire, prominent (Fig. 2a); asci clavate, 8-spored, 40-45 × 8-10 µm; ascospores simple, hyaline, ellipsoid, 9-15 × 6-8 µm (Fig. 2c).Thallus K- or slightly yellow-brown, C-, KC-, P + orange-red. Medulla K-, C-, KC, P-. Disc P+ orange-red. Soralia spot tests are negative.

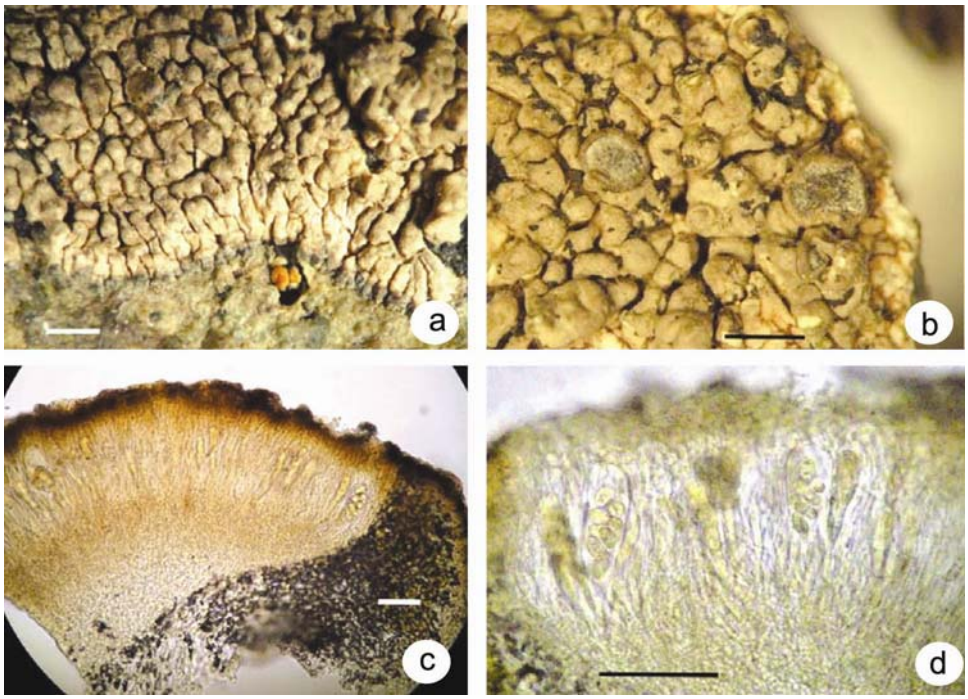

Fig. 1. *Aspicilia asiatica,* a). Thallus with lobes. Scale = 1 mm, b). Apothecia with pruinose disc. Scale = 1 mm, c). Section through apothecium with hymenium, epihymenium, hypothecium, ascus and ascospores. Scale = 50 µm, d). Section of apothecium with hymeniıum, ascus and ascospores. Scale = 50 µm.

Lecanora subcarnea var. *soralifera* is a mild-temperate to Mediterranean species, mostly growing on calcareous rock, sometimes on walls. Previously known from Austria, Germany, Sweden, Norway, North America (Berger and Priemetzhofer, 2014; Dickhäuser *et al.*,1995; Eichler *et al*., 2010). New to Turkey and Asia.

A detailed descriptions are provided by Dickhäuser *et al*., (1995), Poelt and Vězda, (1981).

Specimen examined: Turkey, Bitlis: Tatvan, Nemrut mountain, 38°36′08.60″N 42°15′ 35.18″E, 2360 m, on calcareous rock, 29.06.2016, leg. K.Yazici. (KTUB–2458).

Thelidium minutulum Körb., Parerga lichenol. (Breslau) 4: 351 (1863). **(Fig. 3).**

Thallus crustose, epilithic, thin to moderately thick 50-100 µm, continuous, grey, partly grey-brown, margin indistinct, up to 5 cm diam, lightly cracked, uneven, rough, corrugated, granular or

rimose, also cracked surroundig perithecia; perithecia small, about 150-325 µm diam., 320 µm immersed in the thallus, 160 µm on the thallus, or 0.5 mm immersed 0.35 mm on the thallus, more or less globose to ovate, basal part bounded by algae layer; periphyses present; involucrellum absent or very thin; exciple dark-brown to black, about 100-180 µm diam; asci 8-spored, more or less clavate, 85-90 × 21-23 µm; ascospores colourless, ellipsoid, 17−21 × 6−8 µm, 2-celled (Fig. 3d). All spot tests are negative.

