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***Studia Lichenologica* in Italy. I. New records of red-listed species**

Abstract

Ravera, S., Bianchi, E., Brunialti, G., Ciotti, R., Di Nuzzo, L., Isocrono, D., Gheza, G., Giordani, P., Guttová, A., Malíček, J., Pandeli, G., Paoli, L., Pittao, E., Potenza G. & Stentella G.: *Studia Lichenologica* in Italy. I. New records of red-listed species. — Borziana 2: 087-108. 2021 — ISSN: 2724-5020 online.

We present new data concerning lichen species of the Italian flora and confirm 36 national red-listed species.

Key words: Floristics, Habitats Directive, IUCN, Lichenized Ascomycetes, threatened species.

Introduction

IUCN-based threat assessment process can be considered as a primary tool with reference to wild species conservation at national, regional and global level (<http://www.iucnredlist.org>). Red lists are widely used by governments, politicians, NGOs and researchers as a basis for conservation efforts. Lichens are overlooked in the IUCN Red List, with less than 60 species evaluated out of about 17,500 lichen species (Feurerer & Hawksworth 2007). At the European level, the only reference is the red list by Sérusiaux (1989), which, however, includes only epiphytic macrolichens.

In the last years a few efforts have been made in Italy to assess the status of “policy” species (e.g., taxa listed in the Habitat Directive 92/43 EEC) (Rossi & al. 2013, Ravera & al. 2016), taxa of conservation concern living in highly threatened habitats (e.g., wetlands and coastal habitats) (Rossi & al. 2013), and epiphytic lichens (Nascimbene & al. 2013). Epiphytic lichens, particularly, were evaluated following Dahlberg & Mueller (2011) with a pragmatic approach based on three main points: species’ rarity, declining trend, number of administrative regions and localities where the taxon had been reported during the last 50 years. A total of 381 species has been evaluated to date.

The distribution of species is a crucial information to apply the IUCN Red List criteria for all assessments and status reviews aimed to identify a priority in the species to be pro-

tected. This information is also essential for the use and development of any useful tool to prevent biodiversity loss in Europe (e.g., Habitat Directive). The main aim of this contribution is improving the knowledge on the national distribution of data deficient, low concern, near threatened, and threatened lichens to monitor their population trend.

Materials and methods

Lichens have been identified using a stereo microscope for macroscopic structures (such as reproductive and vegetative structures) and usual chemical spot tests K (a solution of 10% potassium hydroxide), C (sodium hypochlorite solution), and KC. A light microscope was used for identification of microscopic characters, such as paraphyses, asci and spores. For the identification of the lichen species several keys were used, mainly Clauzade & Roux (1985) and Smith & al. (2009). Nomenclature refers to the Index Fungorum Database (2021).

Specimens were independently recorded by the authors during their own field works. For each taxon, locality, substrate, approximate (to safeguard the location) coordinates in UTM WGS84, altitude, dates of observation, collector (legit), identifier (if different from collector) and a few comments are reported. Taxa are presented in alphabetic order. Bio-ecological characterization follows Nimis (2016). Conservation status is based on information from the most recent literature (Nascimbene & al. 2013, Rossi & al. 2013, Ravera & al. 2016) and is indicated before the name by the IUCN categories RE (Regionally Extinct), CR (Critically Endangered), EN (Endangered), VU (Vulnerable), NT (Near Threatened), LC (Least concern), and Data Deficient (DD).

Regarding the locality, regional occurrence in Italy is reported following the tabular representation in Nimis & Martellos (2021), from north to south and designated with the following abbreviations: Frl (Friuli), Lomb (Lombardia), Piem (Piemonte), VA (Valle d'Aosta), Lig (Liguria), Tosc (Toscana), Umb (Umbria), Laz (Lazio), Sar (Sardegna), Camp (Campania), Bas (Basilicata), Si (Sicilia). All geographical and political entities are written in the Italian diction.

Results

(NT) *Arthonia ruana* A. Massal.

Bas: Grumento Nova (Potenza), on *Quercus pubescens* (32T 572904.4462182), 560 m, 13 May 2014, leg. A. Guttová, L. Paoli, S. Ravera; Grumento Nova (Potenza), on *Q. cerris* (32T 575561.4461777), 590 m, 15 May 2014, A. Guttová, L. Paoli, S. Ravera.

Arthonia ruana is a rare temperate-suboceanic species, mostly collected on smooth bark and shrubs in humid deciduous forests (Nimis 2016). Recent reports of this species are very few and limited to highly conservative environments (Ravera 2018). This species in Basilicata was known until now exclusively from sandy dune habitats on the Ionian coast, on *Pinus halepensis* (Potenza & al. 2010). The specimens from Grumento, colonize oaks in an agricultural area with persisting impact of industrial activities.

(VU) *Bacidia absistens* (Nyl.) Arnold

Tosc: San Gimignano (Siena), Riserva Naturale di Castelvecchio, on *Fagus sylvatica* (32T

660900.4812800), 390 m, 8 July 2002, leg. *S. Loppi, S. Ravera*, det. *S. Ravera*. Vallombrosa, Reggello (Firenze), on *Abies alba* (32T 705628.4845750), 915 m, 26 July 2021, *S. Ravera*.

Camp: Palinuro (Salerno), Parco Nazionale del Cilento, Vallo di Diano e Alburni, on *Pinus halepensis* along the path to the lighthouse (33T 524153.4430773), 170 m, 3 April 2010, *S. Ravera*; Pineta di Sant’Iconio (Natura 2000 Site IT8050039) Marina di Camerota (Salerno), on *Pinus halepensis* and *Quercus ilex* (33T 527995.4431746), 50 m, 4 April 2010, *S. Ravera*.

This is a mild-temperate to humid subtropical lichen, mainly Tyrrhenian and extremely to very rare in Italy (Nimis 2016). In Toscana, until now it was known only for Volterra, Pisa (Nimis 1993). In Campania, few records of this species are available from a deep calcareous gorge along the river Bussento (Nimis & Tretiach 2004) and the Sorrento peninsula (Garofalo & al. 2010). In the SAC Pineta di Sant’Iconio, the species was found in an Aleppo pine forests, referring to the Natura 2000 Habitat 9540 “Mediterranean pine forests with endemic Mesogean pines”.

(NT) *Blastenia herbidella* (Hue) Servit

Lomb: Vilminore di Scalve (Bergamo), trail between the hamlet Bueggio and the Gleno dam, on *Salix caprea* (32T 583185.5095198), 1151 m, 25 August 2021, *G. Gheza*; Vilminore di Scalve (Bergamo), hamlet Teveno, on *Prunus avium* (32T 582052.5093559), 1137 m, 25 August 2021, *G. Gheza*; Borno (Brescia), Croce di Salven, on *Sorbus aucuparia* in a clearing (32T 590119.5088395), 1054 m, 7 January 2020, *G. Gheza*; Angolo Terme (Brescia), hamlet Prave, on *Prunus avium* and *Sorbus aucuparia* (32T 587481.5087364), 1145 m, 31 August 2021, *G. Gheza*; Bienno (Brescia), Foresta Val Grigna, Valle delle Forme, on *S. aucuparia* in a clearing (32T 603160.5083210), 1247 m, 6 August 2019, *G. Gheza*; Cisano (Brescia), Foresta Gardesana Occidentale, near Malga Lorina, on *Fagus sylvatica* in a beech wood (32T 629043.5074113), 1333 m, 2 August 2019, *G. Gheza*.

This species has been reported rarely from Lombardia (Magnusson 1944; Dalle Vedove & al. 2004), but it could be more widespread, especially in the montane belt (Nimis 2016). The record from Gardesana Occidentale comes from a beech forest attributed to the Natura 2000 Habitat 91K0 “Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*)”.

(NT) *Buellia disciformis* (Fr.) Mudd

Bas: Lago Pertusillo (Natura 2000 Site IT9210143), Grumento Nova (Potenza), on *Fraxinus ornus* (32T 579000.4460000), 570 m, 15 February 2014, *A. Guttová, L. Paoli, S. Ravera*, det. *S. Ravera*.

There is an old record of this species from Maratea coast on *Quercus ilex* (Bartoli & Puntillo 1998), but since then it was not recorded for Basilicata. We found this species in white-oak dominated woods with a submediterranean flora, referring to the Natura 2000 Habitat 91AA* “Eastern white oak woods”.

(VU) *Calicium pinicola* (Tibell) M. Prieto & Wedin

Piem: Valli di Lanzo (Torino), on old *Larix decidua* trunks (32T 369233.5023487) 840 m, 18 August 2021, leg. *D. Isocrono, A. Chiariglione*, det. *D. Isocrono* (Hb Isocrono n. 97). This species was previously recorded for Piemonte without precise locality (Tibell 1971, Puntillo & Puntillo 2009). This is the first georeferenced find for this administrative region

where the species is considered rare (Nimis & Martellos 2021). In the site the species occurs on few *Larix* trees.

