Lichen flora of the Ilam Province, South West Iran

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ABSTRACT — 121 lichen species are recorded as new to the Ilam province, and four species, *Candelariella rosulans*, *Lecanora sulphurata*, *Lecidella scabra*, and *Lecanora klauskalbii*, are new to Iran. Two newly reported species, *Verrucaria macrostoma* and *Xanthoria candelaria*, have not been seen since 1957.

KEY WORDS — lichenicolous fungi, floristic, Zagrosian mountainous area, *Quercus*

Introduction

The preliminary lichen checklist of Iran (Seaward et al., 2004) included 396 lichens and 8 lichenicolous fungi based on literature records and a study of voucher material; it also summarized the literature on Iranian lichens. A revised checklist of lichenized, lichenicolous and allied fungi for Iran (Seaward et al., 2008) added 136 more records. Valadbeigi et al. (2010), Haji Moniri & Sipman (2009), Valadbeigi & Sipman (2010), Valadbeigi et al. (2011a, b), Valadbeigi and Brackel (2011), Aptroot et al. (2012) together added another 124 species to Iran. This study identified 168 lichens, of which four were new to Iran and 120 new to Ilam province.

The Ilam province, with an area of c. 19,086 square kilometers, in SW Iran is bordered to the north by the Kermanshah and Lurestan provinces, to the south and southwest by Iraq, to the east and south by Khuzestan and Lurestan, and to the west by the Kermanshah province. Two characteristic parts are the vast lowlands of the Mesopotamian continuation plains and the Zagrosian mountainous area of oak forests (*Quercus brantii*).

Geologically, the lowland plain and hills of the province are composed mostly of gypsum and calcareous soils, and the mountainous parts are composed mostly of calcareous, sandstone or conglomerate materials supporting fertile agricultural soils. The highest mountains of the province are Kabir kuh which stretches from the north-west to the south-east between the lowland and the mountainous parts of the province and reach a height of 2790 m. Gachan, Manesht, Ghalarang and Reno around Ilam are a continuation of the Zagros mountains and the lowlands are a continuation of the Mesopotamian plains which have a warm and frost-free climate. A big part of the province is more or less a semi-arid region, and other parts have a temperate climate and a very short period of winter frost. The average annual precipitation is about 674 mm.

Materials and methods

Lichens were identified from 12 sites within the study area (Fig. 1, Table 1). The material was collected by the author between 2004 and 2008. The specimens were investigated with the usual optical equipment and test solutions, and some foliose and fruticose samples were chemically analyzed by TLC (Orange et al., 2001). Reference books and determination keys (Brodo et al., 2001, Hinds & Hinds, 2008, Purvis et al., 1992) were used to identify the specimens. Some of the specimens are kept in TARI with duplicates in the private herbarium of the author and, of most species, in B, F and SBUH.

