

Teuvo Ahti & Mohammad Sohrabi

A synopsis of Iranian *Cladonia* (Lichenes)

Abstract

Ahti, T. & Sohrabi, M.: A synopsis of Iranian *Cladonia* (Lichenes). — Fl. Medit. 16: 139-144. 2006. — ISSN 1120-4052.

19 species of the lichen genus *Cladonia* are known from Iran. Several species reported in this paper are new to the country: *Cladonia cariosa*, *C. chlorophaea*, *C. coniocraea*, *C. fimbriata*, *C. rei*, *C. subulata*, and *C. symphycarpa*. Most of the records represent range extensions from the Caucasus region.

Introduction

The lichen flora of Iran is still incompletely known. Seaward & al. (2004) recently published a checklist containing 396 species, but commented that it was likely that more than 1000 species occur in the country. 12 taxa of *Cladonia* were listed by Seaward & al. (2004) and Sohrabi (2005). The north and north-west of Iran are most suitable for this genus due to the cool, moist climate and the presence of high mountains and forest. The species of the genus *Cladonia* are usually fairly conspicuous fruticose lichens. Among them are the well-known reindeer and cup lichens. A *Cladonia* species consists, as a rule, of two parts, a squamulose or foliose thallus and a more or less erect, terete structure called podetium, which has many forms: simple pin-like, cup-bearing or richly branched, bush-like. The tips of the podetia develop brown, red or rarely yellowish apothecia without thalloid margin. Often no apothecia are produced; reproduction then occurs by thallus fragments or soredia, with which the upper surface may be entirely or partially covered. In case of the richly branching, reindeer lichens, the basal thallus can be extremely reduced. Many species are very variable and are therefore difficult to identify. The species concept is not stabilized in many cases. Some species have several chemotypes. The worldwide distributed genus consists of at least 430 species. The genus is now quite well-known in Europe (e.g., Purvis & al. 1992) and much of Asia, although additional taxa are still being discovered. Seven species of *Cladonia* new to Iran are reported in this paper.

When compared to the data from countries adjacent to Iran, especially Azerbaijan (e.g., Barkhalov 1969, 1975; Novruzov 1990) most of the records reported in this paper represent range extensions from the Caucasus region in general.

Material and methods

Specimens of *Cladonia* were collected by the author Sohrabi during several field trips in the north and north-west of Iran, during the period 1999 to 2004. The specimens were numbered, and preserved in paper envelopes. A stereomicroscope, light microscope, and the usual colour reagents KOH and *p*-phenylenediamine were used in the identification. Specimens are deposited in the Botanical Museum of Helsinki (H) and the private herbarium of M. Sohrabi. Some identifications were confirmed by thin-layer chromatography (TLC), using the methods of Orange & al. (2001).

List of taxa

In addition to the new records, all the present provinces of Iran where each species has been collected or reported are listed.

C. awasthiana Ahti & Upreti

Mazandaran (see Seaward et al. 2004) – The species was recently described from India (Ahti & Upreti 2003). T. Ahti referred the specimens to this species with some hesitation. They contain fumarprotocetraric and homosekikaic acids, but seem to be morphologically closer to *C. awasthiana* than *C. rei*. *C. awasthiana* belongs to a Western Himalayan element, extending to Iran. Earlier, the nearest locality was in Jammu and Kashmir, India.

C. caespiticia (Pers.) Flörke

Mazandaran (Seaward & al. 2004: 552). – General distribution oceanic, sporadic. The Iranian record is within the “Caucasian” outlier of the total distribution map by Litterski & Ahti (2004: fig. 6).

C. cariosa (Ach.) Spreng.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, 1000-1500 m, terricolous, 2001, Sohrabi, 152.

East Azerbaijan. – New to Iran. Also rarely reported from Caucasus. Expected to be more widespread but is easily overlooked because it is often found as small squamules without podetia.

C. chlorophaea (Flörke ex Sommerf.) Spreng.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, around village and to the forest part, 1000-1500 m, terricolous, 2003, Sohrabi, 1448, 1474. MAZANDARAN: Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid 463, 478a. GOLESTAN: Gorgan, Golestan National Park, Tanghehbol to Golzar, by road, 450-600 m, terricolous, 1999, Sohrabi, 1671, 1672.

East Azerbaijan, Mazandaran, Golestan. – New to Iran. A widespread species, including neighbouring areas such as Talish Mts. in Azerbaijan (Barkhalov 1969: 85), Armenia and Turkey. Mainly in forests, also in arid environments.

