

A floristic survey in the Southern Alps: additions to the lichen flora of Italy

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Abstract – A floristic survey was carried out in 42 localities of the Eastern Italian Alps. The Dolomites were explored in more detail, especially in protected areas. The main habitats were: 1) dolomitic and siliceous boulders and outcrops in the alpine/subalpine belts; 2) natural grasslands, both on calcareous and siliceous substrata in the alpine belt; 3) subalpine and montane forests dominated by conifers; 4) siliceous freshwater habitats in the alpine belt; 5) man-made substrates in the montane belt. 182 lichens and 6 lichenicolous fungi are reported. Twelve lichen species are new to Italy: *Absconditella lignicola*, *Caloplaca soralifera*, *Cheiromycina flabelliformis*, *Ionaspis obtecta*, *Lecanora expersa*, *Micarea hedlundii*, *M. micrococca*, *Mycobilimbia* aff. *olivacea*, *Normandina acroglypta*, *Placynthiella dasaea*, *Psoroma tenue* and *Stereocaulon coniophyllum*. 18 species are new to the Veneto Region and 9 species are new to the Trentino-Alto Adige Region. An additional 45 species are new to the Paneveggio-Pale di San Martino Natural Park. Among the surveyed habitats, forests and freshwaters are worthy of further research as well as of conservation, since several rare species were found.

Dolomites / forests / freshwaters / Paneveggio / Trentino-Alto Adige / Veneto

INTRODUCTION

The first modern Italian lichen checklist (Nimis, 1993) was fundamental for the rebirth of Italian lichenology. Its second version (Nimis & Martellos, 2003) added 200 new taxa as a result of intensified studies of the Italian lichen flora between 1993 and 2003. The north-eastern Italian regions Trentino-Alto Adige and Veneto are, together with Tuscany and Sardinia, the lichenologically best known areas. Trentino-Alto Adige, with more than 1,300 infrageneric taxa (Nimis, 2003; Nimis & Martellos, 2003) has the richest lichen flora in Italy, while Veneto is the region where lichens have been explored with the greatest continuity (Nimis, 1993). Their high lichen diversity is also related to the variety of substrata and climates, and to their rugged morphology. Although the region of Veneto includes a vast, intensively cultivated lowland area, the upland parts still host a varied, rich and interesting lichen flora.

The most important work on the lichens of Trentino-Alto Adige was carried out by F. Arnold (1828-1901) in the last years of the 19th century. He surveyed South Tyrol, and published the results in the famous series *Lichenologische Ausflüge* in Tyrol (1868-1897). Another important contribution

was made by E. Kernstock with his *Lichenologische Beiträge* (1890-1896). The lichen records from this region until 1901 were summarized by Dalla Torre & Sarnthein (1902). During the first half of the 20th century, P. Bolzon and M. Cengia Sambo published several new lichen records from this area (Nimis, 1993). Several interesting records were also published by German-speaking authors (Nimis, 1993), for instance the important contribution by Buschardt (1979) on the lichens of the inner alpine valleys (Bolzano). Recent new lichen records from the South-Eastern and Central Alps (Nascimbene & Caniglia, 2000; Nascimbene, 2002, 2003, 2004; Nascimbene *et al.*, 2004; Nascimbene, 2005b) have added c. 50 taxa to Trentino-Alto Adige. The north-eastern part of the Trento Province, roughly corresponding to the Paneveggio-Pale di San Martino Natural Park, is probably the best known area in this region. It includes several localities surveyed by Arnold, with a total of 526 species (Nascimbene & Caniglia, 2003a).

The first relevant lichen records from Veneto were published by phanerogamists during the period 1718-1828 (Nimis, 1993). In the first half of the 19th century A. Massalongo published several papers and distributed several species in his *Lichenes Italici Exsiccati*, continued by Anzi with the *Lichenes Rariores Veneti* (Nimis, 1993). An important contribution was the *Licheni Bassanesi* published by Beltramini in the 1858. During the second part of 19th century the lichenological research declined dramatically, and only few more or less critical compilations were published (Nimis, 1993). An exception is the survey from the Dolomites by Arnold (1876), near Cortina d'Ampezzo. The first part of the 20th century was characterized by the work of Cengia-Sambo, who provided new records from various areas within the region, from the Euganean hills to the Dolomites. Recent papers have added several new records to the lichen flora of Veneto that now consists of 1,012 infrageneric taxa (Nimis & Martellos, 2003). Two works in particular are focused on the lichen flora of the Dolomites, stressing the high lichenological importance of this area: Nimis (1995) reported several species new to Italy and Veneto from the Tre Cime di Lavaredo, while Nascimbene & Caniglia (2003b) described the lichen flora and vegetation of the Dolomiti d'Ampezzo Natural Park.

The aim of this work is to improve the knowledge of the lichen flora of Italy, focusing on its eastern alpine Regions (Trentino-Alto Adige and Veneto).

SURVEY AREAS, MATERIAL AND METHODS

Most of the field work was carried out during the summer of 2005 in various parts of Trentino-Alto Adige and Veneto. Other minor excursions took place during 2003 and 2004. A total of 42 localities were surveyed. The Dolomites were explored in greater detail. Most of the visited localities are within Natural and National Parks, or Nature Reserves.

