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## **Studia Lichenologica in Italy. II. New records of *Cladonia* subgenus *Cladina***

### **Abstract**

Ravera, S., Gheza, G., Benesperi, R., Bianchi, E., Francesconi, L., Giordani, P., Isocrono, D., Nascimbene, J., Pandeli, G., Pistocchi, C., & Di Nuzzo, L.: *Studia Lichenologica in Italy. II. New records of *Cladonia* subgenus *Cladina** — Borziana 5: 59-70. 2024 — ISSN: 2724-5020 online.

New data relating to populations of *Cladonia* L. subgenus *Cladina* are presented for the purposes of updating the distribution of species of community interest.

*Key words*: Biodiversity, Habitats Directive, Lichenized Ascomycetes, Policy Species, threatened species.

### **Introduction**

At the European level, the Habitats Directive (92/43/EEC) plays a crucial role in promoting the conservation of various species, particularly, among lichens, those in the *Cladonia* L. subgenus *Cladina* (Nyl.) Vain. The Habitats Directive identifies this taxon as being of significant community interest, thereby mandating its protection and sustainable management across EU member states. Subsequently to the Italian legislative decree implementing the Habitats Directive (DPR 357/1997), a few administrative regions highlight the importance of this taxon and establish legal protections (e.g. Lombardia Regional Law 10/2008, Valle d'Aosta Regional Law 45/2009) to safeguard them from threats such as habitat destruction. *Cladina* is listed in Annex V as a taxon whose collection and exploitation may be subject to management measures.

These terricolous fruticose lichens are ecologically significant, as they help reduce soil moisture evaporation (Rouse & Kershaw 1971), enhance net nitrogen mineralization and nitrification in forest habitats (Lamontagne & Schiff 2000), and provide winter forage for wildlife (Kumpula 2001). Historically, intensive grazing and overharvesting have posed significant threats to these species mostly in Northern Europe, where commercial harvesting began in the early 20th century (Suominen & Olfosson 2000). Additional threats to *Cladina* species include forest management practices,

gravel quarrying, trampling (Kauppi 1979; Berg & al. 2008), pollution (Moser & al. 1980), disturbances in dune habitats (Gallego Fernández & Díaz Barradas 1997), burning (Webb 1998), soil scarification (Eriksson & Raunistola 1990), and excessive browsing by animals (Suominen & Olfosson 2000).

Recently, the risk of extinction for species in the *Cladina* subgenus in Italy has undergone a comprehensive evaluation. This assessment was carried out following the established criteria of the International Union for Conservation of Nature (IUCN) as detailed by Ravera & al. (2016). The thorough documentation of this risk evaluation has resulted in these species being formally included in the Red List of the Italian flora (Rossi & al. 2013). Subsequently, studies conducted by Gheza & al. (2020a, 2020b, 2021, 2022) provided further information and detailed assessments, highlighting their ecological significance and the challenges they face. The overall conservation status of *Cladina* must be periodically monitored by all EU Member States under Article 17 of the Habitats Directive. This requires regular assessments to ensure that appropriate conservation measures are being implemented and adjusted as necessary. In the last reports, the conservation status of this taxon is considered “inadequate” (Genovesi & al. 2014; Bacchetta & al. 2020), which underscores an urgent need for enhanced understanding and documentation of their presence across national territories.

Recently, sharing data stored in private collections and herbaria (Nimis & Martellos 2024) and several field studies have facilitated obtaining unknown old and current data on the distribution of these species, supporting the implementation of the Directive. Aim of this paper is to improve the knowledge of the national distribution of *Cladina* species adding new records, for maintaining and improving the health and diversity of lichen populations and the habitats they support.

## Material and methods

Specimens were independently recorded by the authors during their own field works. Lichens have been identified using a stereo microscope for reproductive and vegetative structures and usual chemical spot tests K (a solution of 10% potassium hydroxide), C (sodium hypochlorite solution), and P (5% alcoholic p-phenylenediamine solution). For the identification of the lichen species several keys were used, mainly Gheza & Nimis (2021). Nomenclature refers to Nimis & Martellos (2024).

