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A first lichen survey in Valle Imagna (Lombardy, Northern Italy)

Abstract

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Within the province of Bergamo, the less known one in Lombardy (N Italy) under a lichenological point of view, the Valle Imagna was completely devoid of previous lichen surveys. In this work, we report 111 records of 40 lichen taxa, mostly epiphytic, from five sites located on the Bergamasque side of Mount Resegone (Orobic Prealps). Most of them are common species, whereas 11 are new to the province of Bergamo, and three of them (*Buellia griseovirens*, *Phaeophyscia ciliata*, *Punctelia jeckeri*) have been rarely recorded in the region. These finds highlight that, in spite of being recognized as one of the most lichen species-rich regions in Italy, Lombardy is still in need of further explorations.

Key words: broadleaved forests, floristics, macrolichens, Natura 2000 Habitats, Orobic Prealps.

Introduction

Lombardy is one of the richest administrative regions of Italy regarding lichen species (Nimis 2016). Such richness reflects the thorough investigations carried out in some areas of the region – mainly Valtellina, some valleys in the eastern Prealps and the Ticino river valley – in the 1800s and, to a lesser extent, in the late 1900s and early 2000s (Nimis 1993, 2016). Nevertheless, a great part of the region was left unexplored, and therefore the lichenological knowledge of Lombardy is still heterogeneous and fragmentary.

Among the Provinces of Lombardy, Bergamo is the less investigated one (Gheza 2019a, 2019b). The only thorough study on epiphytic lichens, a biomonitoring project extended from the city of Bergamo to the hinterland, was carried out in the 1990s (Arosio & Rinaldi 1994). In the last years, knowledge has improved thanks to few scattered records (Ravera & al. 2016, 2017a, 2017b, 2018, 2019) and with two detailed papers about the macrolichens of the Val di Scalve (Gheza 2019b) and the terricolous lichen flora of calcareous dry grasslands along the lowland course of the Serio river (Gheza 2019c). Nevertheless, the Province is still poorly known, since its two widest districts –Val Brembana and Val Seriana – are still virtually unexplored, except for few scattered records dispersed in an old floristic paper (Baroni 1893) and in some specimens preserved in PAV, TSB and FI (Gheza 2019a). The same applies to Valle Imagna, where lichen data were still completely missing.

Here we report the first results of recent lichenological investigations carried out in this previously unexplored area of the Orobic Prealps.

Materials and Methods

Study area

The study area is located in the upper Valle Imagna (southwestern Orobic Prealps, central Lombardy, Northern Italy), in the Province of Bergamo, which is the valley on the eastern side of Mount Resegone (Fig. 1). Valle Imagna includes two Natura 2000 sites: IT2060301 "Monte Resegone" and IT2060302 "Costa del Pallio". The area is part of the central-eastern esalpic region, with an average annual temperature of about 12°C and an average annual rainfall of 1100 mm; according to Köppen's climatic classification, it belongs to type cfb: humid temperate climate with warm summer. Geologically, the valley is characterized by carbonate rocks. The main outcrops of the area belong to the formations of Calcare di Zu and Rosso Ammonitico Lombardo. The vegetation is dominated by submontane forests of *Fagus sylvatica* L. with Illyrian species such as *Cyclamen purpurascens* Mill. and *Helleborus niger* L. These forests are attributed to the Natura 2000 Habitat 91K0 ("Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*)"). Also mixed broadleaved stands dominated by *Acer pseudoplatanus* L. and *Fraxinus excelsior* L. occur, to a lesser extent, mainly along impluvia and steep slopes. They are attributed to the Natura 2000 Habitat 9180* ("*Tilio-Acerion* forests of slopes, screes and ravines", *prioritary).

Sampling sites

Lichens were sampled in five sites (Fig. 1). For each sampling site, coordinates (UTM WGS84 system, zone 32T) of the central point of the trails/roads travelled, altitudinal range, synthetic description and Habitat codes according to the Habitat Directive (Directive EEC/43/1992, Annex I), when applicable, are reported.

1. Brumano, 538454.5077814, 970–1030 m, muletrack between Brumano and Cascine Zucchero, meadows loosely tree-covered with *Juglans regia* L. and *Prunus avium* (L.) L.

2. Brumano, 537850.5076827, 1100–1180 m, trail to Passo di Porta (signpost CAI, the Italian Alpine Club, 576), broadleaved wood dominated by *Fagus sylvatica* (Habitat 91K0).

3. Brumano, 537260.5076275, 1150–1190 m, trail between Passo di Porta and Bocchetta La Passata (signpost CAI 576), broadleaved wood dominated by *Fagus sylvatica* and *Ostrya carpinifolia* Scop. (Habitat 91K0).