Localities

1. Veneto, Belluno, the downtown area of the town Vittorio Veneto, alt. 140 m, 45°58'N, 12°18'E, 25 August 2005.
2. Veneto, Belluno, Pian (plateau) del Cansiglio, parking place at Rifugio (mountain tourist station) S. Osvaldo, alt. 900-1000 m, 12°24'N, 46°04'E, 25 August 2005.
3. Veneto, Belluno, Pian (plateau) del Cansiglio, the botanical garden Giardino Botanico alpino "G. Lorenzoni", alt. 900-1000 m, 12°25'N, 46°04'E, 25 August 2005.

4. Veneto, Belluno, Cansiglio forest (Bosco del Cansiglio), c. 1.0 km SE of the botanical garden Giardino Botanico alpino "G. Lorenzoni", about 30 years old *Picea abies* plantation on former grassland, alt. 900-1000 m, 12°25'N, 46°04'E, 25 August 2005.

5. Veneto, Belluno, Cansiglio forest (Bosco del Cansiglio), c. 1.0 km SE of the botanical garden Giardino Botanico alpino "G. Lorenzoni", old *Picea abies* forest, alt. 900-1000 m, 12°25'N, 46°04'E, 25 August 2005.

6. Veneto, Belluno, Cansiglio forest, (Bosco del Cansiglio), Val de Piera, old *Fagus sylvatica* forest, alt. 900-1000 m, 12°26'N, 46°07'E, 25 August 2005.

7. Trentino-Alto Adige, Trento, Paneveggio Natural Park, near the restaurant "La Bicocca", old *Picea abies* forest along the road, alt. c. 1500 m, 46°18'N, 11°44'E, 26 August 2005.

8. Trentino-Alto Adige, Trento, Paneveggio Natural Park, along path south from "Centro visitatori" (Tourist information), old *Picea abies* forest, alt. c. 1500 m, 46°18'N, 11°44'E, 26 August 2005.

9. Trentino-Alto Adige, Trento, Paneveggio Natural Park, c. 300 m NW of "Centro visitatori" (Tourist information), at old house in grassland, alt. 1500 m, 46°18'30"N, 11°44'34"E, 26 August 2005.

10. Trentino-Alto Adige, Trento, Paneveggio Natural Park, along the path from Malga (summer farm) Vallazza (1935 m, 46°36'08"N, 12°06'25"E) to the top of the mountain Cima Bocche (alt. 2344 m, 46°20'47"N, 11°46'34"E), in the forest zone, dominated by *Larix decidua*, 26 August 2005.

11. Trentino-Alto Adige, Trento, Paneveggio Natural Park, along the path from Malga (summer farm) Vallazza (1935 m, 46°36'08"N, 12°06'25"E) to the top of the mountain Cima Bocche (alt. 2344 m, 46°20'47"N, 11°46'34"E), at the timber line, 26 August 2005.

12. Trentino-Alto Adige, Trento, Paneveggio Natural Park, along the path from Malga (summer farm) Vallazza (1935 m, 46°36'08"N, 12°06'25"E) to the top of the mountain Cima Bocche (alt. 2344 m, 46°20'47"N, 11°46'34"E), at the top, 26 August 2005.

13. Trentino-Alto Adige, Trento, Paneveggio Natural Park, along the path from Malga (summer farm) Vallazza (1935 m, 46°36'08"N, 12°06'25"E) to the top of the mountain Cima Bocche (alt. 2344 m, 46°20'47"N, 11°46'34"E), in grassland near Malga Vallazza, 26 August 2005.

14. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, at the path from the parking place S. Umberto (1449 m, 46°36'08"N, 12°06'25"E) to Rifugio (mountain tourist station) Ra Stua (1665 m, 46°37'32"N, 12°05'56"E), c. 500 m from the parking place, 27 August 2005.

15. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from the parking place S. Umberto (1449 m, 46°36'08"N, 12°06'25"E) to Rifugio (mountain tourist station) Ra Stua (1665 m, 46°37'32"N, 12°05'56"E), c. 2 km from the parking place, on *Acer pseudoplatanus* in steep gravel slope, 27 August 2005.

16. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from the parking place S. Umberto (1449 m, 46°36'08"N, 12°06'25"E) to Rifugio (mountain tourist station) Ra Stua (1665 m, 46°37'32"N, 12°05'56"E), c. 200 m from Rifugio Ra Stua, vertical dolomite rock in grassland, 27 August 2005.

17. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Ra Stua to Rifugio Biella – Val Salata, open *Pinus mugo* forest in slope exposed to S, alt. 2000 m, 46°38'19"N, 12°05'47"E, 27 August 2005.

18. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Ra Stua to Rifugio Biella – Val Salata, 1 km SW the lake Gran de Fòses, on large boulder in the alpine zone, alt. c. 2100 m, c. 46°38'N, 12°05'E, 27 August 2005.

19. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Ra Stua to Rifugio Biella – Val Salata, grassland with scattered boulders in the alpine zone above the timberline, about 500 m before the lake Gran de Fòses, alt. 2180 m, 46°38'54"N, 12°05'49"E, 27 August 2005.

20. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along path about 300 m above Rifugio (mountain tourist station) Biella (2327 m, 46°39'56"N, 12°05'04"E), near small Ave Maria statue, scattered boulders at a pass in the alpine zone above the timberline, 27 August 2005.

21. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Biella (2327 m, 46°39'56"N, 12°05'04"E) to the top of the mountain Croda del Beco (2812 m, 46°40'30"N, 12°04'21"E), steep slope with calcareous rocks in the alpine zone above the timberline, 28 August 2005.

22. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, above Rifugio (mountain tourist station) Biella, at the top of the mountain Croda del Becco, calcareous rocks in the alpine zone above the timberline, alt. 2812 m, 46°40'30"N, 12°04'21"E, 28 August 2005.

23. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Biella (2327 m, 46°39'56"N, 12°05'04"E) to Rifugio Utia de Sènes, about 400 m from Rifugio Biella, dolomite boulders in the alpine zone above the timberline, on very large boulder, 28 August 2005.

24. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, along the path from Rifugio (mountain tourist station) Utia de Sènes (2116 m) to Rifugio Ra Stua, c. 2 km NW Rifugio Ra Stua, open deciduous forest with scattered old coniferous trees by the gravel road, alt. c. 1800 m, 46°37'N, 12°05'E, 28 August 2005.

25. Veneto, Belluno, Cortina, Dolomiti d'Ampezzo Natural Park, at the small road from Rifugio (mountain tourist station) Ra Stua and the parking place S. Umberto (alt. 1449 m, 46°36'08"N, 12°06'25"E), c. 300 from the parking place, 28 August 2005.

26. Veneto, Belluno, along the path between Rifugio (mountain tourist station) A. Sonino al Coldai (alt. 2132 m) and the small town of Listolade, by the small lake Lago Coldai (alt. 2143 m), grassland and vertical dolomite rock in the alpine zone at the NW shore of the lake, alt. 2156 m, 46°23'59"N, 12°03'37"E, 29 August 2005.

27. Veneto, Belluno, along the path between Rifugio (mountain tourist station) A. Sonino al Coldai (alt. 2132 m) and the small town of Listolade, at the turn to Rifugio Tissi (alt. 2250 m). Dolomite boulders, grassland and scattered shrubs and trees at the timberline, alt. 2086 m, 46°22'57"N, 12°02'01"E, 29 August 2005.

28. Veneto, Belluno, along the path between Rifugio (mountain tourist station) A. Sonino al Coldai (alt. 2132 m) and the small town of Listolade, Rifugio Mario Vazzoler, open mixed coniferous/deciduous forest, alt. 1715 m, 46°21'15"N, 12°01'52"E, 29 August 2005.

29. Veneto, Belluno, along the path between Rifugio (mountain tourist station) Mario Vazzoler (1715 m, 46°21'15"N, 12°01'52"E) and the small town of Listolade (alt. c. 680 m), c. 4.5 km NW of Listolade, dolomite boulders in grassland with small, scattered deciduous trees in steep slope by the gravel road, alt. c. 1400 m, 46°21'N, 12°02'E, 29 August 2005.

30. Veneto, Belluno, along the path from Passo Falzarego (alt. 2105 m) to Rifugio (mountain tourist station) Averau, at the highest pass, exposed dolomite rocks, alt. 2431 m, 46°30'04"N, 12°02'02"E, 30 August 2005.

31. Veneto, Belluno, Vincheto di Cellarda Nature Reserve, in riparian forest dominated by *Salix alba*, *Populus* sp., and *Alnus glutinosa*, alt. c. 310 m, 46°01'N, 11°58'E, November 2005.

32. Veneto, Belluno, Vincheto di Cellarda Nature Reserve, in freshwater habitat on calcareous pebbles) alt. c. 310 m, 46°01'N, 11°58'E, 10 November 2005.

33. Veneto, Belluno, Vincheto di Cellarda Nature Reserve, periglacial pioneer habitat with *Salix eleagnos*, alt. c. 310 m, 46°01'N, 11°58'E, 10 November 2005.

34. Veneto, Belluno, Casera Razzo, subalpine *Larix* forest, alt. c. 1700 m, 6 November 2003.

35. Veneto, Belluno, Misurina (leg. M. Dalle Vedove), subalpine *Larix/Pinus cembra* forest, alt. c. 1800 m, 46°36'N, 12°16'E, 06, July 2005.

36. Veneto, Belluno, Dolomiti Bellunesi National Park, near Rivamonte Agordino, on iron containing metamorphic boulders, alt. c. 1100 m, 17 March 2005.

37. Veneto, Belluno, Cansiglio forest (Bosco del Cansiglio), near Pian Canaie, old beech forest, alt. c. 1000 m, 12°26'N, 46°07'E, June 2005.

38. Veneto, Vicenza, Monte Nero near Montecchio Maggiore (leg. G. Caniglia), on more or less calcareous ground, alt. 150 m, September, 2003.

39. Veneto, Padua, Colli Euganei Natural Park, Arquà Petrarca, on *Tilia* sp., alt. c. 100 m, 18 December 2004.

40. Veneto, Padua, Noventa Padovana, in the park of Villa Melato on large *Tilia* sp., alt. c. 15 m, 45°24'N, 11°58'E, 22 March 2005.

41. Trentino-Alto Adige, Trento, Paneveggio Natural Park, Val Bona, subalpine spruce stand with trees older than 300 years, alt. c. 2100 m, 14 October 2005.

42. Trentino-Alto Adige, Trento, Paneveggio Natural Park, Val Bona, subalpine river on porphyric (acid) rocks, alt. c. 1900 m, October 2005.

The main habitats and substrates include:

1) dolomitic, calcareous, and siliceous boulders and outcrops in the alpine/subalpine belts;

2) natural grasslands, both on carbonatic and siliceous substrata (soil and plant debris), in the alpine belt;

3) subalpine and montane forests dominated by conifers (on bark, wood, and decaying wood);

4) freshwater streams in the alpine belt (on siliceous rocks);

5) man-made substrates (wooden structures and mortar) in the montane belt.