(DD) *Cetrelia cetrarioides* (Duby) W.L. Culb. & C.F. Culb.

Lomb: Bienno (Brescia), Foresta Val Grigna, Put de Berto, on *Picea abies* (32T 602650.5082884), 1350 m, 6 August 2019, *G. Gheza*; Valmasino (Sondrio), Bagni di Masino, on *Picea abies* (32T 545928.5121459), 1184 m, 25 August 2019, *G. Gheza*.

Both the records come from old, cool and humid forest stands attributed to the Natura 2000 Habitat 9410 “Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)”. In Lombardia this species has been reported only recently from three close sites located in the Val di Scalve (Gheza 2019a) in a similar habitat.

(EN) *Cladonia ciliata* Stirt.

Tosc: Santa Maria a Marciola, Scandicci (Firenze), on soil in clearings with *Erica arborea* (32T 671231.4842906), 248 m, 1 October 2021, leg. *G. Pandeli*, det. *G. Gheza*; Poggio Cigoli, Scandicci (Firenze), in clearings with *Erica arborea* (32T 673199.4841820), 275 m, 19 October 2021, leg. *G. Pandeli*, det. *G. Gheza*.

Cladonia ciliata (Fig.1) is a temperate species found on soil with moss in undisturbed maquis vegetation, mostly in humid coastal areas (Nimis 1993, 2016). In Italy it is known from a few sites mainly along the Tyrrhenian coast (Nimis & Martellos 2021 and references therein) and has a declining trend (Ravera & al. 2016). In Toscana, records from Monte Ceceri (Sbarbaro 1956) and Montecristo (Valcuvia Passadore 1978) have not been confirmed recently (Bianchi & al. 2016, Gheza & al. 2020). Therefore, these two reports from Scandicci represent the only locations currently known in the region.

(EN) *Cladonia mediterranea* P.A. Duvign. & Abbayes

Tosc: Valiana, Vescovado di Murlo (Siena), on soil (32T 694400.4783100), 270 m, 12 February 2020, leg. *E. Bianchi*, *P. Giordani*, *L. Paoli*, *S. Ravera*, det. *P. Giordani*, *S. Ravera* (Fig. 2.); Valpiana, Massa Marittima (Grosseto), on soil (32T 651413.4762867), 156 m, 14 January 2021, leg. *G. Pandeli*, det. *G. Gheza*; Marina di Castagneto Carducci, Castagneto Carducci (Livorno), on soil (32T 625228.4780702), 9 m, 22 January 2021, leg. *G. Pandeli*, det. *G. Gheza*; Roccamare, Castiglion della Pescaia (Grosseto), on soil (32T 648239.4738328), 10 m, 2 February 2021, leg. *G. Pandeli*, det. *G. Gheza*; Talamone, Orbetello (Grosseto), on soil (32T 675132.4714555), 24 m, 10 February 2021, leg. *G. Pandeli*, det. *G. Gheza*.

This species has a pronounced Mediterranean-Macaronesian distribution and usually grows on soils forming low clumps together with pleurocarpous mosses in sheltered situations amongst shrub vegetation along the Tyrrhenian coast (Nimis & Martellos 2021). Subpopulations are severely fragmented and threatened (Ravera & al. 2016). In addition to being a species protected under the Habitats Directive, it is also a species of national interest for the selection of Important Plant Areas (Ravera & al. 2011a), being included in the European red list of macrolichens (Sérusiaux 1989). In Toscana *C. mediterranea* is known for Capraia (Nimis & al. 1990), Montecristo (R. Benesperi, com. pers.) and Isola d’Elba (Senese & Critelli 2000), in the province of Livorno; “Parco dell’Uccellina” (Herb. TSB 3) and Versegge (R. Benesperi, com. pers.), in the pro-



Fig. 1. The characteristic red colour reaction of the *Cladonia ciliata* thallus from a spot test with PPD (Paraphenylenediamine) (Photo G. Pandeli).

vince of Grosseto; Poggio Abbù (Putorti & al. 1999) and Camporedaldi (Herb. Ravera 662), in the province of Siena; Puntone di Farneta, in the province of Pistoia (Herb. SI 242).

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

Lomb: Nosate (Milano), Bosco della Chiesa, on soil in a small fragment of *Calluna*-heathland encroached by trees (32T 477618.5044706), 142 m, 20 May 2021, *G. Gheza*. (Fig. 3.).

Tosc: Monticiano (Siena), Strada Provinciale “delle Pinete” between Monticiano and Tocchi, on soil in clearings with *Calluna vulgaris* and *Erica arborea* (32T 680627.4778647 and 682214.4778532), 332 and 449 m, 31 March 2019, *G. Gheza*; Santa Maria a Marciola, Scandicci (Firenze), on soil in clearings with *E. arborea* (32T 671230.4842905), 248 m, 1 October 2021, leg. *G. Pandeli*, det. *G. Gheza*; La Tavernaccia, Scandicci (Firenze), on soil in clearings with *E. arborea* (32T 675511.4841680), 272 m, 3 October 2021, leg. *G. Pandeli*, det. *G. Gheza*; Poggio Cigoli, Scandicci (Firenze), on soil in clearings with *E. arborea* (32T 673227.4841796), 274 m, 19 October 2021, leg. *G. Pandeli*, det. *G. Gheza*.

Cladonia portentosa is a rare species occurring in few localities in northern and central Italy (Nimis 2016). Even if the European distribution of this species has been described as related to the distribution of lowland *Calluna vulgaris* heathlands (Natura 2000 Habitat 4030 “European dry heaths”) (Gilbert 2000, Nimis 2016), many of the Italian records



Fig. 2. *Cladonia mediterranea*, Toscana, Valiana, Vescovado di Murlo (Siena), 2020 (Photo S. Ravera).

come from different habitats. In the western Po Plain the species is mainly related to *Corynephorus canescens* grasslands (Natura 2000 Habitat 2330 “Inland dunes with open *Corynephorus* and *Agrostis* grasslands”) (Ravera & al. 2016, Gheza 2018). The record from Lombardia refers to the Ticino river valley, where the species has a scattered distribution, occurring in five dry grasslands and in one other *Calluna*-heathland, but only two of these sites are located in Lombardia, the others belonging to the region Piemonte (Gheza 2018). At present, in all these sites terricolous lichen communities are threatened by habitat loss mainly due to tree encroachment. The records from Toscana refer to heaths dominated by *Calluna vulgaris* and *Erica arborea* located in clearings of a pine forest, where *C. portentosa* occurred among more common *Cladonia* species, i.e. *C. cervicornis*, *C. foliacea*, *C. furcata*, *C. ramulosa* and *C. rangiformis*. The real distribution of this species in Toscana should be checked carefully: for example, the records from Montecristo by Valcuvia Passadore (1978) could refer instead to *C. mediterranea*, a very similar species reported from that island by Bianchi & al. (2016), who did not find *C. portentosa* there.

(EN) *Crespoa crozalsiana* (Harm.) Lendemer & B.P. Hodk.

Lig: Molinetti, Fraz. Sant’Apollinare, Sori (Genova), on *Olea europaea* (32T 509574.4912908), 270 m, 4 April 2017, *P. Giordani*; Sant’Ilario, Genova, on *O. europaea* (32T 504968.4914551), 220 m, 21 May 2017, *P. Giordani*; Polanesi, Recco (Genova), on *O. europaea* (32T 510082.4912572), 128 m, 28 May 2017, *P. Giordani*; Semorile, Zoagli (Genova), on *O. europaea* (32T 522071.4910934), 196 m, 17 September 2017, *P. Giordani*; Bonassola



Fig. 3. *Cladonia portentosa*, Lombardia, Nosate, Bosco della Chiesa (Milano), 2021 (Photo G. Gheza)

(La Spezia), on *Quercus ilex* (32T 545850.4892831), 119 m, 30 April 2017, *P. Giordani*;
Framura (La Spezia), on *Q. ilex* (32T 545322.4893635), 60 m, 30 April 2017, *P. Giordani*.

The genus *Crespoa* is predominantly distributed in tropical and subtropical areas. In Italy, two related species occur: *C. crozalsiana* and *C. carneopruinata*, the former known from a few localities in Liguria, Lazio, and Sicilia, the latter only from Liguria (Nimis 2016). The records reported here contribute to the knowledge of the distribution of the species in the Ligurian Riviera that probably represents the most suitable area in the whole peninsula (Giordani & al. 2001).

(NT) *Enchylium ligerinum* (Hy) Otálora, P.M. Jørg. & Wedin

Bas: Viggiano (Potenza), on *Quercus pubescens* and *Q. cerris* (32T 575000.4466000), 730 m, 9 April 2014, *A. Guttová, L. Paoli, S. Ravera*; Grumento Nova (Potenza), on *Q. pubescens* (32T 575000.4460000), 590 m, 14 February 2014, *A. Guttová, L. Paoli, S. Ravera*. This very to extremely rare cyanolichen (Nimis & Martellos 2021), was recorded north of Viggiano for the first time in 1996 (Nimis & Tretiach 1999). In the administrative region of Basilicata, it has been reported until now only from Val d'Agri.