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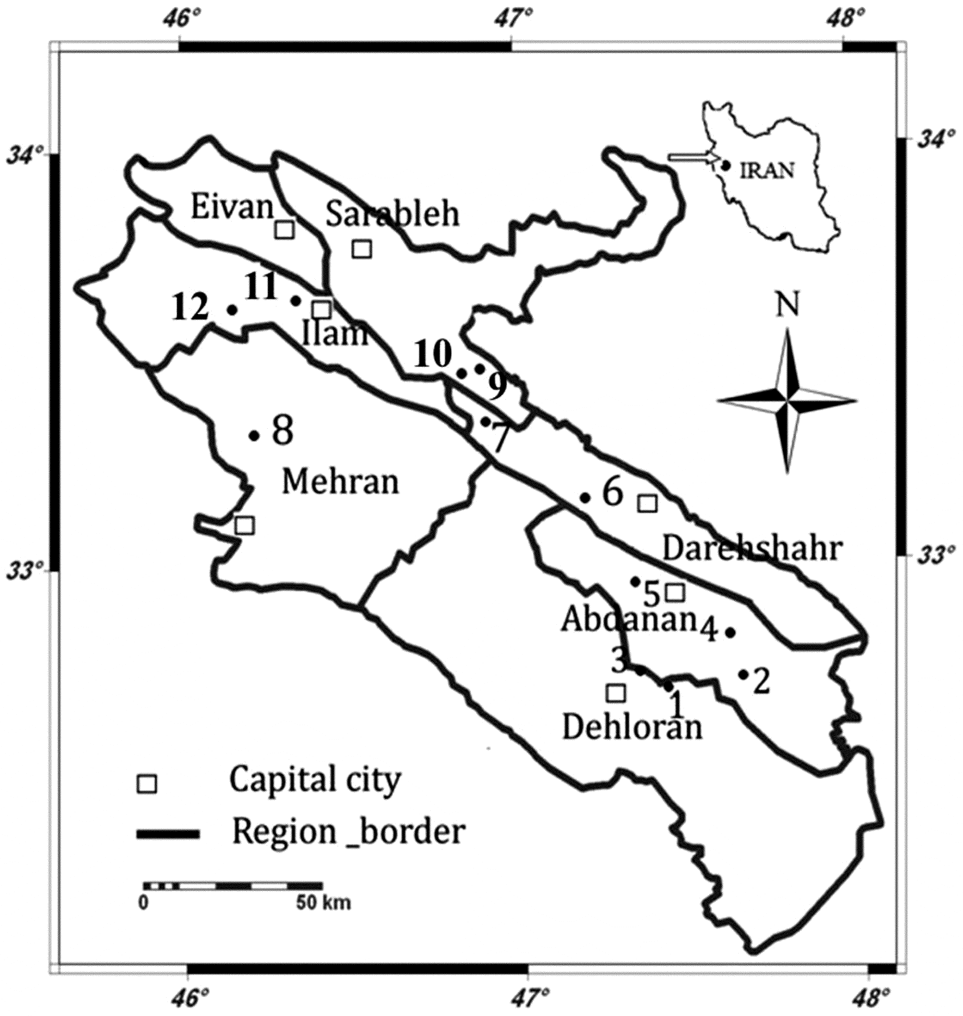

Collecting sites (1–12) and location of Ilam province in Iran.

1- Dehloran district, 32º41'55"N, 47º25'51"E, 1300 m, 13 April 2004.
2- Abdanan towards Dehloran, Murmuri, dry limestone a1.5700 m, 12 Aug. 2006.
3- Abdanan towards Dehloran, Murmuri, dry limestone and gypsum hills, 32º43'26"N, 47º39'69"E, 1800 m, 19 Aug. 2005.
4- Plains towards W slope of Dinar Kuh, montane area, 32º50'23"N, 46º52'11"E, 1000 m, 1 April 2004.
5- Abdanan district, Dinar Kuh, montane area, Sarabe Bagh, 32º49'31"N, 04º73'70"E, 2600 m, 12 March 2005.
6- Abdanan district, Kabir Kuh, montane area, Hezar Nei, 32º57'84"N, 47º22'80"E, c. 2200 m, 26 April 2006.
7- Dareh Shahr district, 33º04'34"N, 47º19'40"E, 1200 m, 18 Sept. 2006.
8- Badreh district, 33º04'86"N, 47º19'42"E, 1100 m, 4 Aug. 2005.
9- Mehran district, c. 30 km S of Salehabad, 10 km after Konjancham towards Shoor o Shirin, gypsum hills along Iraq border,32º49'31"N, 47º37'07"E, 2100 m, 5 April 2006.
10- South of Sarableh, Shirvan Chardavol district, Chame jangl village, Vargar area, 33º35'40"N, 46º42'39"E, 800 m, 24 June 2007.
11- 11- Ilam district, Dare Arghavan, 33º39'18"N, 46º26'12"E, 600 m, 23 Aug. 2006.
12- 12- Ilam district, Tang-e- Razianeh, 33º42'14"N, 46º05'19"E, 700 m, 12 Aug. 2006.