The other environments considered were the lowlands and the Pre-Alps of Veneto. A particularly detailed survey was carried out in the forest of Cansiglio within pure beech and mixed beech-silver fir-spruce stands.

The nomenclature follows Santesson *et al.* (2004; new names are sometimes indicated within parenthesis) with the following exceptions; *Caloplaca scrobiculata*, *Dacampia hookeri*, *Flavoparmelia soledians*, *Fulgensia subbracteata* and *Tuckneraria laureri* follow Nimis & Martellos (2003), *Caloplaca erodens* follows Tretiach *et al.* (2003), *Caloplaca flavocitrina* follows Arup (2006), *Caloplaca soralifera* follows Vondrák & Hrouzek (2006), *Micarea micrococca* follows Coppins (2002), *Mycobilimbia olivacea* follows Sarrión *et al.* (2003) and *Psoroma tenue* follows Jørgensen (2004). The collections by G. Thor (GT) are housed in UPS, those by J. Nascimbene (JN) in his personal herbarium. The annotation "TLC" below indicates that TLC have been performed. "*" = lichenicolous fungus. The number of the locality of collection follows the name of the species.

RESULTS

Absconditella lignicola: 8 (GT). On *Picea abies* stumps. New to Italy.

Acarospora cervina: 21 (GT). On exposed dolomite rock.

Acarospora fuscata: 9 (GT). On exposed wooden table.

Acarospora heppii: 33 (JN). On calcareous pebbles. New to Veneto.

Acrocordia cavata: 7 (GT). On old *Picea abies*. New to Trentino-Alto Adige.

Agonimia tristicula: 3 (GT), 11 (GT), 18 (GT). On mossy vertical rocks. New to the Paneveggio Natural Park.

Amandinea punctata: 9 (GT). On exposed wooden table.

Anisomeridium polypori: 4 (GT), 7 (GT). On *Prunus* sp. and on old *Picea abies*. New to the Trentino-Alto Adige.

Arthonia apatetica: 24 (GT). On shaded *Alnus viridis* twigs.

- Arthonia mediella*: 10 (GT). On old *Larix decidua*. New to the Paneveggio Natural Park.
- Arthonia vinosa*: 5 (GT), 7 (GT). On base of old *Picea abies*. New to the Paneveggio Natural Park.
- Aspicilia calcarea*: 16 (GT). On dolomite rock.
- Aspicilia moenium*: 9 (GT). On mortar on old, exposed house. New to Trentino-Alto Adige.
- Bacidia laurocerasi*: 37 (JN). On *Fagus sylvatica* bark. New to Veneto.
- Bacidina arnoldiana*: 3 (GT), 4 (GT). On mossy vertical rock. New to Veneto.
- Bacidina chlorotricula*: 40 (JN). On *Tilia* sp. bark. New to Veneto.
- Biatora chrysantha*: 5 (GT, TLC), 8 (GT, TLC), 24 (GT, TLC). On base of old *Picea abies* and *Larix decidua* and on *Alnus viridis* at small stream. New to the Paneveggio Natural Park.
- Biatora efflorescens*: 8 (GT, TLC), 28 (GT, TLC). On old *Picea abies* and on old *Betula*. New to Trentino-Alto Adige.
- Biatora helvola*: 8 (GT). On old *Picea abies*. New to the Paneveggio Natural Park.
- Biatora ocelliformis*: 8 (GT). On *Alnus viridis* at small stream.
- Botryolepraria lesdainii*: 1 (GT, TLC). On stonewall. New to Veneto.
- Bryoria fuscescens*: 10 (GT), 24 (GT). On old *Larix decidua*.
- Buellia chloroleuca* (*Tetramelas chloroleucas*): 17 (GT). On wood on base of old *Pinus mugo*.
- Buellia griseovirens*: 2 (GT, TLC), 3 (GT, TLC), 6 (GT, TLC), 8 (GT, TLC), 25 (GT, TLC), 28 (GT). On old *Fagus sylvatica*, on *Alnus viridis*, on coniferous stump, wooden fence and on old *Betula*. New to the Paneveggio Natural Park.
- Calicium trabinellum*: 10 (GT), 34. On coniferous stump and on bark of old *Larix decidua*. New to Veneto and to the Paneveggio Natural Park.
- Caloplaca alociza*: 16 (GT). On vertical dolomite rock.
- Caloplaca chlorina*: 9 (GT). On old wooden table. New to the Paneveggio Natural Park.
- Caloplaca citrina*: 24 (GT). On dolomite boulder.
- Caloplaca crenulatella*: 9 (GT). On mortar on old, exposed house.
- Caloplaca erodens*: 19 (GT). On exposed dolomite boulder.
- Caloplaca flavocitrina*: 9 (GT). On mortar on old, exposed house. New to the Paneveggio Natural Park.
- Caloplaca herbidella*: 7 (GT), 9 (GT, without isidia), 11 (GT), 28 (GT). On old *Picea abies*, on exposed wooden table, on *Rhododendron ferrugineum*, *Juniperus communis* and on old *Betula*.
- Caloplaca saxicola*: 21 (GT), 30 (GT). On exposed dolomite rock.
- Caloplaca scrobiculata*: 21 (GT). On exposed dolomite rock.
- Caloplaca soralifera*: 9 (GT). On mortar on old, exposed house. New to Italy.
- Candelaria concolor*: 9 (GT). On exposed *Acer pseudoplatanus* near parking place.
- Candelariella efflorescens*: 2 (GT). On wooden fence. New to Veneto.
- Candelariella vitellina*: 9 (GT), 13 (GT, in collection of *Carbonea vitellinaria*). On exposed wooden table and on rock.
- Candelariella xanthostigma*: 6 (GT), 15 (GT). On old *Acer pseudoplatanus* and *Fagus sylvatica*.
- **Carbonea vitellinaria*: 13 (GT). On *Candelariella vitellina* on rock in grassland. New to the Paneveggio Natural Park.
- Carbonea vorticosa*: 12 (GT). On exposed rock.
- Cetrelia olivetorum*: 5 (GT). On base of old *Picea abies*.
- Chaenotheca chrysocephala*: 10 (GT). On old *Larix decidua*.