For each taxon, locality, substrate, coordinates in UTM WGS84 (Zone 32T and Zone 32S for Sardegna), altitude, dates of observation, collector (legit), identifier (if different from collector) and a description of the habitat are reported. Taxa are presented in alphabetical order. For each taxon, records are listed in chronological order: from oldest to most recent. Bio-ecological characterization follows Nimis (2024). Regarding the locality, regional occurrence is reported following the tabular representation in Nimis & Martellos (2024), from north to south Italy. All geographical and political entities are written in Italian.

## Results

### *Cladonia arbuscula* (Wallr.) Flot.

**Trentino-Alto Adige:** Val di Sole, Cimon di Bolentina, Rabbi (Trento), on soil in a rocky alpine grassland (642774.5135350), 2280 m, 19 November 2021, *C. Pistocchi*; Val di Rabbi, path between Malga Caldesa Bassa and Rifugio Lago Corvo, Rabbi (Trento), on soil in clearings in a subalpine larch-woodland (639779.5143746), 2055 m, 15 April 2022, leg. *C. Pistocchi*, det. *C. Pistocchi*, *L. Francesconi*; Val del Monte, Fontanino di Celentino, Pejo (Trento), on soil in a subalpine larch-woodland (624458.5132815), 1714 m, 10 May 2022, leg. *C. Pistocchi*, det. *C. Pistocchi*, *L. Francesconi*; trail between Malga Vigo and Lago Malghette, Pinzolo (Trento), on organic soil above granite boulders in a subalpine larch-rhododendron woodland (640554.5124953), 1810 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; Lago Malghette, Pinzolo (Trento), on organic soil in a subalpine larch-rhododendron shrubland (640232.5125193), 1907 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; Val Nambrone, path between Lago di Cornisello Superiore and Rifugio Cornisello, Carisolo (Trento), on soil (633296.5119818), 2170 m, 28 July 2023, leg. *G. Gheza*, *L. Francesconi*, *C. Pistocchi*, det. *E. Betti*, *G. Gheza*; Lago Malghette, Pinzolo (Trento), on organic soil in a subalpine peat bog (639749.5124988), 1925 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; Riserva Integrale di Frattasecca, Pejo (Trento), on soil above granite blocks in a scree (626362.5134987), 1794 m, 31 July 2024, leg. *G. Gheza*, *C. Pistocchi*, *E. Betti*, *J. Nascimbene*, det. *G. Gheza*, *C. Pistocchi*; Riserva Integrale di Frattasecca, Pejo (Trento), on soil in a coniferous forest (626340.5135018), 1820 m, 31 July 2024, leg. *G. Gheza*, *C. Pistocchi*, *E. Betti*, *J. Nascimbene*, det. *G. Gheza*, *C. Pistocchi*; trail between Forte Presanella and Rifugio Denza, Vermiglio (Trento), on organic soil above granite boulders in a subalpine woodland (627689.5123728), 1950 m, 6 August 2024, *G. Gheza*; trail between Forte Presanella and Rifugio Denza, Vermiglio (Trento), on organic soil above granite blocks in a scree (627626.5123589), 2018 m, 6 August 2024, *G. Gheza*.

**Lombardia:** Lago Nero del Gavia, Ponte di Legno (Brescia), on organic soil (614211.5132473), 2395 m, 18 August 2021, *L. Di Nuzzo*, *G. Gheza*; surroundings of Passo del Gavia, Valfurva (Sondrio), on organic soil (614679.5133243), 2620 m, 27 July 2022, *L. Di Nuzzo*, *G. Gheza*; trail between Baita Napoleù and Diga del Gleno, Vilminore di Scalve (Bergamo), on siliceous soil in a montane heath (583871.5095605), 1626 m, 17 August 2022, *G. Gheza*; upper Valle Adamé, Savio dell'Adamello (Brescia), on siliceous soil in a subalpine heath (617668.5106747), 2120 m, 19 August 2023, *G. Gheza*; Valle del Venerocolino, Schilpario (Bergamo), on organic soil above siliceous sandstone in a scree (589908.5099024), 1610 m, 29 August 2023, *G. Gheza*; Baita del Quader, Vilminore di Scalve (Bergamo), on organic soil above siliceous sandstone (586714.5096067), 1290 m, 29 April 2024, *G. Gheza*; trail between Case di Viso and Malga Forgnuncolo, Ponte di Legno (Brescia), on organic soil above gneiss blocks in a subalpine heath (619100.5129605), 2006 m, 1 August 2024, *G. Gheza*; trail between Rifugio Bignami and Ghiacciaio Fellaria, Lanzada (Sondrio), on siliceous soil in a *Vaccinium*-heath (572878.5131870), 2469 m, 14 August 2024, *G. Gheza*; trail between Rifugio Bignami and Alpe Gembré, Lanzada (Sondrio), on siliceous soil in a *Vaccinium-Juniperus*-heath (573242.5131394), 2245 m, 14 August 2024, *G. Gheza*; Alpe Gembré, Lanzada (Sondrio),