List of taxa

The species new to Ilam are denoted in the list with a single asterisk (*), and taxa recorded for the first time to Iran with a double asterisk (**). Bold numbers refer to the locality numbers, followed by the collection numbers of T. Valadbeigi. Substrates are annotated as: calcareous [rock]; calcareous soil; granitic [rock]; granitic soil; sandstone; siliceous [rock]; soil — lichenicolous [on *Physcia dubia*]; moss — *Acer monspessulanum*; *Celtis caucasica*; *Cercis griffithii*; *Fraxinus angustifolia*; *Fraxinus rotundifolia*; *Myrtus communis*; *Paliurus spina-christi*; *Pistacia atlantica*; *Populus euphratica*; *Pterocarya fraxinifolia*; *Quercus brantii*; *Ulmus carpinifolia*; *Ulmus glabra*.

Acarospora fuscata (Schrad.) Th. Fr.: siliceous, **3**: 6074.

Acarospora cervina A. Massal.: siliceous, **1**: 2235, **8**: 1653, **9**: 2325, **10**: 6060, **11**: 2216.

Acarospora lavicola J. Steiner: siliceous, **5**: 3141.

Acarospora placodiiformis H. Magn. (Valadbeigi & Sipman, 2010).

Acarospora reagens Zahlbr.: calcareous, soil, and mosses, **6**: 2222, **7**: 2478, **2**: 1778.

Acarospora strigata (Nyl.) Jatta: calcareous, and sandstone, **3**: 3040, **6**: 2223.

Acrocordia gemmata (Ach.) A. Massal.: *Q. brantii*, *A. monspessulanum*, and *F. angustifolia*, **5**: 1831, **6**: 1997.

Amandinea punctata (Hoffm.) Coppins & Scheid. (Valadbeigi & Sipman, 2010).

Anaptychia ciliaris (L.) Körb. ex A. Massal.: *Q. brantii*, **3**: 3046.

Arthonia leucopellaea (Ach.) Almq.: *Q. brantii*, **3**: 3024.

Aspicilia cinerea (L.) Körb.: calcareous, **11**: 2210.

*** *Aspicilia hoffmannii*** (Ach.) Flagey: calcareous, **3**:3093.

Aspicilia desertorum auct.: calcareous, **4**: 1714, **7**:1783.

Aspicilia supertegens Arnold (Valadbeigi & Sipman, 2010).

Bacidia arceutina (Ach) Arnold (Valadbeigi & Sipman, 2010).

Bactrospora carneopallida Egea & Torrente (Valadbeigi & Sipman, 2010).

Bactrospora homalotropa (Nyl.) Egea & Torrente (Valadbeigi & Sipman, 2010).

*** *Bagliettoa calciseda*** (DC.) Gueidan & Cl. Roux: Thin thallus, and perithecia sunken in pits in calcareous, **11**: 4988.

Buellia zoharyi Galun: siliceous, **9**:3195.

Caloplaca alociza (A. Massal.) Mig.: calcareous, **7**: 6986.

Caloplaca arcis (Poelt & Vězda) Arup (Valadbeigi & Sipman, 2010).

Caloplaca arnoldii (Wedd.) Zahlbr. ex Ginzb. (Valadbeigi & Sipman, 2010).

Caloplaca arnoldii subsp. ***obliterata*** (Pers.) Gaya (Valadbeigi & Sipman, 2010).

Caloplaca aurantia (Pers.) Hellb.: calcareous, **3**: 3071, **11**: 4001.

Caloplaca biatorina (A. Massal.) J. Steiner: calcareous, **9**: 6346.

Caloplaca chrysodeta (Vain. ex Räsänen) Dombr.: calcareous, **11**: 4019.

Caloplaca chrysophthalma Degel.: *C. griffithii*, **11**: 4014.

Caloplaca cirrochroa (Ach.) Th. Fr.: calcareous, **3**: 3074.

Caloplaca crenulatella (Nyl.) H. Oliv.: calcareous, **11**: 2388.

Caloplaca decipiens (Arnold) Blomb. & Forssell: calcareous, **3**: 6072.

Caloplaca ferrugineoides (Nyl.) H. Magn.: *Q. brantii*, and *P. atlantica*, **13**: 6061.