- Chaenotheca furfuracea*: 7 (GT), 28 (GT). On old *Picea abies* and *Larix decidua*.
Chaenotheca gracilentata: 7 (GT). On old *Picea abies*.
Chaenotheca trichialis: 10 (GT), 28 (GT), 35. On old *Larix decidua*. New to Veneto.
Chaenotheca xyloxena: 35 (JN). On old *Larix decidua*. New to Veneto.
Cheiomycina flabelliformis: 8 (GT). On *Picea abies* stump. New to Italy.
Chrysothrix candelaris: 7 (GT). On old *Picea abies*.
Cladonia arbuscula ssp. *squarrosa*: 18 (GT). On boulder.
Cladonia pocillum: 20 (GT). On mosses on boulder.
Clauzadea immersa: 20 (GT). On boulder.
**Clypeococcum hypocenomyces*: 10 (GT). On *Hypocenomyce scalaris* on coniferous stump. New to the Paneveggio Natural Park.
Collema polycarpon subsp. *polycarpon*: 23 (GT), 24 (GT). On shaded dolomite rocks.
Collema subflaccidum: 15 (GT). On *Acer pseudoplatanus*.
Collema tenax: 16 (GT). On mossy dolomite rock.
Cornicularia normoerica: 11 (GT). On exposed rock.
Cyphelium karelicum: 41 (JN). On old *Picea abies* bark. New to North Italy and Trentino-Alto Adige.
Cyphelium tigillare: 10 (GT). On old *Larix decidua*.
Dacampia hookeri: 21 (GT). On soil.
Dimerella pineti: 5 (GT), 8 (GT). On *Picea abies* twigs and base of old *Picea abies*.
Diplotomma alboatrum: 30 (GT). On exposed dolomite rock.
Evernia divaricata: 7 (GT). On old *Picea abies*.
Flavoparmelia soledians: 39 (JN). On *Tilia* sp. bark. New to Veneto.
Fulgensia subbracteata: 38 (JN). On more or less calcareous ground. New to Veneto.
Fuscidea recens: 8 (GT, TLC). On shaded, vertical rock-face by a small stream. New to Trentino-Alto Adige and the Paneveggio Natural Park.
Fuscopannaria praetermissa: 11 (GT). On shaded rock.
Hypotrachyna revoluta: 5 (GT). On *Picea abies* twigs.
**Intralichen lichenicola*: 24 (GT). In *Candelariella xanthostigma* on *Alnus viridis*.
Ionaspsis obtecta: 11 (GT). On pebbles in wet soil. New to Italy.
Ionaspsis suaveolens: 12 (GT). On exposed rock. New to the Paneveggio Natural Park.
Japewia tornoënsis: 35 (JN). On old *Larix decidua*. New to Veneto.
Lecania cyrtella: 3 (GT), 28 (GT). On *Lonicera xylosteum* and other shrubs.
Lecanora cadubriae: 10 (GT). On old *Larix decidua*. New to the Paneveggio Natural Park.
Lecanora chlorotera: 11 (GT). On *Rhododendron ferrugineum*.
Lecanora circumborealis: 11 (GT), 28 (GT). On twigs. New to the Paneveggio Natural Park.
Lecanora epanora: 36 (JN). On iron containing metamorphic rocks. New to Veneto.
Lecanora epibryon: 18 (GT). On mosses on boulder.
Lecanora exspersa: 27 (GT). On old exposed *Larix* snag. New to Italy.
Lecanora glabrata: 6 (GT). On old *Fagus sylvatica*.
Lecanora symmicta: 11 (GT), 14 (GT). On twigs.
Lecanora varia: 27 (GT, in collection of *Ramboldia insidiosa*). On old, exposed *Larix decidua* snag.
Lecidea albofuscescens: 8 (GT). New to the Paneveggio Natural Park.