on siliceous soil in a *Vaccinium-Juniperus*-heath (574080.5131167), 2206 m, 14 August 2024, *G. Gheza*; trail between Alpe Gembré and Val Poschiavina, Lanzada (Sondrio), on siliceous soil in a subalpine heath (573960.5130930), 2210 m, 14 August 2024, *G. Gheza*.

**Piemonte:** Valle Varaita, S. Anna di Bellino, Vallone di Traversagn (Cuneo), 1840 m on siliceous soil (339088.4937173), 1960 m, 6 August 2019, *D. Isocrono*; Monte Doubia North ridge, Valli di Lanzo, Chialamberto (Torino), on soil in dwarf shrub (366695.5022221), 2400 m, 18 July 2021, leg. *A. Chiariglione*, det. *D. Isocrono*; Valle Sermenza path from Rima to Rifugio Vallè (Vercelli) on soil (421875.5083808) 2100 m, 16 August 2022, *D. Isocrono*.

**Valle d'Aosta:** Vallone di Léviönaz, Valsavarenche (Aosta), on soil in rocky alpine grassland (362695.5047939), 2400 m, 28 October 2022, leg. *S. Samoré*, det. *S. Samoré*, *C. Pistocchi*.

*Cladonia arbuscula* is a boreal-temperate species with a bipolar distribution pattern (Myllys & al. 2003), extensively found throughout the entire Alpine region. It thrives in tundra-like vegetation, favoring mineral-rich soil in exposed habitats.

### ***Cladonia ciliata* Stirt. (Fig. 1)**

**Toscana:** I Golli, Scandicci (Firenze), on soil in clearings with *Erica arborea* L. (673434.4841335), 251 m, 23 November 2021, leg. *G. Pandeli*, det. *G. Gheza*, *L. Di Nuzzo* (Fig.2); Poggio Caprofico, Scandicci (Firenze), on soil in clearings with *E. arborea* (671478.4842652), 260 m, 26 December 2021, leg. *G. Pandeli*, det. *G. Gheza*, *L. Di Nuzzo*; La Querciola, Scandicci (Firenze), on soil in clearings with *E. arborea* (674803.4842076), 294 m, 12 February 2022, leg. *G. Pandeli*, det. *G. Gheza*, *L. Di Nuzzo*; Vincigliata, Fiesole (Firenze), on soil in clearings with *E. arborea* (686956.4851740), 339 m, 24 February 2022, leg. *G. Pandeli*, det. *G. Gheza*, *L. Di Nuzzo*; Mulino di Sugana, San Casciano in Val di Pesa (Firenze), on soil in clearings with *E. arborea* (675221.4840291), 217 m, 24 February 2022, leg. *G. Pandeli*, det. *G. Gheza*, *L. Di Nuzzo*; Casore del Monte, Serravalle Pistoiese (Pistoia), on soil in an abandoned chestnut grove (646019.4865677), 467 m, 22 October 2022, leg. *L. Di Nuzzo*, det. *G. Gheza*, *L. Di Nuzzo*; Parco Sassi Neri, Impruneta (Firenze), on serpentine soil (682947.4838344), 450 m, 26 January 2023, *E. Bianchi*; Riserva di Montefalcone, Fucecchio (Pistoia), on loamy soil in a heathland with *Erica scoparia* L. and *Ulex europaeus* L. (640429.4845755, 640389.4845768), 75 m, 9 March 2024, *L. Di Nuzzo*, *G. Gheza*.

