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The bryophyte flora of the city of Trento (North Italy)

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Abstract – The bryophyte flora of Trento has been studied based on an extensive sampling. To standardize the harvesting, the city has been divided into 5 zones and 12 habitats, depending on the human impact, the substratum nature and moisture state. At least 10 samples of 20 × 20 cm have been collected in all available habitats in each zone. As a result, 136 taxa have been recorded, 12 of which were liverworts and 124 were mosses. This is the richest Italian town to date and one of the most diverse, showing an important number of new regional and national records and some remarkable threatened species. The best represented families are 6 (Pottiaceae, Brachytheciaceae, Grimmiaceae, Amblystegiaceae, Orthotrichaceae, Bryaceae and Hypnaceae) and those with only one species are 21 (comprising mosses and liverworts). Some of the species found in Trento are frequent in urban environments, but most of them are uncommon in such environments. This outstanding bryophyte flora can be due to the climatic conditions of Trento and to the presence of numerous microhabitats that are suitable for these cryptogams.

Urban bryophytes / European towns / mosses / liverworts

INTRODUCTION

The urban environment is characterized by a number of features (relatively dry microclimate, presence of pollutants, high nutrient richness) that make it hostile and somewhat selective for most bryophytes (Heras & Soria, 1990; Sukkop & Wurzel, 2003). However, some of these plants show ability to colonize urban areas worldwide. Most of these bryophytes often present a life strategy typical of colonists with a short life span and a high reproductive effort, both in asexual and sexual diaspore production (During, 1979). They are mostly basophilous, nitrophilous, photophilous, and largely tolerant to salts and pollutants (Gilbert, 1970; Soria & Ron, 1995). For these and other reasons, the urban bryophyte flora is interesting, since it gives us much information on the town environmental conditions and on the biological potentiality of some bryophytes species.

Several studies on Italian urban bryophytes are available. Some of them pay attention to the impact of these plants on monumental buildings (Dia & Not, 1991; Lo Giudice & Polizzi, 1997; Lo Giudice & Cristaudo, 1998; Lo Giudice *et al*., 1998). Others deal with biomonitoring (Aleffi *et al*., 1995; Gerdol *et al*., 2002; Adamo *et al*., 2003; Giordano *et al*., 2004; Gueli *et al*., 2004). Finally, a few focus

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on the bryophyte inventory in different towns (Carcano, 1989; Cortini-Pedrotti, 1989; Aleffi, 1991; Lo Giudice, 1992; Aleffi & Taruschio, 1996; Lo Giudice *et al*., 1997; Dia *et al*., 2002). But none of these studies is located in the north of this country.

This work is aimed at increasing the existing knowledge on urban Italian and southern European bryophytes, and at contributing to a better understanding of the biology of these organisms.

STUDY AREA

Trento is the main city of the Trentino-Alto Adige autonomous region. It is sited at the junction of the Adige and Salè rivers (46º 04' N, 1º 20' E) at a mean altitude of 194 m in the Italian Alps. The whole municipality area covers ca 158 km^2 and has more than 100000 inhabitants. Available standardized data from the Meteorological Station of Trento (Gafta & Pedrotti, 1998) show an annual mean precipitation of 948 mm, with a main maximum in October-November (*ca* 100 mm), a secondary one in May-June (*ca* 90 mm) and a minimum in January (*ca* 40 mm). The mean of the lowest monthly temperatures is –2.8ºC and that of the highest monthly temperatures is 29.6ºC. The coldest month is January and the hottest is July. According to Gafta & Pedrotti (1998), Trento belongs to the moderate temperate lower subhumid prealpic subcontinental phytoclimatic unit. The potential vegetation is constituted of *Fraxino orni-Ostryon* forests, excepted Gocciadoro area where *Carpinion* forests are expected to grow.

METHODOLOGY

Sampling procedures are based on precedent works carried out in several European towns (Ron *et al*., 1987; Lara *et al*., 1991; Lo Giudice *et al*., 1997) in order to allow some interesting comparisons with them.

The core area of Trento, approximately 450 ha, has been studied (Fig. 1). This area has been divided into 5 zones mainly according to the variation of the human use.

Zone 1. **Old town** (16 ha): the city centre, that has a typical medieval structure with numerous monumental buildings. Here the traffic is restricted and just a few green areas can be found.

Zone 2. **Modern town** (415 ha). This comprises the remaining built-up area where commercial, business and residential districts get together. In this zone the traffic is not limited at all and trees are quite common along the streets.