- Lecidea pullata*: 8 (GT), 10 (GT, TLC), 14 (GT, TLC), 17 (GT, TLC). On old *Picea abies*, *Larix decidua* and *Pinus mugo*. New to the Paneveggio Natural Park.
- Lecidea turgidula*: 8 (GT). On *Picea abies* stump.
- Lecidella elaeochroma*: 6 (GT). On old *Fagus sylvatica*.
- Lecidella euphorea* (as synonym of *L. elaeochroma* in ITALIC): 11 (GT), 15 (GT), 26 (GT), 27 (GT). On *Acer pseudoplatanus*, *Vaccinium* sp. and *Rhododendron* sp.
- Lecidella patavina*: 30 (GT). On exposed dolomite rock.
- Lepraria diffusa*: 20 (GT, TLC), 26 (GT, TLC), 27 (GT, TLC).
- Lepraria elobata*: 10 (GT, TLC), 12 (GT, TLC), 17 (GT, TLC), 28 (GT, TLC): On old *Larix decidua*, *Pinus mugo*, *Betula* and *Vaccinium* sp. New to the Paneveggio Natural Park.
- Lepraria lobificans*: 1 (GT, TLC), 10 (GT, TLC). On stonewall and on coniferous stump. New to the Paneveggio Natural Park.
- Leptogium intermedium*: 18 (GT), 20 (GT). Among mosses on boulders.
- Leptogium lichenoides*: 3 (GT), 23 (GT). On mossy boulders.
- Leptogium saturninum*: 9 (GT). On exposed *Acer pseudoplatanus* near parking place.
- Letharia vulpina*: 10 (GT). On old *Larix decidua*.
- Loxospora elatina*: 8 (GT, TLC). On old *Picea abies*. New to the Paneveggio Natural Park.
- Megaspora verrucosa*: 20 (GT). On plant debris on boulder.
- Melanelia subargentifera*: 9 (GT). On exposed *Acer pseudoplatanus* near parking place.
- Menegazzia terebrata*: 6 (GT). On old *Fagus sylvatica*.
- Micarea denigrata*: 3 (GT). On wooden fence.
- Micarea hedlundii*: 8 (GT). On *Picea abies* stump. New to Italy.
- Micarea melaena*: 8 (GT). On mosses on shaded, vertical rock-face at small stream.
- Micarea misella*: 8 (GT). On *Picea abies* stump. New to the Paneveggio Natural Park.
- Micarea micrococca*: 4 (GT). On dead deciduous tree. New to Italy (earlier probably included in *M. prasina*).
- Microcalicium ahlneri*: 10 (GT). On coniferous stump and on old *Larix decidua*. New to Trentino-Alto Adige.
- **Muellerella pygmaea* var. *athallina*: 12 (GT). On crustose lichen on exposed rock. New to the Paneveggio Natural Park.
- Mycobilimbia hypnorum*: 20 (GT). On mosses on boulder.
- Mycobilimbia lurida*: 18 (GT), 21 (GT), 23 (GT). On soil.
- Mycobilimbia* aff. *olivacea*: 7 (GT). New to Italy. Differs by Spanish material by the paler thallus and in not having biseriate asci.
- Mycobilimbia tetramera*: 3 (GT). On vertical mossy rock.
- Mycoblastus fucatus*: 8 (GT). On old *Picea abies*. New to the Paneveggio Natural Park.
- Myxobilimbia lobulata*: 12 (GT), 18 (GT), 20 (GT), 27 (GT). On mosses.
- Myxobilimbia microcarpa*: 21 (GT). On soil.
- Naetrocymbe rhypona*: 8 (GT). On *Alnus viridis* growing by a small stream. New to the Paneveggio Natural Park.
- Normandina acroglypta*: 3 (GT, TLC), 6 (GT, TLC). On *Lonicera xylosteum*, old *Fagus sylvatica* and base of old *Picea abies*. New to Italy.
- Ochrolechia alboflavescens*: 10 (GT, TLC). On old *Larix decidua*.

- Ochrolechia androgyna*: 8 (GT, TLC). On old *Picea abies*. New to the Paneveggio Natural Park.
- Ochrolechia arborea*: 3 (GT, TLC), 9 (GT, TLC). On exposed wooden table. New to the Paneveggio Natural Park.
- Ochrolechia microstictoides*: 8 (GT, TLC), 10 (GT, TLC), 24 (GT, TLC), 27 (GT, TLC). On old *Picea abies* and *Larix decidua* and on *Larix decidua* snag. New to the Paneveggio Natural Park.
- Opegrapha niveoatra*: 5 (GT), 8 (GT). On base of old *Picea abies*. New to Veneto and to the Paneveggio Natural Park.
- **Opegrapha pulvinata*: 11 (GT). On *Dermatocarpon miniatum* on shaded wet rock. New to the Paneveggio Natural Park.
- Opegrapha viridis*: 6 (JN). On old *Fagus sylvatica*.
- Opegrapha vulgata*: 6 (GT). On old *Fagus sylvatica*.
- Parmelia omphalodes* ssp. *omphalodes*: 11 (GT). On exposed rock.
- Parmelia saxatilis*: 6 (GT). On old *Fagus sylvatica*.
- Parmelia submontana*: 6 (GT). On old *Fagus sylvatica*.
- Parmeliopsis ambigua*: 10 (GT). On old *Larix decidua*.
- Parmeliopsis hyperopta*: 11 (GT). On *Rhododendron ferrugineum*.
- Peltigera didactyla*: 13 (GT). On soil in grassland.
- Peltigera malacea*: 26 (GT). On the ground.
- Pertusaria albescens*: 7 (GT, TLC). On base of old *Picea abies*.
- Pertusaria amara*: 8 (GT). On base of old *Picea abies*.
- Pertusaria pupillaris*: 8 (GT, TLC), 10 (GT, TLC). On *Picea abies* stump, old *Larix decidua* and *Alnus viridis*. New to the Paneveggio Natural Park.
- Petractis clausa*: 16 (GT). On vertical dolomite rock.
- Phaeocalicium compressulum*: 8 (GT), 24 (GT). On *Alnus viridis*.
- Phaeophyscia nigricans*: 9 (GT). On mortar on old, exposed house. New to the Paneveggio Natural Park.
- Phaeophyscia orbicularis*: 9 (GT). On exposed *Acer pseudoplatanus* near parking place.
- Phaeorrhiza nimboza*: 18 (GT). On boulder.
- Phlyctis argena*: 6 (GT). On old *Fagus sylvatica*.
- Physcia dubia*: 18 (GT). On boulder.
- Physconia distorta*: 15 (GT). On *Acer pseudoplatanus*.
- Physconia enteroxantha*: 9 (GT). On exposed *Acer pseudoplatanus* near parking place. New to the Paneveggio Natural Park.
- Physconia muscigena*: 20 (GT), 30 (GT). On mosses on the ground.
- Placynthiella dasaea*: 27 (GT, TLC). On base of old, exposed *Larix decidua* snag. New to Italy.
- Placynthiella icmalea*: 8 (GT, TLC). On *Picea abies* stump.
- Placynthiella oligotropha*: 18 (GT). New to Veneto.
- Placynthium subradiatum*: 21 (GT), 23 (GT). On dolomite rocks.
- Polyblastia cruenta*: 42 (JN). On periodically submerged porphyric rocks. New to the Paneveggio Natural Park.
- Polyblastia sendtneri*: 18 (GT). On mosses.
- Polysporina simplex*: 9 (GT). On exposed wooden table.
- Protoblastenia incrustans*: 21 (GT). On shaded rock.
- Psoroma tenue*: 11 (GT, TLC). On shaded wet rock. New to Italy.
- Ramboldia insidiosa*: 27 (GT). On *Lecanora varia* on old, exposed *Larix decidua* snag.
- Rinodina efflorescens*: 6 (GT, TLC). On old *Fagus sylvatica*. New to Veneto.
- Rinodina exigua*: 2 (GT). On wooden fence.