*Cladonia ciliata* is an oceanic species (Litterski & Ahti 2004) that typically grows on soil with moss in undisturbed maquis vegetation, especially in humid coastal areas. In Italy, it is found at a few sites, primarily along the Tyrrhenian coast (Nimis & Martellos 2024). It is national red-listed as endangered (EN) (Rossi & al. 2013) and is experiencing a decline (Ravera & al. 2016).

In Toscana, historical records have not been confirmed recently (Bianchi & al. 2016; Gheza & al. 2020a) and it was known only from a few locations (Ravera & al. 2021).

### ***Cladonia mediterranea* P.A. Duvign. & Abbayes**

**Liguria:** Bonassola, Salto della Lepre (La Spezia), on soil in garigue (545706.4892487), 156 m, 1 June 2024, *P. Giordani*.



Fig. 1. *C. ciliata*, Toscana, I Golli, Scandicci (Firenze), 2021 (Photo G. Pandeli).

**Toscana:** Parco Sassi Neri, Impruneta (Firenze), on serpentine soil (682947.4838344), 450 m, 26 January 2023, *E. Bianchi*; Montecristo, Livorno, on soil in clearings with *E. arboorea* and *E. scoparia* (607030.4688137), 302 m, 28 May 2023, *E. Bianchi*; Capraia, Livorno, on soil (567828.4765409), 130 m, 30 March 2024, *R. Benesperi*.

**Sardegna:** Montresta, valley of Riu Piccarolu, above Sa Entale (Oristano), on soil in garigue (461129.4472387), 193 m, 23 April 2024, *P. Giordani*, *D. Locati*; Arbus, dunes of Piscinas (Sud Sardegna), on soil in *Juniperus* shrubland (453822.4376246), 33 m, 2 May 2024, *P. Giordani*.

*Cladonia mediterranea* has a Mediterranean-Macaronesian distribution (Nimis & Martellos 2024). Additionally, there are some populations found along the Atlantic coast of France and the United Kingdom (Burgaz & al. 2020). This species usually grows on acid and subneutral soils, less frequent on limestone soils, forming low clumps together with pleurocarpous mosses in sheltered situations amongst shrub vegetation along the Tyrrhenian coast (Nimis & Martellos 2024). Subpopulations are severely fragmented and threatened, according to Ravera & al. (2016) this species has been assessed as endangered (EN) in Italy. In Liguria, *C. mediterranea* is currently present in the hinterland (Valle del Rio Gavano and crossroads of Glori) (Gheza & al. 2020b) and along the coast (Bonassola and Portofino), while historical reports in Varazze have not been reconfirmed (Ravera &



Fig. 2. *C. ciliata* in clearings with *Erica arborea*, Toscana, I Golli, Scandicci (Firenze), 2021 (Photo G. Pandeli).

al 2016). In Toscana, the species is known from the islands and several stations along the coast. These recent surveys confirm the stability of the populations on the islands of Capraia (Nimis & al. 1990) - samples collected in 1988 and 1999 are stored respectively in the Herbaria TSB and SI (Nimis & Martellos 2024) - and Montecristo - samples collected from 2009 to 2016 are stored in FI and in the Herbarium Nascimbene (Nimis & Martellos 2024). Regarding its presence in the inland areas (Impruneta, Florence), until now it was only known to exist around Pistoia and Siena (Ravera & al. 2021). In Sardegna, *C. mediterranea* had not been reported since the late 1990s and was known exclusively from three sites (Ravera & al. 2016).

#### ***Cladonia mitis* Sandst.**

**Lombardia:** Lago Nero del Gavia, Ponte di Legno (Brescia), on organic soil (614211.5132473), 2395 m, 18 August 2021, *L. Di Nuzzo, G. Gheza*; surroundings of Passo del Gavia, Valfurva (Sondrio), on organic soil (614679.5133243), 2620 m, 27 July 2022, *L. Di Nuzzo, G. Gheza*.

**Piemonte:** Valle Varaita, bosco dell'Allevé (Cuneo), on siliceous soil (339088.4937173), 1960 m, 6 August 2019, *D. Isocrono*; Valli di Lanzo, Chialamberto, Monte Doubia North ridge, on soil in dwarf shrub (366683.5022216), 2380 m, 18 July 2021, leg. *A. Chiariglione* det. *D. Isocrono*.