Caloplaca flavorubescens (Huds.) J. R. Laundon: calcareous, **6**: 1833, **11**: 2201.

Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth.: calcareous, **9**: 1758, **11**: 2202.

Caloplaca holocarpa (Hoffm.) A. E. Wade: siliceous, and sandstone, **4**: 2326, **5**: 4022.

Caloplaca inconnexa (Nyl.) Zahlbr.: calcareous, **11**: 4031.

Caloplaca luteoalba (Turner) Th. Fr.: *Q. brantii*, and *U. carpinifolia*, **4**: 5782.

Caloplaca polycarpa (A. Massal.) Zahlbr. (Valadbeigi & Sipman, 2010).

Caloplaca polycarpoides (J. Steiner) M. Steiner & Poelt: *Q. brantii*, *U. carpinifolia*, and *P. fraxinifolia*, **2**: 1602, **3**: 3044, **7**: 1782.

Caloplaca saxicola (Hoffm.) Nordin: calcareous, **3**: 3030, **11**: 4017.

Caloplaca stillicidiorum (Vahl) Lynge: calcareous, **4**: 4023.

Caloplaca trachyphylla (Tuck.) Zahlbr.: sandstone, **3**: 3140.

Caloplaca ulcerosa Coppins & P. James: *C. griffithii*, **11**: 4027.

Caloplaca variabilis (Pers.) Müll. Arg.: calcareous, **5**: 7057, **10**: 6009.

Caloplaca velana (A. Massal.) Du Rietz: calcareous, **4**: 1736.

Candelaria concolor (Dicks.) Stein: *P. euphratica*, and *Q. brantii*, **3**: 3029.

Candelariella aurella (Hoffm.) Zahlbr.: calcareous, **3**: 3021.

Candelariella coralliza (Nyl.) H. Magn. (Valadbeigi et al., 2010).

Candelariella oleaginescens Rondon (Valadbeigi & Sipman, 2010).

Candelariella rosulans (Müll. Arg.) Zahlbr.: calcareous, **5**: 3155, **3**: 3025.

Candelariella vitellina (Hoffm.) Müll. Arg.: siliceous, **4**: 1713.

Catillaria aphana (Nyl.) Coppins (Valadbeigi & Sipman, 2010).

Chaenothecopsis savonica (Räsänen) Tibell (Valadbeigi & Sipman, 2010).

Chrysothrix candelaris (L.) J. R. Laundon: *Q. brantii*, **3**: 3055, **11**: 2380.

Circinaria calcarea (L.) A. Nordin, S. Savić & Tibell: calcareous, **11**: 2390, **12**: 2321.

Circinaria contorta (Hoffm.) A. Nordin, S. Savic´ & Tibell: calcareous, **5**: 1784, **11**: 2217.

Clavascidium lacinulatum (Ach.) M. Prieto.: granitic soil, **4**: 2295.

Collema crispum (Huds.) F. H. Wigg.: calcareous, **10**: 6201.

Collema cristatum (L.) Weber ex. F. H. Wigg.: calcareous, and soil, **12**: 2324.

Collema flaccidum (Ach.) Ach.: *F. rotundifolia*, and *A. monspessulanum*, **3**: 3000.

Collema fuscovirens (With.) J. R. Laundon: calcareous, **7**: 2141.

Collema nigrescens (Huds.) DC. (Valadbeigi et al., 2010).

Collema subflaccidum Degel.: *A. monspessulanum*, **10**: 6043.

Collema tenax (Sw.) Ach.: moss, soil, and calcareous, **11**: 2432.

Dermatocarpon miniatum (L.) W. Mann: calcareous, siliceous, **1**: 2299, **2**: 3017, **6**: 1618, **5**: 1869, **8**: 1688, **9**: 2271, **12**: 1648.

Dimelaena oreina (Ach.) Norman: siliceous, **9**: 2101.

Diploschistes diacapsis (Ach.) Lumbsch: sandstone, **5**: 1745.

Diploschistes muscorum (Scop.) R. Sant.: moss, **12**: 2480.