(NT) *Gabura fascicularis* (L.) P.M. Jørg.

Bas: Grumento Nova (Potenza), on *Quercus pubescens* (32T 575561.4461777), 590 m, 15

May 2014, *A. Guttová, L. Paoli, S. Ravera*; Grumento Nova (Potenza), on *Malus* sp. (32T 573000.4460000), 590 m, 13 February 2014, *A. Guttová, L. Paoli, S. Ravera*.

This cyanolichen is considered very to extremely rare in Italy (Nimis & Martellos 2021). In Basilicata it was previously known only from one site in the Lucan Apennines (Potenza 2006).

(DD) *Gyalecta arbuti* (Bagl.) Baloch & Lücking

Camp: Monte della Stella (Natura 2000 Site IT8050025), Omignano (Salerno), on *Castanea sativa* (33T 533767.4436582), 14 July 2010, *S. Ravera*; San Biase (Salerno), on *C. sativa* (33T 533767.4436582), 16 April 2011, *G. Brunialti, S. Ravera*.

Tosc: Vallombrosa, Reggello (Firenze), on *Abies alba* (32T 705628.4845750), 915 m, 26 July 2021, *S. Ravera*.

Gyalecta arbuti is closely related to *G. carneola* with which it was probably often confused, since they share the same ecology (Nimis 2016). This species is known only from a few sites in Liguria, Sardegna (Nimis 1993 and references therein), and Toscana (Loppi & al. 2004) where it was only found on *Quercus ilex* in the island of Elba (Marciana, Livorno). It is new to the lichen flora of Campania.

(NT) *Gyalecta carneola* (Ach.) Hellb.

Tosc: Piteglio (Pistoia), on *Castanea sativa* (32T 641896.4876250), 760 m, 5 February 2021, leg. *R. Benesperi, E. Bianchi, L. Di Nuzzo, L. Paoli, S. Ravera*, det. *L. Di Nuzzo, S. Ravera*; Vallombrosa, Reggello (Firenze), on *Abies alba* (32T 705628.4845750), 915 m, 26 July 2021, *S. Ravera*.

Umb: Cimitelle, Stronccone (Terni), on *C. sativa* (33T 310271.4706643), 840 m, 4 March 2021, leg. *R. Ciotti, S. Ravera*, det. *S. Ravera*.

Laz: Riserva Naturale Regionale Monterano, Canale Monterano (Roma), on *Quercus pubescens* (33T 259630.4670526), 300 m, 23 November 2002, *S. Ravera*.

This very to extremely rare trentepohlioid lichen is a mild-temperate species found in old, humid forests, known for a few sites in Toscana (Nimis 1993 and references therein). The report from Cimitelle confirms a preferential presence of *G. carneola* in Umbria on old chestnut trees (Ravera 1998). In Lazio, it was known only from the lowland hygrophilous woodlands of Castelporziano.

(NT) *Gyalecta ulmi* (Sw.) Zahlbr.

Umb: Salto del Cieco, Ferentillo (Terni), on mosses on steeply inclined faces of calciferous rocks (33T 324724.4719420), 930 m, 3 October 2000, leg. *V. Genovesi, G. Massari, D. Puntillo, S. Ravera* det. *D. Puntillo*.

Bas: Grumento Nova (Potenza), on *Malus* sp. (32T 573000.4460000), 590 m, 13 February 2014, *A. Guttová, L. Paoli, S. Ravera*.

This trentepohlioid lichen was probably more frequent in the past in Italy (Nimis 2016).

(VU) *Lecanora impudens* Degel.

VA: Oyace, on *Fraxinus excelsior* trunks (32T 373024.5076999), 1089 m, 22 July 2021, leg. *D. Isocrono, S. Ongaro* det. *D. Isocrono* (Hb Isocrono n. 75).

This crustose lichen, characterized by the presence of well-defined or confluent soralia, is quite rare in Italy. This record broadens the known range of this species in Italy. *Lecanora impudens* was previously unknown for the western Italian Alps (Nimis & al. 2018).

(EN) *Leptogium furfuraceum* (Harm.) Sierk

Camp: San Biase (Salerno), on *Castanea sativa* (32T 533767.4436582), 16 April 2011, *G. Brunialti, S. Ravera*.

Leptogium furfuraceum is an epiphytic cyanolichen restricted to the Old World, where it occurs in some regions of southern Europe (Croatia, France, Portugal, and Spain) and Africa (Ethiopia, Kenya, and Tanzania) (Otálora & al. 2010). This species seems to be extremely rare and it is known only from a few locations from two regions on the Tyrrhenian side of Peninsular Italy (Nimis 2016). It is new to the lichen flora of Campania.

(NT) *Leptogium hildenbrandii* (Garov.) Nyl.

Lomb: Paisco-Loveno (Brescia), crossroads between Paisco, Loveno and the Vivione Pass in the Val Paisco, on an old pollarded *Fraxinus excelsior* near the road (32T 597553.5102063), 1089 m, 4 August 2019, *G. Gheza*; Schilpario (Bergamo), outlet of the Valle del Vo near the hamlet Ronco, on *F. excelsior* (32T 588323.5096279), 1083 m, 26 August 2021, *G. Gheza*; Azzone (Bergamo), Via Pizzo Camino, on *Juglans regia* (32T 586319.5092311), 991 m, 21 August 2019, *G. Gheza*.

This species grows on base-rich bark in humid and well-lit situations without direct solar irradiation, a condition that is typically found on old isolated trees in humid valleys with continental climate (Stofer 2015, Nimis 2016). It is strongly threatened by air pollution and loss of its habitat-trees (Stofer 2015). As in many other European areas, this species suffered a strong decline in lowland areas of Lombardia in the last century: after the mid 20th century it has been reported only from montane areas (Rivellini 1994, Arosio & al. 2003, Abramini & al. 2008), even if it occurred widely also in the plain at least until the early 1910–1920s (Anzi 1860, Cozzi 1917, Tretiach 1996). The records reported here come from montane sites located in secondary valleys of the upper basin of the Oglio river; in the same area, Giacomini (1937) reported *L. hildenbrandii* only from one locality, Edolo, which was cited later by Dalle Vedove & al. (2004).

(NT) *Lethariella intricata* (Moris) Krog

Bas: Montepiano, Accettura (Potenza), on bark of *Quercus cerris* (32T 596733.4478711) 1136 m, 17 June 2018, *G. Potenza, L. Rosati* (HLUC No.796). Piano Carbone, Laurenzana (Potenza), on bark of *Q. cerris* (32T 585314.4482371), 1235 m, 19 June 2018, *G. Potenza, L. Rosati* (HLUC No.797).

The species has a distribution range that includes Macaronesia and the Mediterranean region up western Anatolia and Crimea where it is considered extinct (The Global Fungal Red List Initiative 2014). Epilithic and epiphytic, tendentially acidophilic, it colonizes mainly siliceous rocks and acid barks. In Italy it seems locally common only in Sardinia where it was originally described by Moris (1829). Considered a Mediterranean relict (Nimis 2016), *L. intricata* has declined in the eastern part of its distribution area, probably due to general climate aridification. Forest fires and possibly overgrazing are other threats for the species (The Global Fungal Red List Initiative 2014).

In Basilicata, several locations are already known in the Lucan Apennines where exceptionally fertile populations are found (Potenza 2006), and on Pollino (Puntillo & al. 2009).

(NT) *Lobarina scrobiculata* (Scop.) Nyl.

Bas: Lago Pertusillo (Natura 2000 Site IT9210143), Grumento Nova (Potenza), on *Quercus cerris* (32T 579000.4460000), 570 m, 15 February 2014, *A. Guttová, L. Paoli, S. Ravera*; between Grumento Nova and Tramutola (Potenza), on *Quercus* spp. (32T 571375.4462375), 570 m, 13 May 2014, *A. Guttová, L. Paoli, S. Ravera*.

According to Nascimbene & al. (2016), the Italian range of this species is expected to be severely reduced in the next years due to its higher sensitivity to climate change. Already recorded in Basilicata at the end of the 19th century (Jatta 1880, 1882, 1885, 1889), *L. scrobiculata* is currently known only from a few sites (Potenza 2006, Puntillo & al. 2009). In Val d'Agri, we found few thalli in two semi-natural oak woods. Particularly, in the SAC Lago Pertusillo, we found this species in white-oak dominated woods with a submediterranean flora, referring to the Natura 2000 Habitat 91AA* "Eastern white oak woods".

(NT) *Nephroma resupinatum* (L.) Ach.

Bas: Monte della Madonna di Viggiano (Natura 2000 Site IT9210180), Viggiano (Potenza) on *Fagus sylvatica* (32T 573000.4470300), 1500 m, 10 April 2014, *A. Guttová, L. Paoli, S. Ravera*.