*Cladonia mitis* is a species with an Arctic-Mediterranean and continental distribution, exhibiting a bipolar pattern (Myllys & al. 2003). It is widely distributed throughout the entire Alpine region, thriving predominantly in subalpine-alpine tundra environments. This species is often more abundant at higher altitudes compared to *C. arbuscula*.

***Cladonia portentosa*** (Dufour) Coëm.

**Lombardia:** Ansa di Castelnovate, Vizzola Ticino (Varese), on sandy-pebbly soil in a small heathland fragment with *Calluna vulgaris* (L.) Hull (474772.5052342), 160 m, 18 October 2023, *G. Gheza*.

**Toscana:** I Golli, Scandicci (Firenze), on soil in clearings with *E. arborea* (673434.4841335), 251 m, 23 November 2021, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; La Palazzina, Scandicci (Firenze), on soil in clearings with *E. arborea* (672158.4841525), 220 m, 10 December 2021, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; Poggio Caprofico, Scandicci (Firenze), on soil in clearings with *E. arborea* (671478.4842652), 260 m, 26 December 2021, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; La Querciola, Scandicci (Firenze), on soil in clearings with *E. arborea* (674803.4842076), 294 m, 12 February 2022, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; La Tavernaccia, Scandicci (Firenze), on soil in clearings with *E. arborea* (675361.4841847), 267 m, 12 February 2022, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; Vincigliata, Fiesole (Firenze), on soil in clearings with *E. arborea* (686956.4851740), 339 m, 24 February 2022, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; Mulino di Sugana, San Casciano in Val di Pesa (Firenze), on soil in clearings with *E. arborea* (675221.4840291), 217 m, 24 February 2022, leg. *G. Pandeli*, det. *G. Gheza, L. Di Nuzzo*; Casore del Monte, Serravalle Pistoiese (Pistoia), on soil in an abandoned chestnut grove (646019.4865677), 467 m, 22 October 2022, leg. *L. Di Nuzzo*, det. *G. Gheza, L. Di Nuzzo*; Parco Sassi Neri, Impruneta (Firenze), on serpentine soil (682947.4838344), 450 m, 26 January 2023, *E. Bianchi*; Riserva di Montefalcone, Fucecchio (Pistoia), on loamy soil in a heathland with *E. scoparia* and *U. europaeus* (640494.4845733, 640429.4845755, 640389.4845768), 75 m, 9 March 2024, *L. Di Nuzzo, G. Gheza*.

*Cladonia portentosa*, which has an oceanic affinity and is common and abundant in the Euro-Siberian region, appears scattered in the Mediterranean region (Burgaz & al. 2020). In Italy, it is rare and fragmented, found only in a few localities in the northern and central parts of the country (Nimis & Martellos 2024), where it is mainly related to dry grasslands and Calluna-heathlands (Gheza 2018; Ravera & al. 2021). It is national red-listed as endangered (EN) (Rossi & al. 2013).

***Cladonia rangiferina*** (L.) F.H. Wigg.

**Trentino-Alto Adige:** Val di Rabbi, path between Malga Caldesa Bassa and Rifugio Lago Corvo, Rabbi (Trento), on soil in clearings in a subalpine larch-woodland