C. coniocraea (Flörke) Spreng.

MAZANDARAN: Nour, the road of Nour to Amol, Lavij village by the road, 800 m, lignicolous, 2002, Sohrabi & Mofid, 967. Nour, Kojdur & Kodir villages, 2000 m, ligni-

colous, 2002, Sohrabi & Mofid, 410, 444. GOLESTAN: Gorgan to Ziyarat village around village, 300-500 m, lignicolous, 2001, Sohrabi, 4501.

Mazandaran, Golestan. – New to Iran. A widespread holarctic species, which usually grows on rotting wood or mossy tree bases. Also recorded from the Talish Mts. in Azerbaijan (Barkhalov 1969: 86), Armenia and Turkey. The status of the name *Cladonia coniocraea* was uncertain for a long time but its nomenclatural conservation, proposed by Ahti & DePriest (2005), was accepted in the International Botanical Congress in Vienna 2005.

C. convoluta (Lam.) Anders

GOLESTAN: Gorgan, Aliabbad, Zaringol to Afrathakhteh village round the road, 300-500 m, terricolous, 2003, Sohrabi, 2139.

Gilan, Mazandaran? (Elburz Mts.), Golestan (see Seaward & al. 2004). – An essentially Mediterranean species, growing on open calcareous soil in arid lowlands. The Iranian records are the easternmost ones within the range of *C. convoluta* (Litterski & Ahti 2004: fig. 9). Also widespread in the Talish Mts. of Azerbaijan and elsewhere in Caucasus (Barkhalov 1969: 87).

C. farinacea (Vain.) A. Evans

Mazandaran. (Seaward & al. 2004). – A sporadic species, well-known from southern South America (Stenroos & al. 1993), eastern North America, and coastal East Asia. Recently recorded by T. Ahti (ined.) in Central Asia, e.g., in Jammu and Kashmir (India), Kazakhstan, Tuva Republic (Russia), and Xinjiang (China) (all new records to these areas). For a report from Sichuan (China), see Stenroos et al. (1997). – It is close to *C. furcata* and *C. scabriuscula* (Delise) Nyl., but has scattered farinose soralia, which are lacking in the other species.

C. fimbriata (L.) Fr.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, 1000-1500 m, terricolous, 2001, Sohrabi, 89.

East Azerbaijan. – New to Iran. Widespread outside the tropics in the world, including Caucasus and Turkey. Ecology similar to its common associate *C. coniocraea*, but *C. fimbriata* is more frequently also terricolous.

C. ladonia foliacea (Huds.) Willd.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan, forest part, 1000-1500 m, terricolous, 2003, Sohrabi, 1505, 1370. MAZANDARAN: Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid, 449.

East Azerbaijan (new report), Mazandaran, Golestan (see Szatala 1957: 118, Seaward & al. 2004: 552). Widespread soil lichen in temperate to Mediterranean western Eurasia and North Africa, including Caucasus and Turkey. Not reported from Talish Mts. but present at Xankändi (Stepanakert) in Nagorno-Karabakh Republic (Azerbaijan) (Barkhalov 1969).

C. furcata (Huds.) Schrad.

GOLESTAN: Gorgan, Golestan National Park, Tanghehghol to Golzar, around road, 450-600 m, terricolous, 1999, Sohrabi, 1560. Gorgan, Galuo-gah to Hezarjerib area, 50-200 m,

terricolous, 2004, Ebrahimi, 1883.

Mazandaran, Golestan (see Szatala 1957: 118, Weber 1965, Seaward & al. 2004: 552). – Widespread forest lichen in the world, mainly on soil and rocks. Also in Talish Mts. (Barkhalov 1969: 95) and Turkey.

C. pocillum (Ach.) Grognot

EAST AZERBAIJAN: Tabriz, Jolfa, Hadishahr, Daran village, by the road to the Kiamaki-dagh, 1500-2000 m, terricolous, 1999, Sohrabi, 9, 536. Tabriz, Jolfa to Khodaafrin, Missan village, Forest part, 1000-1500 m, terricolous, 2003, Sohrabi 104, 1525. GOLESTAN: Gorgan, Golestan National Park, Tanghehgol to Golzar around road, 450-600 m, terricolous, 1999, Sohrabi, 1636. MAZANDARAN: Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid, 460,467,470,478b.

East Azerbaijan, Mazandaran, Golestan (Sohrabi 2005). – New to the first two provinces. The find earlier record (Rabenhorst 1870) has no exact locality (but probably refers to Elburz Mts.). This species is a well-known soil lichen of calcareous and other basic habitats, especially in arid regions. Also known from Naxcivan (Nakhichevan), Nagorno-Karabakh and Talish Mts. in Azerbaijan (Barkhalov 1969: 99), and Turkey. It can be very difficult to distinguish from *C. pyxidata* s. lat.