Si: Monti Nebrodi, in a beech forest in surrounding of crossroad, 5.5 km NNE of Capizzi (Messina), on mossy trunk of *F. sylvatica* (33S 457000.4197400), 1500 m, 24 September 2014, *J. Malíček* (Herb. Malíček n. 7523)

Nephroma resupinatum is a mainly temperate, holarctic cyanolichen found in cool and sheltered habitats, with optimum in humid beech forest (Nimis 2016), currently known from a few sites in Basilicata (Potenza 2006, Brackel 2011). In the SAC Monte della Madonna di Viggiano, we found this species in a thermophilous beech forest, highly fragmented, referring to the Natura 2000 Habitat 9210 "Apennine beech forests with *Taxus* and *Ilex*". In Sicilia, this species is known only for Monti Nebrodi (Grillo 1992), where the presence here is confirmed.

(VU) *Nephromopsis laureri* (Kremp.) Kurok.

Lomb: Paghera in Val di Vallaro, Vione (Brescia), on *Larix decidua* (32T 610905.5120076), 1509 m, 14 August 2019, *G. Gheza*.

Few thalli of this species were found together with *Nephromopsis chlorophylla* and *Platismatia glauca* on larch trunks in a mixed coniferous stand with larch and spruce crossed by a stream in a narrow valley. Two recent records for Lombardia come from the Val Camonica as well – from the Adamello massif (Nascimbene et al. 2006) and the Val Brandet (Gheza 2019b), the latter referring to a very similar habitat to that reported here – while some historical records from Valtellina were reported by Anzi (1860).

(NT) *Pannaria conoplea* (Ach.) Bory

Camp: Pineta di Sant'Iconio (Natura 2000 Site IT8050039), Marina di Camerota (Salerno), on *Pinus halepensis* (33T 527995.4431746), 50 m, 4 April 2010, *S. Ravera*; Monte della Stella (Natura 2000 Site IT8050025), Omignano (Salerno), on *Castanea sati-*

va (33T 533767.4436582), 14 July 2010, *S. Ravera*; Monte Bulgheria (Natura 2000 Site IT8050023), Celle di Bulgheria (Salerno), on *C. sativa* (33T 533767.4436582), 11 April 2011, *G. Brunialti, S. Ravera*; San Biase (Salerno), on *C. sativa* (33T 533767.4436582), 16 April 2011, *G. Brunialti, S. Ravera*.

Bas: Lago Pertusillo (Natura 2000 Site IT9210143), Grumento Nova (Potenza), on moss (32T 579000.4460000), 570 m, 15 February 2014, *A. Guttová, L. Paoli, S. Ravera*.

This extremely rare cyanolichen is declining, especially in northern Italy (Nimis 2016) as over most of its European range (Nimis 1993). In Campania and Basilicata this species is currently present in a few locations (Potenza 2006; Garofalo & al. 2010; Brackel 2011, 2021; Catalano & al. 2016). These records from the administrative region of Campania are the first from the Cilento (Salerno) area.

(NT) *Pannaria rubiginosa* (Ach.) Delise

Camp: Pisciotta (Salerno), on *Olea europaea* (33T 519127.4440793), 230 m, 22 February 2011, leg. *S. Ravera, G. Brunialti*, det. *S. Ravera*.

Pannaria rubiginosa is an extremely rare cyanolichen, restricted to rainy-humid areas, and strongly declining, especially in northern Italy (Nimis 2016). This specimen was collected on centenary trees in olive groves. It is new to the lichen flora of Campania.

(EN) *Parmotrema arnoldii* (Du Rietz) Hale

Lomb: Foresta Val Grigna, Put de Berto, Bienno (Brescia), on twigs of *Picea abies* fallen to the ground (32T 602650.5082884), 1350 m, 6 August 2019, *G. Gheza*.

The site reported here is located in an old, cool and humid coniferous forest attributed to the Natura 2000 Habitat 9410 “Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)” crossed by a stream, where *P. arnoldii* was found together with *Cetrelia cetrarioides* and *Parmelia submontana* on conifer twigs fallen from the canopy. This is very similar to the other two sites known in Lombardia, reported by Gheza (2019a) from the Val di Scalve.

(NT) *Parmotrema crinitum* (Ach.) M. Choisy

Lomb: Valmasino (Sondrio), Bagni di Masino, on granite rock (32T 546196.5121355), 1172 m, 24 August 2019, *G. Gheza*; Paisco-Loveno (Brescia), Foresta Legnoli, on schist rock (32T 596324.5101125), 1265 m, 4 August 2019, det. *G. Gheza*; Schilpario (Bergamo), western side of the lower Valle del Vo, on mossy schist rock (32T 588683.5097526), 1140 m, 26 August 2021, *G. Gheza*; Vilminore di Scalve (Bergamo), trail between Nona and the Gleno dam, on mossy schist rock (32T 582790.5095554), 1437 m, 9 August 2021, *G. Gheza*; Bienno (Brescia), Foresta Val Grigna, trail between Valle delle Forme and Put de Berto, on *Picea abies* (32T 602865.5082961), 1299 m, 6 August 2019, *G. Gheza*.

The new records reported here come from old, cool and humid forest stands attributed to the Natura 2000 Habitat 9410 “Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)”. In Lombardia this species has been reported previously by Anzi (1860), Coassini Lokar & al. (1987), Dalle Vedove & al. (2004) and Gheza (2019a), always from forest habitats.

(NT) *Pectenia plumbea* (Lightf.) P.M. Jørg., L. Lindblom, Wedin & S. Ekman

Bas: Lago Pertusillo (Natura 2000 Site IT9210143), Grumento Nova (Potenza), on *Quercus cerris* (32T 579000.4460000), 570 m, 15 February 2014, *A. Guttová, L. Paoli, S. Ravera*.

Pectenia plumbea is a foliose cyanolichen with oceanic affinities usually found on old trees in undisturbed humid-warm forest habitats. This species and *P. atlantica* have been considered a “species pair” (i.e. closely related species that primarily differ in their reproductive modes) until a revision of the genus based on DNA analysis (Otálora et al. 2017) showed that both species are able to reproduce sexually and asexually. This made it necessary to check all the exsiccates and the historical records of both of the species in order to correctly evaluate their current distribution in Italy (not yet done). In this location located in Val d’Agri, we found a few thalli in a white-oak dominated woods with a submediterranean flora, referring to the Natura 2000 Habitat 91AA* “Eastern white oak woods”.

(VU) *Pyxine subcinerea* Stirt.

Lig: Bonassola (La Spezia), on *Quercus ilex* (32T 545850.4892831), 119 m, 30 April 2017, *P. Giordani*; Polanesi, Recco (Genova), on *Olea europaea* (32T 510082.4912572), 128 m, 28 May 2017, *P. Giordani*.

Pyxine subcinerea has a mainly tropical to subtropical distribution. In Italy it has a western range, being distributed along the northern coasts of the Tyrrhenian Sea (Nimis 2016), especially in Liguria. It occurs in lichen communities characterized by a high incidence of oceanic species, mainly on *Olea*, more rarely on isolated holm oak trees. The species is locally extinct in most of the stations of the western Riviera (Ravera & Giordani 2008), where it was reported in the first decades of the last century (Moberg 1983, Nimis 1993).

(NT) *Ricasolia amplissima* (Scop.) De Not. – chloromorph

Laz: Camposecco (Natura 2000 Site IT6050008), Camerata Nuova (Roma) on *Fagus sylvatica* (33T 346839.4647837), 1480 m, May 2010, *S. Ravera*, form with coralloid cephalodia; Bosco del Cerquone (Natura 2000 Site IT6030018), Rocca Prora (Roma), Parco Regionale dei Castelli Romani, on *Quercus cerris* (33T 315931.4625684), 530 m, 23 May 2020, *S. Ravera*.

According to Nascimbene & al. (2016), the Italian range of this species is expected to have a severe reduction in the next years due to its higher sensitivity to climate change. *Ricasolia amplissima* (chloromorph) is currently known from a few sites in Lazio (Nimis 2016), but only in one of them, it seems to be growing in the rare form with coralloid cephalodia (Ravera 2018). In Camposecco, this form was observed on an old beech tree in a beech forest referred to Natura 2000 Habitat 9210 “Apennine beech forests with *Taxus* and *Ilex*”.

(NT) *Ricasolia virens* (With.) H.H. Blom. & Tønberg

Sar: Nuraghe Rujju, Montiferru (Oristano), on *Quercus ilex* (32T 464738.4440707), 800 m, 20 August 2016, *P. Giordani, R. Benesperi, J. Nascimbene, E. Bianchi*; Elighes Uttiosus, Montiferru (Oristano), on *Q. ilex* (32T 466373.4443332), 950 m, 19 August 2017, *P. Giordani*. The records of this species in Sardegna date back to the nineteenth century (Baglietto 1879, Nimis & Poelt 1987). To date, less than 10 populations of this species are known in Italy, and it is probably almost extinct in northern Italy and along the eastern side of the Peninsula (Nimis 2016). In the sites recorded here, this species colonizes small

fragments of an ancient holm oak forest characterized by high amounts of atmospheric humidity thanks to the presence of sea winds.