- Rinodina roscida*: 26 (GT). On plant debris.
Rinodina sophodes: 2 (GT). On wooden fence.
Schaereria fuscocinerea: 9 (GT). On exposed wooden table.
Scoliciosporum chlorococcum: 8 (GT). On *Alnus viridis* twigs. New to Trentino-Alto Adige.
Scoliciosporum sarothamni: 28 (GT). On old *Betula*.
Squamarina cartilaginea: 20 (GT), 26 (GT). On mosses on boulder and on the ground.
Squamarina gypsacea: 21 (GT). On soil.
Staurothele fissa: 42 (JN). On periodically submerged porphyric rocks. New to the Paneveggio Natural Park.
Staurothele fuscocuprea: 42 (JN). On periodically submerged porphyric rocks. New to the Paneveggio Natural Park.
Staurothele rupifraga: 9 (GT, adest. in collection of *Caloplaca soralifera*).
Stereocaulon coniophyllum: 11 (GT, TLC). On shaded wet rock. New to Italy.
**Stigmidium microspilum*: 6 (GT). On *Graphis scripta* on old *Fagus sylvatica*. New to Veneto.
Strangospora moriformis: 10 (GT). On old *Larix decidua*. New to the Paneveggio Natural Park.
Synalissa symphorea: 29 (GT). On exposed dolomite boulder.
Thelomma ocellatum: 9 (GT). On exposed wooden table. New to the Paneveggio Natural Park.
Thelotrema lepadinum: 5 (GT). On base of old *Picea abies*.
Toninia alutacea: 14 (GT), 20 (GT), 21 (GT). On dolomite rocks.
Toninia candida: 18 (GT). On dolomite rock.
Trapelia coarctata: 11 (GT). On pebbles in wet soil. New to the Paneveggio Natural Park.
Trapelia placodioides: 12 (GT). On exposed rock. New to Trentino-Alto Adige.
Trapeliopsis flexuosa: 8 (GT), 10 (GT). On *Picea abies* stump and on old *Larix decidua*. New to the Paneveggio Natural Park.
Trapeliopsis gelatinosa: 10 (GT). On coniferous stump. New to the Paneveggio Natural Park.
Trapeliopsis granulosa: 10 (GT). On coniferous stump.
Tremolecia atrata: 12 (GT). On exposed rock.
Tuckneraria laureri: 24 (GT). On old *Larix decidua*.
Umbilicaria crustulosa: 11 (GT). On exposed rock.
Usnea florida: 7 (GT). On old *Picea abies*. New to the Paneveggio Natural Park.
Verrucaria aquatilis: 32 (JN). On calcareous, permanently submerged pebbles. New to Veneto.
Verrucaria latebrosa: 42 (JN). On periodically submerged porphyric rocks. New to the Paneveggio Natural Park.
Xanthoria elegans: 20 (GT). On dolomite boulder.
Xanthoria fulva: 9 (GT). On exposed *Acer pseudoplatanus* near parking place. New to the Paneveggio Park.
Xylographa parallela: 8 (GT), 24 (GT). On *Picea abies* stump. New to the Paneveggio Natural Park.
Xylographa vitiligo: 8 (GT, TLC). On *Picea abies* stump. New to the Paneveggio Natural Park.