(639779.5143746), 2055 m, 15 April 2022, leg. *C. Pistocchi*, det. *C. Pistocchi*, *L. Francesconi*; Val di Tovel, Laghetti Effimeri, Ville d'Anaunia (Trento), on soil in clearings in pine woodland with *Erica carnea* L. (652041.5128068), 830 m, 17 April 2022, *C. Pistocchi*; Val del Monte, Fontanino di Celentino, Pejo (Trento), on soil in a subalpine larch-woodland (624458.5132815), 1714 m, 10 May 2022, leg. *C. Pistocchi*, det. *C. Pistocchi*, *L. Francesconi*; Val Gelada, path towards Bocchetta dei Tre Sassi, Tre Ville (Trento), in soil in an alpine grassland (645268.5122762), 2350 m, 24 June 2022, leg. *J. Nascimbene*, *C. Pistocchi*, det. *C. Pistocchi*; Val Nana, Sasso Rosso, Dimaro Folgarida (Trento), in soil in an alpine grassland with *Salix retusa* L. and *Salix reticulata* L. (646939.5126929), 2410 m, 28 July 2022, leg. *J. Nascimbene*, *C. Pistocchi*, det. *C. Pistocchi*; lower Val Gelada, Tre Ville (Trento), on stump in a subalpine larch-woodland (644129.5122836), 1890 m, 5 September 2022, leg. *J. Nascimbene*, *C. Pistocchi*, det. *C. Pistocchi*; Malga San Giuliano, Caderzone Terme (Trento), in soil in a subalpine larch-woodland (631491.5112790), 1915 m, 5 July 2023, leg. *J. Nascimbene*, *C. Pistocchi*, det. *J. Nascimbene*; Val di Genova, Malga Genova, Massimeno (Trento), on stump in clearings in coniferous forest (628410.5113835), 1125 m, 27 July 2023, leg. *G. Gheza*, *L. Francesconi*, *C. Pistocchi*, det. *L. Francesconi*; Val Nambrone, Lago di Cornisello Inferiore, Carisolo (Trento), on soil in rocky alpine grassland (633691.5120116), 2100 m, 28 July 2023, leg. *G. Gheza*, *L. Francesconi*, *C. Pistocchi*, det. *E. Betti*, *G. Gheza*; trail between Malga Vigo and Lago Malghette, Pinzolo (Trento), on organic soil above granite boulders in a subalpine larch-rhododendron woodland (640554.5124953), 1810 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; Lago Malghette, Pinzolo (Trento), on organic soil in a subalpine larch-rhododendron shrubland (640232.5125193), 1907 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; peat bog above Lago Malghette, Pinzolo (Trento), on organic soil in a subalpine peat bog (639749.5124988), 1925 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*; Via del Fontanino, Peio (Trento), along path CAI 110 on soil between mosses and *Vaccinium* shrubs, (625349.5133337), 1553 m, 15 August 2023, leg. *L. Di Nuzzo*, det. *G. Gheza*, *L. Di Nuzzo*; Malga Folgarida di Dimaro, Dimaro Folgarida (Trento), on stump in coniferous forest (642511.5126064), 1690 m, 6 July 2024, *L. Francesconi*, *C. Pistocchi*; Riserva Integrale di Frattasecca, Pejo (Trento), on soil above granite blocks in a scree (626362.5134987), 1794 m, 31 July 2024, leg. *G. Gheza*, *C. Pistocchi*, *E. Betti*, *J. Nascimbene*, det. *G. Gheza*, *C. Pistocchi*; Riserva Integrale di Frattasecca, Pejo (Trento), on soil in a coniferous forest (626340.5135018), 1820 m, 31 July 2024, leg. *G. Gheza*, *C. Pistocchi*, *E. Betti*, *J. Nascimbene*, det. *G. Gheza*, *C. Pistocchi*; trail between Forte Presanella and Rifugio Denza, Vermiglio (Trento), on organic soil above granite boulders in a subalpine woodland (627689.5123728), 1950 m, 6 August 2024, *G. Gheza*; trail between Forte Presanella and Rifugio Denza, Vermiglio (Trento), on organic soil above granite blocks in a scree (627626.5123589), 2018 m, 6 August 2024, *G. Gheza*.

**Lombardia:** Passo di Mignone, Borno (Brescia), on organic soil (593827.5092272), 1527 m, 9 July 2016, *G. Gheza*; Lago Nero del Gavia, Ponte di Legno (Brescia), on organic soil (614211.5132473), 2395 m, 18 August 2021, *L. Di Nuzzo*, *G. Gheza*; surroundings of Passo del Gavia, Valfurva (Sondrio), on organic soil (614679.5133243), 2620 m, 27 July 2022, *L. Di Nuzzo*, *G. Gheza*; trail between Baita Napoleù and Diga del Gleno, Vilminore di Scalve (Bergamo), on siliceous soil in a montane heath