Diploschistes ocellatus (Vill.) Norman: calcareous, **3**: 3028, **9**:6020, **10**: 6053.

Diploschistes scruposus (Schreb.) Norman: siliceous, **9**: 6017.

Diplotomma venustum Körb.: calcareous, **9**: 1334.

Endocarpon pusillum Hedw.: soil, **4**: 1756, **9**: 7011.

Fulgensia bracteata (Hoffm.) Räsänen: moss, and soil, **7**: 2312, **12**: 2474.

Fulgensia desertorum (Tomin) Poelt: sandstone, **2**: 1851, **4**: 1766.

Fulgensia fulgens (Sw.) Elenkin: soil, **5**: 3186.

Fulgensia subbracteata (Nyl.) Poelt: sandstone, **9**: 2311.

Glypholecia scabra (Pers.) Müll. Arg.: calcareous, **6**: 1651, **8**: 1617.

Graphis scripta (L.) Ach.: *A. monspessulanum*, and *U. glabra,* **3**: 3020.

Lecania inundata (Hepp ex Körb.) M. Mayrhofer (Valadbeigi & Sipman, 2010).

Lecanographa lyncea (Sm.) Egea & Torrente (Valadbeigi & Sipman, 2010).

Lecanora albescens (Hoffm.) Branth & Rostr. (Valadbeigi et al., 2010).

****Lecanora chlarotera*** Nyl.: *A. monspessulanum*, **3**: 3049.

****Lecanora crenulata*** auct.: calcareous, **11**: 2422.

****Lecanora dispersa*** (Pers.) Sommerf.: calcareous, **11**: 2383.

****Lecanora garovaglii*** (Körb.) Zahlbr.: calcareous, **7**: 2486.

****Lecanora hagenii*** (Ach.) Ach.: *Q. brantii*, **2**: 1850.

Lecanora jamesii J.R. Laundon (Valadbeigi & Sipman, 2010).

Lecanora juniperina Śliwa (Valadbeigi & Sipman, 2010).

*****Lecanora klauskalbii*** Sipman: calcareous, **10**: 1724.

****Lecanora muralis*** (Schreb.) Rabenh.: siliceous, and sandstone, **2**: 1155, **3**: 3023, **8**: 1667, **11**: 1777, **12**: 2477**.**

Lecanora percrenata H. Magn. (Valadbeigi & Sipman, 2010).

Lecanora prophetae-eliae Sipman (Valadbeigi & Sipman, 2010).

****Lecanora rupicola*** (L.) Zahlbr.: siliceous, **6**: 1723.

Lecanora semipallida H. Magn. (Valadbeigi & Sipman, 2010).

*****Lecanora sulphurata*** (Ach.) Nyl.: siliceous, **10**: 1308.

Lecanora torrida Vain. (Valadbeigi & Sipman, 2010).

****Lecanora umbrina*** (Ach.) A. Massal.: calcareous, **6**: 2270.

Lecanora valesiaca (Müll. Arg.) Stizenb. (Valadbeigi et al., 2010).

****Lecidea tessellata*** Flörke: calcareous. **8**: 1455.

*****Lecidella scabra*** (Taylor) Hertel & Leuckert: calcareous, **4**: 7000.

Lepraria isidiata (Llimona) Llimona & A. Crespo (Valadbeigi et al., 2010).

Leptogium biatorinum (Nyl.) Leight. (Valadbeigi & Sipman, 2010).

Leptogium pulvinatum (Hoffm.) Cromb. (Valadbeigi et al., 2010).

Lichenostigma elongatum Nav.-Ros. & Hafellner (Valadbeigi & Sipman, 2010).

Lichenostigma episulphurella Etayo & van den Boom (Valadbeigi & Sipman, 2010).

****Lichinella nigritella*** (Lettau) P. Moreno & Egea: calcareous, and soil, **8**: 2285.

Llimoniella scabridula (Müll. Arg.) Nav.-Ros & Haf. (Valadbeigi & Sipman, 2010).