(RE) *Rinodina polyspora* Th. Fr.

VA: Oyace on *Fraxinus excelsior* trunks (32T 373024.5076999), 1089 m, 22 July 2021, leg. D. Isocrono, S. Ongaro det. D. Isocrono (Hb Isocrono n. 79).

The species has been recorded only in northern Italy where it is probably declining and currently considered regionally extinct (Nascimbene & al. 2013). The occurrence of this species in Valle d'Aosta was unknown till now.

(DD) *Rostania occultata* (Bagl.) Otálora, P.M. Jørg. & Wedin

Si: Piano Zucchi, Madonie, trees along road close to Rifugi Alpini Luigi Orestano, 5.8 km ESE of Collesano (Palermo), on bark of *Quercus coccifera* (33S 411883.4194885), 1100 m, 26 September 2014, J. Malíček (Herb. Malíček n. 7528).

This cyanolichen is characterized by minute thalli - easy to overlook in the field – growing on smooth, base-rich, but not very eutrophicated bark of more or less isolated broad-leaved trees (Nimis 2016). In Sicilia it was already known only from a few locations in the SE of the island (Grillo & Romano 1989, Grillo & Caniglia 2004), this record is the first from the northern sector of the administrative region.

(VU) *Segestria leptalea* (Durieu & Mont.) R.C. Harris

Camp: Pisciotta (Salerno), on *Olea europaea* (33T 519127.4440793), 230 m, 22 February 2011, leg. S. Ravera, G. Brunialti, det. S. Ravera.

This species prefers old-growth forests, but it may occur also in managed ones, which are close to some old-growth forests. In Central Europe, it is typical for temperate beech forests. In Italy it usually grows on smooth bark of broadleaved trees, in moist forests and sometimes foliicolous on *Buxus sempervirens* L. (Nimis 2016); it is known only for Basilicata (Bartoli & Puntillo 1998), Calabria (Puntillo & Vězda 1994, Puntillo 1995, 1996), and Toscana (Ravera & al. 2020b). This specimen was collected on centenary trees in olive groves. The species is new to the lichen flora of Campania.

(LC) *Thelopsis isiaca* Stizenb.

Sar: Piscinas, Arbus (SU) on *Juniperus oxycedrus* twigs on sand dunes (32S 453194.4376787) 14 m, 5 June 2021, D. Isocrono (Hb Isocrono, 105).

In Sardegna, *Thelopsis isiaca* has been reported once in 1989 from the south eastern coast near Feraxi pond (stagno di Feraxi) on *Juniperus* (TSB 13146). The specimen from Arbus widens the range of the species in the region westwards.

(NT) *Teloschistes chrysophthalmos* (L.) Th. Fr.

Frl: Celante di Vito d'Asio (Pordenone), on *Fraxinus excelsior* branches (33T 339888.5120036), ca. 300 m, 10 July 2018, E. Pittao (TSB No. 41031).

Tosc: Pian de' Cerri, Scandicci (Firenze), on *Olea europaea* branches (32T 672998.4843618), 310 m, 16 October 2020, G. Pandeli; La Lepre, Scandicci (Firenze), on *O. europaea* branches (32T 676630.4842785), 178 m, 31 January 2021, G. Pandeli; Giogoli, Scandicci (Firenze), on *O. europaea* L. branches (32T 677199.4843667), 161 m,

31 January 2021, *G. Pandeli*; Terra Rossa, Scandicci (Firenze), on *O. europaea* branches (32T 674338.4843912), 205 m, 31 January 2021, *G. Pandeli*; Cafaggio, Pelago (Firenze), on *O. europaea* branches (32T 700418.4850008), 313 m, 2 August 2021, *G. Pandeli*; Necropoli di Palastreto, Sesto Fiorentino (Firenze), on *O. europaea* branches (32T 679281.4855856), 236 m, 23 August 2021, *G. Pandeli*; Rio Buti (Prato), on shrubs (32T 671946.4864966), 356 m, 3 September 2021, *G. Pandeli*; Agresto, Poggibonsi (Siena), on *O. europaea* branches (32T 675891.4815941), 230 m, 28 September 2020, *G. Pandeli*; Santa Lucia, Poggibonsi (Siena), on *Olea europaea* branches (32T 676887.4816219), 267 m, 28 September 2020, *G. Pandeli*.

Umb: Calvi dell'Umbria (Terni), on *O. europaea* branches in the garden of the former Ursuline monastery (33T 285083.4674748), 437 m, 12 November 2018, *G. Stentella*; Santa Maria della Neve, Calvi dell'Umbria (Terni), on *O. europaea* (33T 299092.4696345), 253 m, 15 November 2018, *G. Stentella*; Parco archeologico di Otricoli, Otricoli (Terni), on *O. europaea* (33T 291624.4698904), 70 m, 22 March 2019, *G. Stentella*.

Laz: Parco Regionale Valle del Treja, Mazzano Romano (Roma), on *O. europaea* (33T 285083.4674748), 205 m, 15 October 2018, leg. *G. Stentella*, *S. Ravera*, det. *S. Ravera*; Valle della Caffarella, Parco Regionale dell'Appia Antica (Roma), on *Prunus* sp. branches (33T 339888.5120036), ca. 300 m, 22 November 2020, *S. Ravera*.

The species occurs in natural, semi-natural open habitats, and extensively used ancient cultural landscapes with a dry climate and frequent spells of fog, on twigs of shrubs and isolated trees (Nimis 2016). It is considered extremely rare, extinct in many regions (especially in northern Italy), and included in the Italian red list of epiphytic lichens as "Near-threatened" (Nascimbene & al. 2013). It is also a species of national interest for the selection of Important Plant Areas (Ravera & al. 2011a), being included in the European red list of macrolichens (Sérusiaux 1989). Pollution, fertilizers, and the loss of some habitats, such as traditional orchards and hedgerows in rural areas, are responsible for its decline (Ravera & al. 2011b) and its irregular distribution (Ravera et al. 2020a). The distribution of *T. chrysophthalmos* could also be affected by ongoing climate change, with possible loss of bioclimatic space and distribution displacements (Rubio-Salcedo & al. 2017).

In Friuli Venezia Giulia the species was firstly reported from Fagagna (province of Udine); the record derives from historical collections (19th century) kept in the Friulan Museum of Natural History of Udine (Tretiach 1990). In the 19th - early 20th centuries it was reported from the surroundings of Trieste and near Bagnoli, a village on the edge of the Nature Reserve of Val Rosandra - Dolina Glinščice (province of Trieste) (Beck & Zahlbruckner 1896; Hillmann 1935; Kušan 1953; Nimis & Loi 1982), but it is difficult to establish whether the localities are currently in Italian or Slovenian territory; the first (and last) reliable record for the province of Trieste could be postponed to 1982, in the Reserve area (Clerc 1984; Tretiach 2008). More recently, the species was found in Monfalcone (province of Gorizia) (Capozzi & al. 2013). The herbarium specimen (TSB No. 41031) consists of small, almost all fertile thalli, collected along the main road of a small village from a bundle of branches; their owner confirmed that the branches had been picked up in the immediate surroundings. This is the first record for the province of Pordenone and the northernmost for the region.

In Toscana, specimens of *T. chrysophthalmos* were occasionally collected since 1980, mainly around Siena where a stable and persistent population is periodically reconfirmed (Ravera & al. 2011b) and recently on the Livorno hills (Pasquinelli 2021). All current

records are located on hilly sites, in old olive groves, especially the wetter and wild ones with N-NE-E exposure. Its presence is often accompanied by the abundance of *Xanthoria parietina* *Ramalina* spp., *Physcia leptalea* and sometimes *Usnea esperantiana* on the twigs of *Olea europaea*.

In Umbria and Lazio, *T. chrysophthalmos* has been occasionally reported mostly on shrubs in agrosilvopastoral areas from the coast (Nimis 1988) to the hill belt (Panfili 2000, Ravera 2000, Ravera & al. 2011b, Brackel 2015). The specimen from Valle della Caffarella is the first in the urban area of Rome.

(VU) *Varicellaria velata* (Turner) I. Schmitt & Lumbsch

Camp: Catona (Salerno), on *Ficus carica* (33T 519665.4442309), 600 m, 22 February 2011, leg. S. Ravera, G. Brunialti, det. S. Ravera.

This cosmopolitan species is rather rare in western Europe and is considered very to extremely rare in Italy (Nimis & Martellos 2021) where it is known only from Sardegna (Nimis & Tretiach 1993, Loi & al. 2000, Zedda 2002) and Puglia (Hanko 1983, Nimis & Tretiach 1999). It is new to the lichen flora of Campania.