(584064.5095639), 1632 m, (583871.5095605), 1626 m, (583706.5095468), 1543 m, 17 August 2022, *G. Gheza*; between Monte Colmo and Monte Piccolo, Edolo (Brescia), on organic soil above tonalite in a montane heath (606173.5115769), 1890 m, 14 August 2023, *G. Gheza*; upper Valle Adamé, Saviore dell'Adamello (Brescia), on siliceous soil in a subalpine heath (617668.5106747), 2120 m, 19 August 2023, *G. Gheza*; Lago Belviso, Teglio (Sondrio), on soil in a coniferous forest (587599.5104177), 1490 m, 22 August 2023, *G. Gheza*; Baita del Quader, Vilminore di Scalve (Bergamo), on organic soil above siliceous sandstone (586714.5096067), 1290 m, 29 April 2024, *G. Gheza*; Valle del Tino near Lago di Varro, Vilminore di Scalve (Bergamo), on organic soil above siliceous sandstone (585832.5097570), 2197 m, 20 July 2024, *G. Gheza*, *L. Di Nuzzo*; trail between Case di Viso and Malga Forgnuncolo, Ponte di Legno (Brescia), on organic soil above gneiss blocks in a subalpine heath (619100.5129605), 2006 m, 1 August 2024, *G. Gheza*; Lago di Valbona, Schilpario (Bergamo), on siliceous soil in a subalpine pasture (591874.5099856), 2040 m, 5 August 2024, *G. Gheza*; Lago di Val Asinina, Schilpario (Bergamo), on siliceous soil in a subalpine pasture (591150.5099351), 2152 m, 5 August 2024, *G. Gheza*; above Rifugio Gheza, Braone (Brescia), on siliceous soil in a subalpine grassland (609749.5090794), 2110 m, 8 August 2024, *G. Gheza*; trail between Rifugio Bignami and Alpe Gembré, Lanzada (Sondrio), on siliceous soil in a *Vaccinium-Juniperus*-heath (573242.5131394), 2245 m, 14 August 2024, *G. Gheza*; Alpe Gembré, Lanzada (Sondrio), on siliceous soil in a *Vaccinium-Juniperus*-heath (574080.5131167), 2206 m, 14 August 2024, *G. Gheza*; trail between Alpe Gembré and Val Poschiavina, Lanzada (Sondrio), on siliceous soil in a subalpine heath (573960.5130930), 2210 m, 14 August 2024, *G. Gheza*.

**Piemonte:** Valli di Lanzo, Chialamberto, Monte Doubia North ridge, on soil in dwarf shrub (366683.5022216), 2380 m, 18 July 2021, leg. *A. Chiariglione* det. *D. Isocrono*.

**Valle d'Aosta:** Passo del Piccolo San Bernardo, slopes around Lago Verney (335441.5061929) 2105 m, 20 October 2022, leg. *D. Isocrono*, *S. Ongaro* det. *D. Isocrono*.

*Cladonia rangiferina* is a circumpolar, arctic-alpine species. It thrives in lichen-rich, tundra-like vegetation on mineral soil, typically found in exposed habitats. In Italy, this species is particularly common only on the Alps.

### *Cladonia stellaris* (Opiz) Pouzar & Vězda

**Trentino-Alto Adige:** Val di Tovel, Sentiero delle Glare, near the pic-nic area “Lavacel”, Ville d’Anuania (Trento), on soil in clearings in pine woodland (650811.5126306), 1050 m, 17 April 2022, leg. *C. Pistocchi*, det. *C. Pistocchi*, *G. Gheza*; trail between Malga Vigo and Lago Malghette, Pinzolo (Trento), on organic soil above a granite boulder in a subalpine larch-rhododendron woodland (640554.5124953), 1810 m, 8 August 2023, *G. Gheza*, *C. Pistocchi*.

*Cladonia stellaris* is a circumpolar subarctic-subalpine species. In Italy, the subpopulations are particularly vulnerable and red-listed as endangered (EN) (Rossi & al. 2013). They are small in size, relatively isolated from one another, and confined to the Alpine region.

## Discussion and conclusion

In this contribution we add information on the Italian occurrence of *Cladonia* species overall reporting 90 records from the following regions: Trentino-Alto Adige (31), Lombardia (24), Piemonte (6), Valle d'Aosta (2), Liguria (1), Toscana (24), and Sardegna (2). Recent observations suggest a positive trend for certain species previously considered at risk of extinction. Notably, *C. ciliata*, *C. mediterranea*, and *C. portentosa* have been observed in several new locations. These findings indicate that these species might be expanding their range, suggesting a potentially broader distribution than previously recorded. This expansion into new habitats could signify an adaptive response to changing environmental conditions or successful conservation efforts. The discovery of these species in additional areas provides hope for their continued survival and may lead to a reassessment of their conservation status.

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