****Lobothallia radiosa*** (Hoffm.) Hafellner: calcareous, **6**: 2301, **8**: 2342, **10**: 6079.

Megaspora rimisorediata Valadbeigi & A. Nordin (Valadbeigi et al., 2011a).

****Mycobilimbia tetramera*** (De Not.) Vitik. et al.: soil, and moss, **9**: 1329.

****Romjularia lurida*** (Ach.) Timdal: calcareous, **10**: 4033.

Normandina pulchella (Borrer) Nyl. (Valadbeigi et al., 2010).

****Opegrapha varia*** Pers.: *Q. brantii,* **3**: 3051.

Peltula euploca (Ach.) Poelt (Valadbeigi et al., 2010).

****Peltula obscurans*** (Nyl.) Gyeln.: calcareous, **7**: 1715.

Phaeorrhiza sareptana var. ***sphaerocarpa*** (Th. Fr.) H. Mayrhofer & Poelt (Valadbeigi & Sipman, 2010).

****Physcia adscendens*** (Fr.) H. Olivier: *Q. brantii*, *C. griffithii*, and *P. spina-christi*, **2**: 1456, **4**: 1212, **11**: 1711.

****Physcia aipolia*** (Ehrh. ex Humb.) Fürnr.: *Q. brantii*, **6**: 1912, **7**: 1100.

****Physcia biziana*** (A. Massal.) Zahlbr.: *Q. brantii*, **11**: 1605.

****Physcia caesia*** (Hoffm.) Fürnr.: calcareous, **11**: 1234.

****Physcia dimidiata*** (Arnold) Nyl.: calcareous, **5**: 2484.

****Physcia dubia*** (Hoffm.) Lettau: siliceous, **4**: 1109, **7**:2198, **11**: 1121.

****Physcia tenella*** (Scop.) DC.: *Q. brantii*, **2**: 1156, **6**: 1584.

Placidiopsis custnani (A. Massal.) Körb. (Valadbeigi & Sipman, 2010).

****Placidium semaforonense*** (Breuss) Breuss: calcareous soil, **6**: 2192, **11**: 2377.

****Placidium squamulosum*** (Ach.) Breuss: calcareous soil, **5**: 2067.

Placopyrenium bucekii var. ***triseptatum*** Breuss (Valadbeigi & Sipman, 2010).

**** Placopyrenium fuscellum*** (Turner) Gueidan & Cl. Roux: calcareous, **3**: 3021.

****Placocarpus schaereri*** (Fr.) Breuss: calcareous, **3**: 3026.

****Polycoccum pulvinatum*** (Eitner) R. Sant.: lichenicolous, **10**: 6089**.**

****Psora decipiens*** (Hedw.) Hoffm.: calcareous, soil, and sandstone, **2**: 1141, **4**: 2261, **2**: 2473, **3**: 1662, **6**: 1615, 7: 1645, **8**: 1771.

Psora globifera (Ach.) A. Massal. (Valadbeigi et al., 2010).

Psora saviczii (Tomin) Follmann & A. Crespo (Valadbeigi et al., 2010).

Psora testacea Hoffm. (Valadbeigi et al., 2010).

****Pyrenula nitida*** (Weigel) Ach.: *F. rotundifolia*, **3**: 3039.

****Ramalina farinacea*** (L.) Ach.: *A. monspessulanum*, **3**: 3058.

****Rhizoplaca chrysoleuca*** (Sm.) Zopf: siliceous, **1**: 3115, **5**: 3128, **6**: 2068, **12**:1527.

****Rhizoplaca melanophthalma*** (Ramond) Leuckert & Poelt: siliceous, **9**: 1393, **10**: 6084, **11**: 2472.

****Rhizoplaca peltata*** (Ramond) Leuckert & Poelt: calcareous, **5**: 3147, **5**: 2069, **12**: 2479.

****Rhizoplaca subdiscrepans*** (Nyl.) R. Sant.: granitic, **3**: 3038.

****Rinodina calcarea*** (Arnold) Arnold: calcareous, and soil, **9**: 6087.

Rinodina mayrhoferi A. Crespo (Valadbeigi & Sipman, 2010).