4. Brumano, 538860.5078993, 1100–1140 m, secondary road between Brumano and Fuipiano ("Strada Intervalliva Cascine Pallio"), mixed broadleaved wood.

5. Brumano, 539426.5079380, 1150–1250 m, trail between Corna Legata and Bocca di Palio (signpost CAI 578), mixed broadleaved wood dominated by *Acer pseudoplatanus* L. and *Fraxinus excelsior* L. (Habitat 9180*).

Lichen sampling

Lichens were collected along the main trails crossing the sampling sites on all the available substrates.

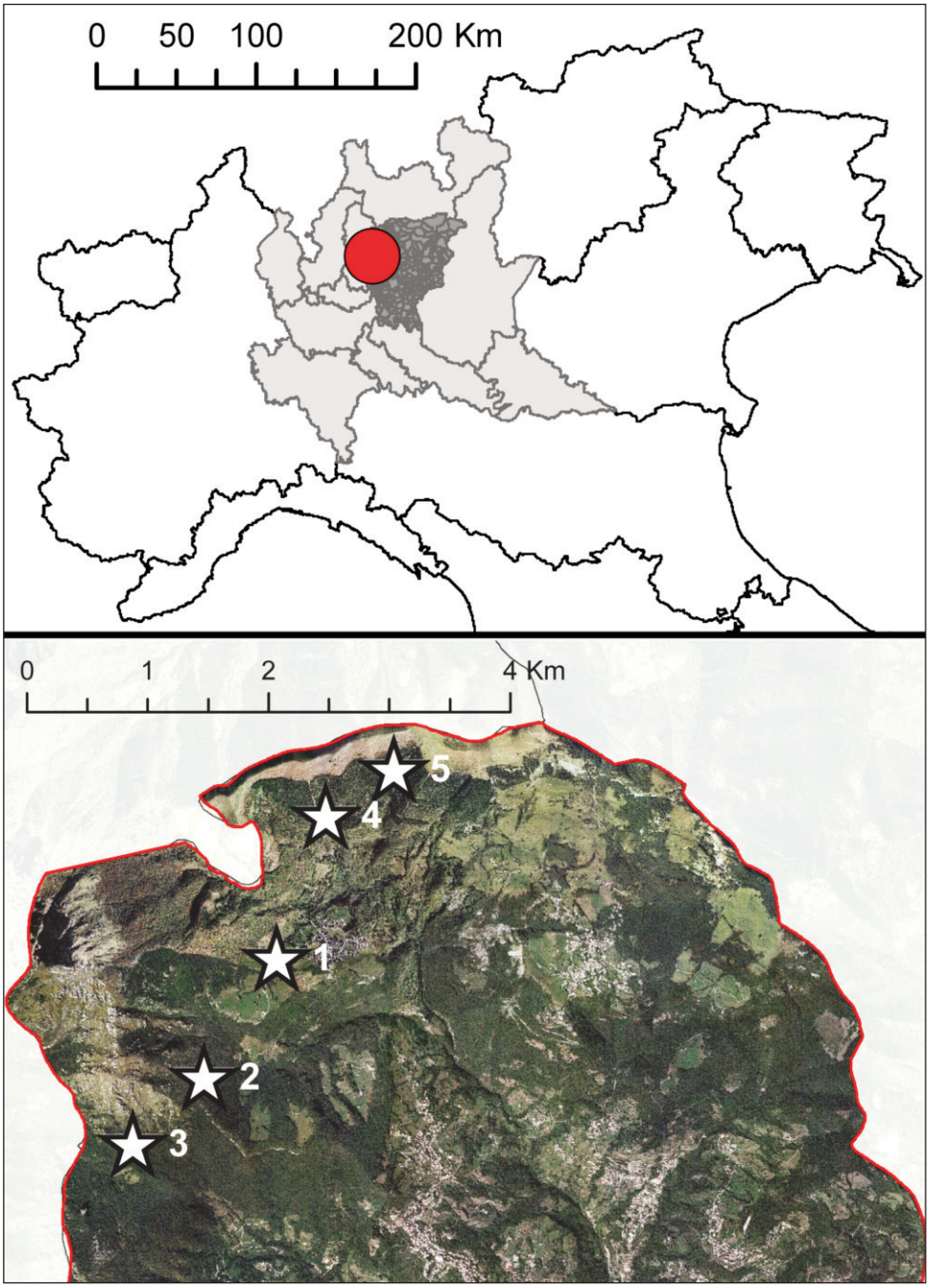

Fig. 1. Localization of the upper Valle Imagna in the Prealps of Lombardy (Northern Italy) (light grey: Lombardy; dark grey: Province of Bergamo) (upper half) and of the five study sites, indicated by star symbols (lower half).