DISCUSSION AND CONCLUSION

182 lichens and 6 lichenicolous fungi are reported. Twelve lichen species are new to Italy: *Absconditella lignicola*, *Caloplaca soralifera*, *Cheiromycina flabelliformis*, *Ionaspis obtecta*, *Lecanora exspersa*, *Micarea hedlundii*, *M. micrococca*, *Mycobilimbia* aff. *olivacea*, *Normandina acroglypta*, *Placynthiella dasaea*, *Psoroma tenue* and *Stereocaulon coniophyllum*. 18 species are new to Veneto: *Acarospora heppii*, *Bacidia laurocerasi*, *Bacidina arnoldiana*, *Bacidina chlorotricula*, *Botryolepraria lesdainii*, *Calicium trabinellum*, *Candelariella efflorescens*, *Chaenotheca trichialis*, *Chaenotheca xyloxa*, *Flavoparmelia soledians*, *Fulgensia subbracteata*, *Japewia tornoënsis*, *Lecanora epanora*, *Opegrapha niveoatra*, *Placynthiella oligotropha*, *Rinodina efflorescens*, *Stigmidium microspilum* and *Verrucaria aquatilis*. Nine species are new to Trentino-Alto Adige as well as to the Paneveggio-Pale di San Martino Natural Park: *Acrocordia cavata*, *Anisomeridium polypori*, *Aspicilia moenium*, *Biatora efflorescens*, *Cyphelium karelicum*, *Fuscidea recensa*, *Microcalicium ahlneri*, *Scoliciosporum chlorococcum* and *Trapelia placodioides*. An additional 45 species are new to the Paneveggio-Pale di San Martino Natural Park.

Despite the Alps being one of the lichenologically best known areas of the world, there are still several gaps in the knowledge of the taxonomy and ecology of lichens associated with poorly known or overlooked micro-habitats, such as dead wood in forests, freshwaters and exposed siliceous rocks. Among the surveyed habitats, forests and freshwaters merit particular remarks, as well as the particularly rich lichen flora of the protected area of Paneveggio-Pale di San Martino Natural Park.

Forests

Subalpine and montane forests dominated by conifers proved to be species-rich. Several micro-habitats are suitable for lichen establishment, creating a high lichen diversity. Dead wood (stumps, snags, logs) in particular is an overlooked micro-habitat in Italy (5 species new to Italy) that requires further investigation. Some recent papers stress the importance of coarse woody debris for lichen conservation in the Nordic countries and the Baltic States (e.g., Kruys *et al.* 1999; Löhmus & Löhmus, 2001; Svensson *et al.*, 2005) and it would be interesting to investigate its importance for lichen diversity and conservation in the forests of the Southern Alps. In Northern Italy, forests (including Natural and National Parks) have normally been managed for centuries, and only a few Forest Reserves with old-growth forests are left. During certain periods (e.g., World War 1), the forests were more open than now, but the areas were never without trees. Today, the maximum size of a clear-cutting is 0.2 ha, and typically only individual trees are logged. This presents a stark contrast to conditions in Scandinavia, where clear-cutting is the normal practice in forestry. The average area of a Swedish clear-cutting was 5.5 ha in 2005 (Statistical yearbook of Forestry 2005). In Northern Italy, selective cutting allows the development of semi-natural conditions with short dispersal distances for lichen propagules, i.e. conditions suitable for some lichens considered dependent on old-growth stands, which are declining and red-listed in Sweden (e.g. *Cetrelia olivetorum*, *Chaenotheca gracilentia*, *Evernia divaricata* and *Menegazzia terebrata*).

Contrary, old-growth forests and old-growth structures are probably more common in Scandinavia and species confined to very old trees, snags and

logs were absent or very rare in the Italian forests. In the Paneveggio Park such species include *Cyphelium karelicum*, found on old (more than 200 years) *Picea* trunks in a subalpine spruce stand where management had not been intensive in the past, allowing a regular establishment of trees both in time and in space during the last three centuries, and where no cuttings have been made in the last 50 years (Motta, 2002).

Freshwaters

As stressed by Nascimbene & Nimis (2006) in their review on freshwater lichens of the Italian Alps, freshwater habitats merit particular attention in Italy. Surveys should primarily be focused on the subalpine belt near the timber line, which constitutes the altitudinal optimum for freshwater species (Nascimbene & Nimis, 2006). We found 5 freshwater lichens, mostly on siliceous rocks, one of which (*Ionaspis obtecta*) collected in the alpine belt, is new to Italy. In terms of conservation, the main threats to this group of lichens in the Alps are posed by hydroelectric plans involving water abstraction. Traditional and tourist use of freshwaters can also lead to a reduction in freshwater lichen diversity if silting and nitrate-phosphate levels are increased. A generalized habitat protection is a prudent approach that may compensate for poor floristic and taxonomic knowledge, especially in protected areas.

Paneveggio-Pale di San Martino Natural Park

The Paneveggio-Pale di San Martino Natural Park is a typical Alpine protected area extended over a surface area of 20,000 Ha. Its territory is heterogeneous both in terms of climate (continental in the north part and sub-oceanic in the south) and substrate (carbonatic rocks in the eastern part and siliceous rocks in the western part). These features create a high plant and lichen diversity. Festi & Prosser (2000) published a checklist of 1,484 vascular plants, while Nascimbene & Caniglia (2003a) listed 526 lichens, to which 60 new species have been added by this paper (total 586). The mean ratio lichens/vascular plants is 0.39, but in several habitats the number of lichens greatly exceeds that of vascular plants (Nascimbene, 2005a). The lichen flora of Paneveggio represents 45% of the lichen flora of Trentino-Alto Adige and 31.5% of that of the Italian Alps. This stresses the importance of lichens to the total biodiversity of Alpine environments, and the importance of further targeted conservation measures. Despite the fact that several lichen surveys have been conducted over a period of two centuries, the knowledge of the lichen flora of this park is probably far from complete. A realistic estimate is probably that the total number of lichens and lichenicolous fungi exceeds 900 species. The Paneveggio area, investigated since the days of F. Arnold, may be considered one of the lichen-richest areas with a boreal vegetation in the Alps.

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