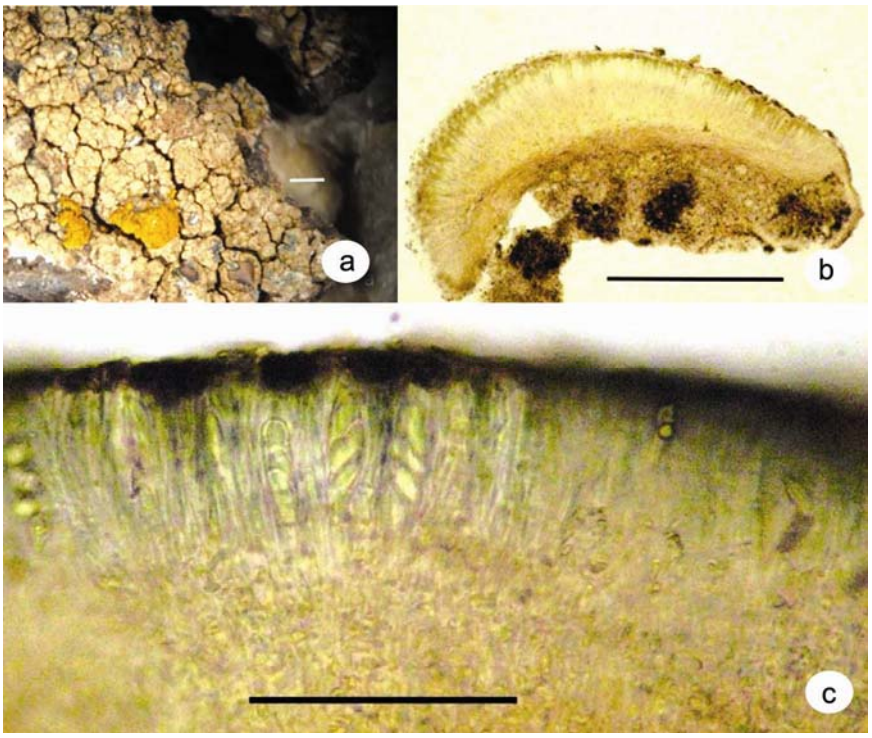

Fig. 2. *Lecanora subcarnea* var. *soralifera,* a). Thallus with apothecia and blue-gray soralia. Scale = 1 mm, b). Cross-section of apothecium with hymenium, epihymenium, hypothecium. Scale = 500 µm, c). Section of apothecium with hymenium, ascus and ascospores. Scale = 500 µm.

A detailed description is provided by Orange (2008).

Thelidium minutulum is a widespread, cool-temperate to arctic-alpine, circumpolar lichen, occuring on calcareous or siliceous rocks, metal-rich, old walls, often vertical faces, limestones, rarely on soil, sterile and grows on steeply inclined faces (Ceynowa-Giełdon and Adamska, 2014; Adamska, 2010; 2012; Ceynowa-Giełdon, 2001). It is known from throughout the Europe. Asia (Taiwan) and North America, (Freire *et al*., 1999; Thüs and Nascimbene, 2008; Redchenko *et al*., 2010; Vondrák *et al.,* 2010; Coste ,2011; Pykälä *et. al.,* 2012; Toetenel *et al.,* 2012; Ceynowa-Giełdon and Adamska, 2014). New to Turkey.

Specimen examined: Turkey, Bitlis: Adilcevaz, Karşıyaka village, surrounding Sodalı Lake, 38°49′26.29″N 42°57′16.60″E, 1712 m, on calcareous rock, 17.07.2016, leg. K.Yazici (KTUB–2460).

Notes: Some members of *Thelidium minutulum* can be confused with *Thelidium rehmii* Zschacke, but the thallus in *T. minutulum* is more granular than that of *T. rehmii.* The photobionts

in *T. minutulum* are in small aggregated groups, while those of *T. rehmii* distributed irregularly in the thallus. Habitat of these two speceis are Also different (Ceynowa-Giełdon, 2001). Moreover this species is morphologically confused with *Verrucaria bryoctona* (Th. Fr.) Orange. However *T. Minutulum* can be distinguished from *V. bryoctona* in having 2-celled ascospores and structure of excipulum (Aslan and Yazici, 2013). Accompanying species was *Verrucaria nigrescens* Pers.

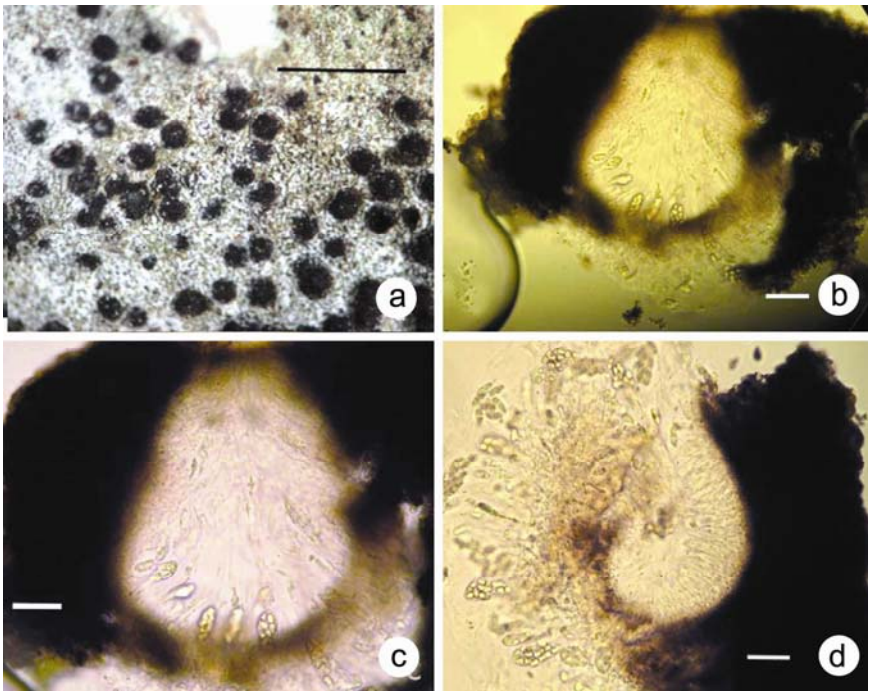

Fig. 3. *Thelidium minutulum,* a). Thallus with perithecia, habitus. Scale = 1 mm. b). Perithecium covered by algae in small group, periphyses, indistinct brown wall of perthecium, ascus and ascospores. Scale = 50 µm, c). Section through perithecium coverd by algae, ligth distict brown wall of perithecium, exciple, periphyces, ascus and ascospores. Scale = 50 µm, d.Section of perithecium with periphyses, ascus and ascospores. Scale = 50 µm.

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