Epiphytic species were sampled on ash (*Fraxinus excelsior*), beech (*Fagus sylvatica*), birch (*Betula pendula* Roth), cherry (*Prunus avium*), chestnut (*Castanea sativa* Mill.), hop-hornbeam (*Ostrya carpinifolia*), larch (*Larix decidua* Mill.), spruce (*Picea abies* (L.) H. Karst.), sycamore maple (*Acer pseudoplatanus* L.), and walnut (*Juglans regia* L.). Terricolous species were sampled on soil. Saxicolous species were sampled mainly on dry stone walls built with limestone and on the scarce limestone outcrops found within the woods.

The common/easily identifiable species were identified in the field with a hand lens. Species that could not be identified in the field were collected and identified in the laboratory by means of stereomicroscope, microscope and chemical reagents commonly used in lichenology, following Nimis (1986) and Nimis & Martellos (2012). The specimens are stored in the first author's personal herbarium.

Results

The annotated floristic list includes 111 records referred to 40 species. Among them, 11 are new to the Province of Bergamo (marked with an asterisk in the list).

For each taxon, the substrates on which it was collected are given with the reference to the respective sites, and, when available, also the previous records from the Province of Bergamo are reported. A short note about the distribution in Lombardy is reported for some species which are uncommon in the region.

***** ***Anaptychia ciliaris*** (L.) Flot.
On bark of ash (4).

***** ***Athallia pyracea*** (Ach.) Arup, Frödén & Søchting
On bark (4, 5) of ash (4), walnut (4).

***** ***Buellia griseovirens*** (Sm.) Almb.
On bark of sycamore maple (3, 5). This is not a rare species in Italy (Nimis 2016), but, in spite of this, it has been reported previously only from one site in Lombardy (specimens in UPS, cited by Nimis 2016).

Candelaria concolor (Dicks.) Stein
On bark of ash (4, 5), sycamore maple (3, 5), walnut (1, 4). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Candelariella reflexa (Nyl.) Lettau
On bark of ash (2, 5), beech (2, 3), cherry (1), hop-hornbeam (3), sycamore maple (3), walnut (1). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994).

Cladonia caespiticia (Pers.) Flörke
On organic soil at the edge of the trail (2, 5), on bark at the base of beech (2) and birch (2). Previously reported from Val di Scalve (Gheza 2019b).

Cladonia coniocraea (Flörke) Spreng.
On bark of larch (5). Previously reported from Val di Scalve (Gheza 2019b).

Cladonia fimbriata (L.) Fr.
On bark of larch (5). Previously reported from Val di Scalve (Gheza 2019b).

Cladonia pyxidata (L.) Hoffm.
On soil at the edge of the trail (5). Previously reported from the hills of Bergamo by Baroni (1893), Val Cavallina (Fenaroli 1962) and Val di Scalve (Tomaselli 1955; Gheza 2019b; Ravera & al. 2019).

Collema flaccidum (Ach.) Ach.
On a thin soil layer above limestone (2). Previously reported from Val di Scalve (Gheza 2019b).

Evernia prunastri (L.) Ach.
On bark (4). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Flavoparmelia caperata (L.) Hale
On bark of cherry (1), hop-hornbeam (3), sycamore maple (5). Previously reported from the hinterland (Arosio & Rinaldi 1994) and the hills of Bergamo (Baroni 1893) and Val di Scalve (Gheza 2019b).

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt
On bark of sycamore maple (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994).

Hypogymnia physodes (L.) Nyl.
On bark of larch (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Lathagrium auriforme (With.) Otálora, P.M. Jørg. & Wedin
On calcareous rock (1, 2, 5). Previously reported from Val di Scalve (Gheza 2019b).

Lathagrium cristatum (L.) Otálora, P.M. Jørg. & Wedin
On calcareous rock (2). Previously reported from Val di Scalve (Gheza 2019b).

Lecanora carpinea (L.) Vain.
On bark of beech (3), sycamore maple (3). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994).

Lecanora chlarotera Nyl.
On bark of ash (4, 5), sycamore maple (4, 5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994).

***** ***Lecanora leptyrodes*** (Nyl.) Degel.
On bark of ash (2), beech (2, 3), sycamore maple (3).

Lecidella elaeochroma (Ach.) M.Choisy
On bark of ash (5), beech (2, 3). Previously reported the hinterland of Bergamo (Arosio & Rinaldi 1994).

***** ***Melanelixia glabratula*** (Lamy) Sandler & Arup
On bark of ash (5), beech (3), hop-hornbeam (3), sycamore maple (3, 4, 5).