C. pyxidata (L.) Hoffm. s. lat.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, 1000-1500 m, terricolous, 2001, Sohrabi, 141.

Gilan, East Azerbaijan (new report), Mazandaran, Golestan (see Szatala 1957: 118, Seaward & al. 2004: 552). – Widespread in the world. Also known from neighbouring areas in Azerbaijan (Naxcivan, Nagorno-Karabakh and Talish Mts.) and Turkey. No attempt has been made to distinguish the recent (doubtful) segregate *C. monomorpha* Aptroot & al. (Aptroot & al. 2002). The demarcation against *C. pocillum* and *C. chlorophaea* is also problematic, so that many literature records are doubtful.

C. ramulosa (With.) J. R. Laundon

Mazandaran (Seaward & al. 2004: 552). – A widespread temperate species in the world, but much confused in many areas due to taxonomic problems. Not known from Caucasus but is reported from Turkey.

C. rangiferina (L.) F.H. Wigg.

Gilan (Buhse 1860). – A widespread species in the world but only (rarely) in the Greater Caucasus in Azerbaijan (Novruzov 1990). Although also present in the high mountains of Georgia and NE Turkey, the Gilan record is doubtful. It may belong to *C. rangiformis*, which was earlier often confused with *C. rangiferina*.

C. rangiformis Hoffm.

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, 1000-1500 m, terricolous, 2001, Sohrabi, 134. MAZANDARAN: Amol, to Tehran, Haraz way, Kelerd village, 300 m, terricolous, 2004 & on calcareous soil, Sohrabi & Mofid, 2736. Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002 Sohrabi & Mofid, 275,492. Nour, the road of Nour to Amol, Lavij village by the road, 800 m, terricolous, 2002, Sohrabi & Mofid, 974, 991.

East Azerbaijan, Mazandaran, Golestan (Szatala 1957: 118, Seaward & al. 2004: 552). – A West European-Mediterranean species, which particularly prefers arid, calcareous soils or saline sea shores. The Iranian localities are the easternmost ones within its total range, as mapped by Litterski & Ahti (2004: fig. 18). It is also common in Caucasus, including Talish Mts. (Barkhalov 1969: 103).

C. rei Schaer.

MAZANDARAN: Nour, Kojdur & Kodir villages 2000 m, terricolous, 2002, Sohrabi & Mofid 362.

Mazandaran. – New to Iran. A widespread, holarctic soil lichen, which is often overlooked. Reported from Azerbaijan, Jammu and Kashmir (India), and Kazakhstan, for instance.

C. subrangiformis Sandst. (*C. furcata* subsp. *subrangiformis*)

EAST AZERBAIJAN: Tabriz, Jolfa to Khodaafrin, Missan village, 1000-1500 m, terricolous, 2001, Sohrabi, 154, 1502. MAZANDARAN: Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid, 269.

East Azerbaijan (new report), Mazandaran. – A mainly Mediterranean species of calcareous soil. Often overlooked but known from Azerbaijan (incl. Talish Mts. and Nagorno-Karabakh; Barkhalov 1969: 107). The name *Cladonia furcata* subsp. *subrangiformis*, used by Seaward & al. (2004) and others, is an illegitimate later homonym.

C. subulata (L.) F.H. Wigg.

MAZANDARAN: Nour, the road of Nour to Amol, Lavijid village by the road, 500 m, terricolous, 2002, Sohrabi & Mofid, 958. Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid, 356.

Mazandaran. – New to Iran. Widespread soil lichen. Known from Azerbaijan (incl. Talish Mts., Nagorno-Karabakh; Barkhalov 1969: 89, as *C. cornutoradiata*) and Turkey (H).

C. symphycarpa (Flörke) Fr.

MAZANDARAN: Nour, Kojdur & Kodir villages, 2000 m, terricolous, 2002, Sohrabi & Mofid, 307.

MAZANDARAN: New to Iran. A widespread species of calcareous soils. Reported from Caucasus. An often overlooked, chemically variable and poorly understood species.

Acknowledgements

The junior author would like to express his thanks to Prof. Reza Mansouri, the Director of ISMO, and Miss Shimi and her colleagues in ISMO (Center for International Research & Collaboration) in Tehran. Particular thanks are due to Prof. Jaakko Hyvönen in the University of Helsinki (Finland) and Prof. P.L. Nimis in the University of Trieste (Italy) for their encouragement and, useful comments and suggestions.

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Address of the authors:

Teuvo Ahti & Mohammad Sohrabi,
Botanical Museum (Mycology), P.O. Box 7, FIN-00014 Helsinki University,
Finland. E-mail: teuvo.ahti@helsinki.fi.