****Sarcogyne clavus*** (DC.) Kremp.: granitic, **2**: 1542.

****Sarcogyne regularis*** Körb.: calcareous, **11**: 4987.

****Squamarina cartilaginea*** (With.) P. James: moss, soil, and sandstone, **1**: 3016, **3**: 3015, **7**: 1840.

****Squamarina gypsacea*** (Sm.) Poelt: calcareous, **2**: 1541, **5**: 3146.

****Squamarina lentigera*** (Weber) Poelt: soil, and sandstone, **3**: 1776, **4**: 3047, **10**: 6058.

****Staurothele fissa*** (Taylor) Zwackh: siliceous, **9**: 1230.

Staurothele succedens (Rehm ex Arnold) Arnold (Valadbeigi & Sipman, 2010).

Strigula glabra (A. Massal.) V. Wirth (Valadbeigi & Sipman, 2010).

****Tephromela atra*** (Huds.) Hafellner: sandstone, **6**: 2075.

Thelotrema lepadinum (Ach.) Ach. (Valadbeigi et al., 2010).

Tomasellia gelatinosa (Chevall.) Zahlbr. (Valadbeigi & Sipman, 2010).

****Toninia candida*** (Weber) Th. Fr.: calcareous soil, **4**:1712, **5**: 3156.

****Toninia cinereovirens*** (Schaer.) A. Massal.: calcareous, **3**: 3079.

****Toninia diffracta*** (A. Massal.) Zahlbr.: calcareous soil, **2**: 2024.

****Toninia sedifolia*** (Scop.) Timdal: calcareous soil, and moss, **2**: 3045, **3**: 1757, **4**: 1652, **6**: 2047, **8**: 1644.

****Trapelia coarctata*** (Sm.) Choisy: siliceous, **1**: 3106.

****Umbilicaria decussata*** (Vill.) Zahlbr.: siliceous, **1**: 3111.

****Usnea articulata*** (L.) Hoffm.: *A. monspessulanum*, **3**: 3007.

****Verrucaria macrostoma*** Dufour ex DC.: calcareous, **9**: 7018.

Verrucaria margacea (Wahlenb.) Wahlenb. (Valadbeigi & Sipman, 2010).

****Verrucaria nigrescens*** Pers.: calcareous, **9**: 3454.

Verrucaria pinguicula A. Massal. (Valadbeigi & Sipman, 2010).

****Xanthomendoza fallax*** (Hepp) Søchting, Kärnefelt & S. Kondr.: *F. rotundifolia*, and *M. communis,* **6**: 2070, **11**: 2045.

****Xanthomendoza fulva*** (Hoffm.) Søchting, Kärnefelt & S. Kondr.: *Q. brantii*, and *P. euphratica*, **4**: 1054, **7**: 1812.

Xanthoria candelaria (L.) Th. Fr.: calcareous, **3**: 6073.

Xanthoria elegans (Link.) Th. Fr.: calcareous, and sandstone, **1**: 3110, **4**: 2117, **7**: 1500.

Discussion

The studied area has various climatic (rainfall, temperature) and topographical conditions, providing a rich lichen biodiversity. However, due to its inaccessibility, there were previously no noticeable lichen records from the area. The present paper is the first part of an intended series on the lichen flora of the Ilam province. It contains new records of some of the more conspicuous species, but many samples remain unidentified due to lack of adequate identification tools. Among the 166 species listed above, 120 taxa are new to the province and among them, *Candelariella rosulans, Lecanora sulphurata*, *Lecidella scabra* and *L. sulphurata* are new to Iran; the latter was also collected from the Kivarestan area (Hamedan province, 34°51′14″N 48°25′25″E) on 27 May 2006 by the author. *Verrucaria macrostoma* previously reported by Müller (1892; as f. *nigrata*) and Szatala (1957; as *V. macrostoma* and f. *nigrata*), and *Xanthoria candelaria* by Steiner (1910), Oxner (1946) and Szatala (1957) have been refound.

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