Discussion and Conclusion

In this contribution we add information on the Italian occurrence of 36 red listed species overall reporting 98 records from the following regions: Friuli (1 record), Lombardia (19 records, 7 taxa), Piemonte (1 record), Valle d'Aosta (2 records, 2 taxa new to the region), Liguria (8 records, 2 taxa) Toscana (26 records, 7 taxa), Umbria (5 records, 3 taxa), Lazio (5 records, 3 taxa), Sardegna (3 records, 2 taxa), Campania (12 records, 7 taxa, 5 new to the region), Basilicata (14 records, 10 taxa), and Sicilia (2 records, 2 taxa).

According to the last assessments for lichens in Italy (Nascimbene & al. 2013, Rossi & al. 2013, Ravera & al. 2016), our records concern 1 species evaluated RE, 13 threatened (6 EN, 7 VU), 18 NT, 1 LC, and 3 DD.

Some of the records will help to review the status of threat. This is especially the case of *Rinodina polyspora* and *Leptogium furfuraceum*. The recent discovery of *R. polyspora* in Valle d'Aosta obviously determines the change in the assessment from RE to CR, the latter being a category assigned to species presently known from a single locality in Italy (IUCN criterion D). While *L. furfuraceum* – known so far only from two Italian regions in more than one locality, and here reported from a new administrative region – according to the approach proposed by Nascimbene & al. (2013) for the epiphytic lichens, should be changed in status from an EN to VU, i.e. species that are known from three to five Italian regions in more than one locality. Furthermore, the high number of reports of *T. chrysophthalmos* – also considering other recent records from Emilia-Romagna (Fariselli & al. 2020), Puglia (Ravera & al. 2020a, Gianfreda & Matino 2020), and Sicilia (La Rosa & al. 2021) – suggests an expansion of this species in suitable habitats.

Information on new localities of *Cladonia ciliata*, *C. mediterranea*, and *C. portentosa* are also of particular interest concerning *Cladonia* subg. *Cladina* (Nyl.) Vain. listed in the annex V of Habitats Directive. Their overall conservation status is required to be periodically monitored by all EU Member States under the Article 17 of the Habitats Directive.

The status of this taxon is currently considered “inadequate” (Genovesi & al. 2014, Bacchetta & al. 2020) and an improvement in the knowledge of their presence on the national territory appears urgent and necessary.

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References

- Abramini, V., Chiappetta, D. & Valcuvia Passadore, M. 2008: La flora lichenica epifita della Valle del Lesina (Sondrio). – *Not. Soc. Lich. Ital.* **21**: 25.
- Anzi, M. 1860: Catalogus lichenum quos in Provincia Sondriensi et circa Novum-Comum collegit et in ordinem systematicum digessit presbyter Martinus Anzi. – Novi-Comi.
- Arosio, G., Pozzoli, M. L. & Scarselli, S. 2003: Biomonitoraggio della qualità dell’aria in Valtellina mediante l’impiego dei licheni come bioindicatori e bioaccumulatori. – Sondrio.
- Bacchetta, G., Cogoni, D., Fenu, G., Pinna, M. S. & Sarigu, M. 2020: Reporting 2013-2018. – www.reportingdirettivahabitat.it [Last accessed 03.05.2021].
- Baglietto, F. 1879: Lichenes insulae Sardiniae recensit F. Baglietto. – *Nuovo Giorn. Bot. Ital.* **11**: 50-123.
- Bartoli, A. & Puntillo, D. 1998: Interesting lichen species from the Maratea coast (Basilicata region, South Italy). – *Sauteria* **9**: 61-70.
- Beck, G.v. & Zahlbruckner, A. 1896: Schedae ad “Kryptogamas exsiccatas” editae a Museo Palatino Vindoboniensi Centuria II, 157: *Teloschistes chrysophthalmus*. – *Annalen des K. K. naturhistorischen Hofmuseums* **11**: 81-101.
- Bianchi, E., Esposito, C. & Benesperi, R. 2016: Contributo alla flora lichenica della Riserva Naturale dell’Isola di Montecristo (Toscana-Livorno). – *Not. Soc. Lich. Ital.* **29**: 37.
- Brackel, W.v. 2011: Lichenicolous fungi and lichens from Puglia and Basilicata (southern Italy). – *Herzogia* **24**: 65-101. <https://doi.org/10.13158/hea.24.1.2011.65>
- Brackel, W.v. 2015: Lichenicolous fungi from Central Italy with notes on some remarkable hepaticolous, algicolous and lichenized fungi. – *Herzogia* **28**: 212-218. <https://doi.org/10.13158/hea.28.1.2015.212>
- Brackel, W.v. 2021: Lichenicolous fungi from Campania (Italy). – *Borziana* **2**: 31-68. <https://doi.org/10.7320/Borz.002.031>
- Capozzi, E., Panepinto, F. & Tretiach, M. 2013: Notulae Cryptogamicae 7, 43: *Teloschistes chrysophthalmus* (L.) Th. Fr. – *Inform. Bot. Ital.* **45(2)**: 316.
- Catalano, I., Mingo, A., Migliozi, A. & Aprile, G.G. 2016: The lichens of Roccamonfina volcano (southern Italy). – *Nova Hedwigia* **103(1-2)**: 95-116. https://doi.org/10.1127/nova_hedwigia/2016/0337
- Clauzade, G. & Roux, C. 1985: Likenoj de Okcidenta Europa. Ilustrita determinlibro. – *Bull. Soc. Bot. Centre-Ouest* **7**: 1-893.
- Clerc, P. 1984: Contribution à la connaissance de la flore lichénique du nord de l’Italie (province Friuli-Venezia Giulia). – *Gortania* **5**: 81-100.

- Coassini Lokar, L., Nimis, P.L. & Geatti, M. 1987: Chemistry and chorology of the genus *Parmotrema* Massal. (Lichenes, Parmeliaceae) in Italy. – *Webbia* **41**: 125-142. <https://doi.org/10.1080/00837792.1987.10670403>
- Cozzi, C. 1917: Manipolo di licheni della pianura milanese. – *Bull. Soc. Bot. Ital.* **4-5**: 39-44.
- Dahlberg, A & Mueller, G. M. 2011: Applying IUCN red-listing criteria for assessing and reporting on the conservation status of fungal species. – *Fungal Ecol.* **4(2)**: 147-162. <https://doi.org/10.1016/j.funeco.2010.11.001>
- Dalle Vedove, M., Nascimbene, J. & Bonettini, A.M. 2004: I Licheni del Parco dell'Adamello. – *Conoscere il Parco*, **1**. – Breno.
- Fariselli, R., Nimis, P. L. & Nascimbene, J. 2020: Catalogo critico dei licheni dell'Emilia-Romagna. – Bologna.
- Feurerer, T. & Hawksworth, D. L. 2007: Biodiversity of lichens, including a worldwide analysis of checklist data based on Takhtajan's floristic regions. – *Biodivers. Conserv.* **16**: 85-98. <https://doi.org/10.1007/s10531-006-9142-6>
- Garofalo, R., Aprile, G. G., Mingo, A., Catalano, I. & Ricciardi, M. 2010: The lichens of the Sorrento Peninsula (Campania - southern Italy). – *Webbia* **65(2)**: 292-319. <https://doi.org/10.1080/00837792.2010.10670876>
- Genovesi, P., Angelini, P., Bianchi, E., Dupré, E., Ercole, S., Giacaneli, V., Ronchi, F. & Stoch, F. 2014: Specie e habitat di interesse comunitario in Italia: distribuzione, stato di conservazione e trend. ISPRA, Serie Rapporti 194/2014. – Roma.
- Gheza, G. 2018: Addenda to the lichen flora of the Ticino river valley (western Po Plain). – *Nat. Hist. Sci.* **5(2)**: 33-40. <https://doi.org/10.4081/nhs.2018.381>
- Gheza, G. 2019a: The macrolichens of Val di Scalve (northern Italy) and the first record of *Parmelia pinnatifida* Kurok. in Italy. – *Webbia* **74(2)**: 307-315. <https://doi.org/10.1080/00837792.2019.1692595>
- Gheza, G. 2019b: Aggiunte alla flora lichenica della Val Camonica. – *Nat. Bresciana, Ann. Mus. Civ. Sc. Nat. Brescia* **42**: 51-56.
- Gheza, G., Di Nuzzo, L. & Nascimbene, J. 2020: The lichen genus *Cladonia* in Monte Ceceri (Tuscany, Central Italy). – *Borziana* **1**: 5-13. <https://doi.org/10.7320/Borz.001.005>
- Giacomini, V. 1937. Licheni di Valle Camonica. – *Atti Ist. Bot. e Lab. Critt. Univ. Pavia* **4(9)**: 123-149.
- Gianfreda, S. & Matino, C. 2020: Contributo alla conoscenza floristica dei licheni italiani. L'agro di Manduria (Taranto, Italia). – *Thalassia Salentina* **42**: 25-40. <https://doi.org/10.1285/I15910725V42P25>
- Gilbert, O. 2000: Lichens. (Collins New Naturalist Library, Book **86**.) – London.
- Giordani, P., Brunialti, G. & Modenesi P. 2001: Applicability of the lichen biodiversity method (L.B.) to a Mediterranean area (Liguria, NW Italy). – *Cryptogam. Mycol.* **22(3)**: 193-208. [https://doi.org/10.1016/S0181-1584\(01\)01065-X](https://doi.org/10.1016/S0181-1584(01)01065-X)
- Grillo, M. 1992: Florula lichenica del territorio di Capizzi (Sicilia nebrodense). – *Arch. Bot. Ital.* **68(1-2)**: 9-25.
- Grillo, M. & Caniglia G.M. 2004: A check-list of Iblean Lichens (Sicily). – *Fl. Medit.* **14**: 219-251.
- Grillo, M. & Romano E. 1989: I licheni del bosco di Santo Pietro nel Caltagirone (Sicilia meridionale-orientale). – *Arch. Bot. Ital.* **65(1-2)**: 17-38.
- Hanko, B. 1983: Die Chemotypen der Flechtengattung *Pertusaria* in Europa [The chemotypes of genus *Pertusaria* in Europe]. – *Bibl. Lichenol.* **19**: 1-297.
- Hillmann, J. 1935: Teloschistaceae. Pp 1-36 in: Rabenhorst, L. (ed.), *Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz*, **9(6)**. – Leipzig.
- Kušan, F. 1953: *Prodromus Flore Lišaja Jugoslavije*. [Prodromus Lichen Flora of Yugoslavia] – Zagreb.
- Index Fungorum Partnership, 2021: Index Fungorum – <http://www.indexfungorum.org> [Last accessed 02.03. 2021].