Parmelia sulcata Taylor
On bark of ash (4, 5), sycamore maple (3, 4, 5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Parmelina tiliacea (Hoffm.) Hale
On bark of ash (4, 5), cherry (1), sycamore maple (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Parmotrema perlatum (Huds.) M.Choisy
On bark (4, 5). Previously reported from Val di Scalve (Gheza 2019b).

***** ***Phaeophyscia ciliata*** (Hoffm.) Moberg
On bark of ash (4). Uncommon species reported from few localities in the Lombard Prealps and Alps (Nimis 1993, 2016).

***** ***Phaeophyscia nigricans*** (Flörke) Moberg
On bark of ash (4).

Phaeophyscia orbicularis (Neck.) Moberg
On bark of ash (4, 5), sycamore maple (3, 4, 5), walnut (1). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

***** ***Phlyctis argena*** (Spreng.) Flot.
On bark of ash (5), beech (2, 3), hop-hornbeam (2, 3), sycamore maple (2, 3, 5).

Physcia adscendens H.Olivier
On bark of ash (5), beech (3), sycamore maple (3, 5), walnut (1). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Physcia aipolia (Humb.) Fürnr.
On bark (4, 5) of sycamore maple (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

***** ***Physcia leptalea*** (Ach.) DC.
On bark (4).

Physconia distorta (With.) J.R. Laundon
On bark of sycamore maple (4), walnut (1). Previously reported from Val di Scalve (Gheza 2019b).

Physconia perisidiosa (Erichsen) Moberg
On bark of sycamore maple (5). Previously reported from Val di Scalve (Gheza 2019b).

Physconia grisea (Lam.) Poelt
On bark of walnut (1, 4). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994).

Pseudevernia furfuracea (L.) Zopf
On bark of larch (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

*** *Punctelia jeckeri*** (Roum.) Kalb
On bark of ash (4). This is an uncommon species in Italy (Nimis 2016), which has been reported previously only once from Lombardy (Brackel 2013).

Punctelia subrudecta (Nyl.) Krog
On bark of ash (4, 5), sycamore maple (5). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

*** *Ramalina farinacea*** (L.) Ach.
On bark of sycamore maple (4, 5).

Xanthomendoza fallax (Hepp) Søchting, Kärnefelt & S.Y. Kondr.
On bark of sycamore maple (5), walnut (1, 4). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Xanthoria parietina (L.) Th.Fr.
On bark of sycamore maple (5), walnut (1). Previously reported from the hinterland of Bergamo (Arosio & Rinaldi 1994) and Val di Scalve (Gheza 2019b).

Conclusions

This survey widened the lichenological knowledge in a previously unexplored area of the Orobic Prealps in the province of Bergamo. It has to be noted that only the uppermost part of the valley has been investigated during this survey, and therefore the data reported here offer only a partial overview on the lichen diversity of Valle Imagna. In spite of being located within forests attributed to Natura 2000 Habitats, the most valuable study sites (2, 3, 5) showed the occurrence of only few, and mostly common species, while species of conservation concern (Nascimbene & al. 2013a; Nimis 2016) were not found at all. According to our results and additional field observations (Gheza, unpubl. data), beech

forests in the Prealps of Lombardy are generally rather poor in epiphytic lichens. This could be related to unfavorable climatic conditions and/or previous overexploitation (Nascimbene & al. 2013b), since beech forests located in other areas of the Italian Alps showed a higher richness of epiphytic lichens, and also the occurrence of species of conservation concern (e.g. Nascimbene & al. 2006, 2007).

The records of some species which are considered not rare overall in Italy (Nimis 1993, 2016), but which have been reported very rarely from Lombardy, highlight that lichenological knowledge in the region is still fragmentary. New field investigations in unexplored areas are crucial to widen knowledge on lichen diversity and to get recent and reliable information useful for a first critical checklist of the lichen flora of Lombardy, which would be a precious tool to plan further investigations, as well as conservation actions.

Another relevant aspect in conservation is a better understanding of the relationships between lichen diversity and habitat types, particularly within Natura 2000 Habitats, which represent the best conservation chance for biodiversity in Europe. This knowledge should be obtained and aimed at considering these organisms when planning conservation-aimed management of such habitats. So far, in spite of well established evidences indicating that different forest types host different epiphytic lichen assemblages (Nascimbene & al. 2014), the study of their relationships have been poorly addressed in Italy, considering only the red-listed species occurring in Natura 2000 forest habitats (Nascimbene & al. 2013a). The only attempt made in this geographic area applied to terricolous lichens in lowland dry habitats (Gheza & al. 2020), and therefore the development of this topic is still at the beginning and needs to be improved.

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