- IUCN 2020: The IUCN Red List of Threatened Species. Version 2020-3. – <https://www.iucnredlist.org>. [Last accessed 02.03.2021].
- Jatta, A. 1880: *Lichenum Italiae meridionalis manipulus tertius, quem collegit et ordinavit A. Jatta*. – N. Giorn. Bot. Ital. **12**: 199-242.
- Jatta, A. 1882: *Lichenum Italiae meridionalis manipulus quartus, quem collegit et ordinavit A. Jatta*. – N. Giorn. Bot. Ital. **14**: 107-143.
- Jatta, A. 1885: Licheni raccolti nel R. Orto Botanico di Napoli dall'Ch.mo Barone V. Cesati. – Rend. Acc. Sc. Fis. Mat. Soc. R. Napoli **3**: 73-77.
- Jatta, A. 1889: *Monographia Lichenum Italiae Meridionalis*. – Trani.
- La Rosa, A., Gianguzzi, L., Salluzzo, G., Scuderi, L. & Pasta, S. 2021: Last tesserae of a fading mosaic: floristic census and forest vegetation survey at Parche di Bilello (south-western Sicily, Italy), a site needing urgent protection measures. – Pl. Sociol. **58(1)**: 55-74. <https://doi.org/10.3897/pls2020581/04>
- Loi, C., Cani, F., Cappai, A., Putzolou, T., Sandolo, G., & De Martis, B. 2000: Licheni e indice di purezza atmosferica (I.A.P.) in alcune foreste a clima mediterraneo della Sardegna meridionale. – Arch. Geobot. **4(2)**: 231-241.
- Loppi, S., Putorti, E., Paoli, L., Frati, L., Giordani, P., Brunialti, G., Critelli, P. & Senese, G. 2004: Contributo alla flora lichenica dell'isola d'Elba. – Quad. Mus. Stor. Nat. Livorno **17**: 73-84.
- Moberg, R. 1983: Studies on *Physciaceae* (Lichens). II The genus *Pyxine* in Europe. – Lichenologist **15(2)**: 161-167. <https://doi.org/10.1017/S0024282983000250>
- Moris, G.G. 1829: *Stirpium Sardoarum Elenchus*, **3**. – Torino.
- Nascimbene, J, Martellos, S. & Nimis, P. L. 2006: Epiphytic lichens of tree-line forests in the Central-Eastern Italian Alps and their importance for conservation. – Lichenologist **38(4)**: 373-382. <https://doi.org/10.1017/S0024282906006220>
- Nascimbene, J., Nimis, P. L. & Ravera, S. 2013: Evaluating the conservation status of epiphytic lichens of Italy: a red list. – Pl. Biosyst. **147(4)**: 898-904. <https://doi.org/10.1080/11263504.2012.748101>
- Nascimbene, J., Casazza, G., Benesperi, R., Catalano, I., Cataldo, D., Grillo, M., Isocrono, D., Matteucci, E., Ongaro, S., Potenza, G., Puntillo, D., Ravera, S., Zedda, L. & Giordani, P. 2016: Climate change fosters the decline of epiphytic *Lobaria* species in Italy. – Biol. Conserv. **201**: 377-384. <https://doi.org/10.1016/j.biocon.2016.08.003>
- Nimis, P. L. 1988: Contributi alle conoscenze floristiche sui licheni d'Italia. II. Florula lichenica della Tenuta di Castelporziano (Roma). – Braun-Blanquetia **2**: 223-238.
- Nimis, P.L. 1993: The lichens of Italy: an annotated catalogue. – Boll. Mus. Reg. Sci. Nat. Torino **12**: 1-897.
- Nimis, P. L. 2016: The Lichens of Italy. A Second Annotated Catalogue. – Trieste.
- Nimis, P. L. & Loi, E. 1982: I licheni epifiti della Provincia di Trieste. – Gortania **3**: 101-122.
- Nimis, P. L. & Martellos, S. 2021: ITALIC – The Information System on Italian Lichens. Version 6.0. University of Trieste, Dept. of Biology. – <http://dryades.units.it/italic> [Last accessed 02.03.2021]
- Nimis, P. L & Poelt, J. 1987: The lichens and lichenicolous fungi of Sardinia (Italy). An annotated list. – Stud. Geobot. **7 (suppl. 1)**: 1-269.
- Nimis, P. L. & Tretiach, M. 1993: A contribution to lichen floristics in Italy. Boll. Mus. Reg. Sci. Nat. Torino **11(1)**: 1-45.
- Nimis, P. L. & Tretiach, M. 1999: *Itinera Adriatica*. Lichens from the eastern side of the Italian Peninsula. – Stud. Geobot. **18**: 51-106.
- Nimis, P. L. & Tretiach, M. 2004: Delimiting Tyrrhenian Italy: A lichen foray in the SW of the peninsula. – Bibl. Lichenol. **88**: 456-478.

- Nimis, P. L., Tretiach, M. & De Marchi, M. 1990: Contribution to Lichen floristic in Italy V. The lichens of the island of Capraia (Tuscan Archipelago). – *Criptogam., Bryol., Lichénol.* **11(1)**: 1-30.
- Nimis, P. L., Hafellner, J., Roux, C., Clerc, P., Mayrhofer, H., Martellos, S & Bilovitz, P. O. 2018: The lichens of the Alps - an annotated checklist. – *MycKeys* **31**: 1-634. <https://doi.org/10.3897/mycokeys.31.23568>
- Otálora, M. A. G., Martínez, I., Aragón, G. & Molina, M. C. 2010: Phylogeography and divergence date estimates of a lichen species complex with a disjunct distribution pattern. – *Amer. J. Bot.* **97**: 216-223. <https://doi.org/10.3732/ajb.0900064>
- Otálora, M. A. G., Martínez, I., Aragón, G. & Wedin, M. 2017: Species delimitation and phylogeography of the *Pectenina* species-complex: A misunderstood case of species-pairs in lichenized fungi, where reproduction mode does not delimit lineages. – *Fungal Biol.* **121**: 222-233. <https://doi.org/10.1016/j.funbio.2016.12.001>
- Panfili, M. 2000: Contributo alla conoscenza dei licheni dell'Italia centrale: specie nuove o interessanti nell'area della Provincia di Perugia. – Perugia.
- Pasquinelli, P. 2021: Prima segnalazione per le Colline Livornesi del lichene *Teloschistes chrysophthalmus* (L.) Th. Fr. – *Quad. Mus. St. Nat. Livorno* **27**: 27-33.
- Potenza, G. 2006: La flora lichenica della Basilicata. Aggiornamento delle conoscenze floristiche ed indagini sulle comunità epifite dell'Appennino Lucano e della Costa Jonica. Tesi di dottorato. Univ. della Basilicata. – Campobasso.
- Potenza, G., Fascetti, S., Ravera, S. & Puntillo, D. 2010: Lichens from sandy dune habitats on the Ionian Coast (Basilicata, southern Italy). – *Cryptogam., Mycol.* **31(1)**: 59-65.
- Puntillo, D. 1995: Contributi alle conoscenze floristiche sui licheni d'Italia. VIII. Florula lichenica del Bosco di Santa Maria (Serra San Bruno, Vibo Valentia, Calabria). – *Webbia* **50**: 51-66. <https://doi.org/10.1080/00837792.1995.10670597>
- Puntillo, D. 1996: I Licheni di Calabria. Monografie XXII. – *Mus. Reg. Sci. Nat. Torino. Monografie* **22**
- Puntillo, D. & Vězda, A. 1994: Some foliicolous lichens new to Calabria. – *Webbia* **49**: 125-131. <https://doi.org/10.1080/00837792.1994.10670575>
- Puntillo, D. & Puntillo, M. 2009: Calicioid lichens and fungi of Italy: A State of the Art. – *Fl. Medit.* **19**: 251-260.
- Puntillo, D., Puntillo, M., Potenza, G. & Fascetti, S. 2009: Contributo alla conoscenza della flora lichenica della Basilicata: SIC Bosco Magnano IT 9210040 (Basilicata). – *Not. Soc. Lich. Ital.* **22**: 57.
- Putorti, E., Ivanov, D., Boccardi, R., Paoli, L., Nocciolini, S., Gentilini, S. & Loppi, S. 1999: Licheni nuovi o interessanti per la Toscana. III. – *Atti Accad. Fisiocritici Siena* **15(18)**: 85-88.
- Ravera, S. 1998: Contributo alla conoscenza dei licheni d'Italia: la florula epifitica dello Spoletino (Regione Umbria). – *Biol. Ital.* **6**: 17-24.
- Ravera, S. 2000: Contributo alla conoscenza della flora lichenica epifitica dell'Umbria. – *Stud. Geobot.* **19**: 49-55.
- Ravera, S. 2018: I licheni del SIC IT6030008 Macchia Grande di Manziana (Roma). – *Not. Soc. Lich. Ital.* **31**: 48.
- Ravera, S. & Giordani, P. 2008: *Pyxine subcinerea* Stirt. – In: Rossi, G., Gentili, R., Abeli, T., Gargano, D., Foggi, B., Raimondo, F. M., Blasi, C. (eds): Flora da conservare. Iniziativa per l'implementazione di nuove Liste Rosse. – *Inform. Bot. Ital.* **40(S1)**: 146-148.
- Ravera, S. & Puntillo, D. 2014: I licheni a spillo. Piccola guida alle *Caliciales* d'Italia. – Avigliano Umbro.
- Ravera, S., Azara, C., Baragatti, E., Paoli, L., Genovesi, V. & Tretiach, M. 2011b: Notulae Cryptogamicae 3, 11: *Teloschistes chrysophthalmus* (L.) Th. Fr. – *Inform. Bot. Ital.* **43**: 152-153.

- Ravera, S., Isocrono, D., Nascimbene, J., Giordani, P., Benesperi, R., Tretiach, M. & Montagnani, C. 2016: Assessment of the conservation status of the mat-forming lichens *Cladonia* subgenus *Cladina* in Italy. – *Pl. Biosyst.* **150(5)**: 1010-1022. <https://doi.org/10.1080/11263504.2014.1000422>
- Ravera, S., Nimis, P. L., Brunialti, G., Frati, L., Isocrono, D., Martellos, S., Munzi, S., Nascimbene, J., Potenza, G. & Tretiach, M. 2011a: The role of lichens in selecting Important Plant Areas in Italy. – *Fitosociologia* **48(S1)**: 145-153.
- Ravera, S., Cogoni, A., Totti, C., Aleffi, M., Assini, S., Caporale, S., Fačkovcová, Z., Filippino, G., Gheza, G., Olivieri, N., Ottonello, M., Paoli, L., Poponnessi, S., Pišút, I. & Venanzoni, R. 2016. Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 2. – *Ital. Botanist* **1**: 43-54. <https://doi.org/10.3897/italianbotanist.2.10812>
- Ravera, S., Cogoni, A., Vizzini, A., Bonini, I., Cheli, F., Fačkovcová, Z., Gheza, G., Guttová, A., Mair, P., Mayrhofer, H., Miserere, L., Pandeli, G., Paoli, L., Prosser, F., Puntillo, D., Puntillo, M., Selvaggi, A., Spitale, D. & Tratter W. 2018: Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 6. – *Ital. Bot.* **6**: 97-109. <https://doi.org/10.3897/italianbotanist.6.30873>
- Ravera, S., Vizzini, A., Puglisi, M., Adamčík, S., Aleffi, M., Aloise, G., Boccardo, F., Bonini, I., Caboň, M., Catalano, I., De Giuseppe, A.B., Di Nuzzo, L., Dovana, F., Fačkovcová, Z., Gheza, G., Gianfreda, S., Guarino, C., Guttová, A., Jon, R., Malíček, J., Marziano, M., Matino, C., Nimis, P.L., Pandeli, G., Paoli, L., Passalacqua, N.G., Pittao, E., Poponnessi, S., Puntillo, D., Sguazzin, F., Sicoli, G. & Vallese, C. 2020a: Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 9. – *Ital. Bot.* **9**: 35-46. <https://doi.org/10.3897/italianbotanist.9.52762>
- Ravera, S., Puglisi, M., Vizzini, A., Totti, C., Barberis, G., Bianchi, E., Boemo, A., Bonini, I., Bouvet, D., Cocozza, C., Dagnino, D., Di Nuzzo, L., Fačkovcová, Z., Gheza, G., Gianfreda, S., Giordani, P., Hilpold, A., Hurtado, P., Köckinger, H., Isocrono, D., Loppi, S., Malíček, J., Matino, C., Minuto, L., Nascimbene, J., Pandeli, G., Paoli, L., Puntillo, D., Puntillo, M., Rossi, A., Sguazzin, F., Spitale, D., Stifter, S., Turcato, C. & Vazzola, S. 2020b: Notulae to the Italian flora of algae, bryophytes, fungi and lichens: 10. – *Ital. Botanist* **10**: 83-99. <https://doi.org/10.3897/italianbotanist.99.59352>
- Rivellini, G. 1994: Raccolte di specie macrolicheniche mediante l'impiego di Guardie Ecologiche Volontarie in provincia di Sondrio (Lombardia, Italia settentrionale). – *Nat. Valtellinese* **5**: 43-64.
- Rossi, G., Montagnani, C., Gargano, D., Peruzzi, L., Abeli, T., Ravera, S., Cogoni, A., Fenu, G., Magrini, S., Gennai, M., Foggi, B., Wagensommer, R.P., Venturella, G., Blasi, C., Raimondo, F. M. & Orsenigo, S. (eds) 2013: Lista Rossa della Flora Italiana. 1. Policy Species e altre specie minacciate. – Roma.
- Rubio-Salcedo, M., Psomas, A., Prieto, M., Zimmermann, N.E. & Martínez, I. 2017: Case study of the implications of climate change for lichen diversity and distributions. – *Biodivers. Conserv.* **26**: 1121-1141. <https://doi.org/10.1007/s10531-016-1289-1>
- Sbarbaro, C. 1956: Aliae lichenum species in Italia (praesertim in Liguria) inventae annis 1941-1955. – *Ann. Mus. Civico Storia Nat. Genova* **68**: 259-288.
- Senese, G. & Critelli, P. 2000: Workshop Biomonitoraggio della Qualità dell'Aria dell'Isola d'Elba (LI) tramite licheni epifiti. – *Not. Soc. Lich. Ital.* **13**: 83-86.
- Sérusiaux, E. 1989: Liste rouge des macrolichens dans la Communauté Européenne. Centre de Recherches sur les Lichens. – Liège.
- Smith, C.W., Aptroot, A., Coppins, B.J., Fletcher, A., Gilbert, O.L., James, P.W. & Wolseley, P.A. (eds) 2009: *The Lichens of Great Britain and Ireland*. – London.
- Stofer, S. 2015: Fiches pratiques sur les lichens: Leptogie d'Hildenbrand, *Leptogium hildenbrandii* (Garov.) Nyl. – Birmensdorf.

- The Global Fungal Red List Initiative 2014 – http://iucn.ekoo.se/iucn/species_view/342490/ [Last accessed 02.03.2021].
- Tibell, L. 1971: The genus *Cyphelium* in Europe. – Svensk Bot. Tidskr. **65**: 138-164.
- Tretiach, M. 1990: Le collezioni lichenologiche del Museo Friulano di Storia Naturale (MFU). Pp. 23-26. – In: Tretiach, M. & Valcuvia Passadore, M. (eds), Censimento degli Erbari Lichenologici Italiani. – Not. Soc. Lich. Ital. **3(S1)**: 23-26.
- Tretiach, M. 1996: Alcune collezioni lichenologiche del Museo Civico di Storia Naturale di Venezia. – Not. Soc. Lich. Ital. **9**: 27-34.
- Tretiach, M. 2008: Licheni. Pp. 75-77 in: Gasparo, G. (ed.), La Val Rosandra e l'ambiente circostante. – Trieste.
- Valcuvia Passadore, M. 1978: Contributo alla flora lichenica dell'Isola di Montecristo (Arcipelago Toscano). – Atti Ist. Bot. Univ. Pavia **6(13)**: 159-169.
- Zedda, L. 2002: The epiphytic lichens on *Quercus* in Sardinia (Italy) and their value as ecological indicators. – Englera **24**: 1-457.

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