Zone 3. **Inner parks** (11 ha). This zone corresponds to green areas (public gardens and parks) found in the modern town.

Zone 4. **Outer park** (6 ha): the forest garden (Gocciadoro Park) in the surroundings of Trento. Its geomorphological features and environmental conditions (like its remarkable humidity) make this public garden ecologically different from other green areas in the town.

Zone 5. **Riverside** (2 ha). Bed of the main river (Adige River). Samples have been taken off only in the left bank, by Via Giacomo Leopardi.

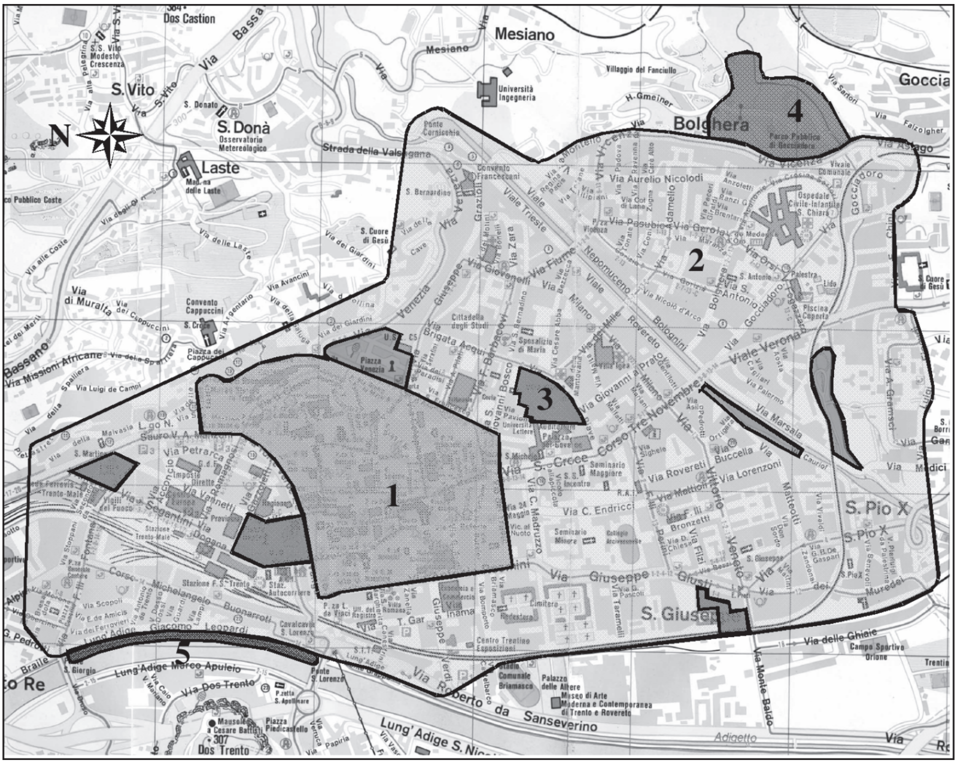

Fig. 1. Study area with differentiation into sampling zones (**1**, old town; **2**, modern town; **3**, inner parks; **4**, outer park; **5**, riverside) based on differential human use.

At least 10 samples of 20 × 20 cm were gathered in each habitat found in the previously described zones. Based on the classification proposed by Ron *et al.* (1987), 12 habitats, grouped in 4 main types, have been recognized in the studied area:
Rheophilic: a) bed of the Adige River.
Rupestrian and chasmophytic: a) concrete and mortar, b) tiles and bricks, c) wet limestone (e.g., tuffs, fountains and ponds), d) dry limestone, e) shaded volcanic rock and f) sunny volcanic rock. Sampled volcanic rocks from the Gocciadoro Park are all of acidic type, and correspond to andesites, dacites and rhyodacites.
Terrestrian: a) sunny dry soil, b) shaded humid soil (e.g. lawns) and c) nitrified soil.
Epiphytic: a) tree bases (< 50 cm high) and b) tree trunks (> 50 cm high).
The field work was carried out in summer 2000 and 2001 and 339 samples were collected.

BRYOPHYTE CATALOGUE

The bryophytes found in the study area are listed, giving, for each of them, information on the city zone where they lived and the habitat where they were growing.

Taxa are ordered alphabetically. Nomenclature of liverworts follows Grolle & Long (2000); that of mosses follows Cortini-Pedrotti (2001), excepted *Bryum laevifilum* Syed (Hodgetts, 2001), *Dialytrichia mucronata* (Brid.) Broth. (Zander, 1993), *Neckera besseri* (Lobarz.) Jur. (Casas, 1999) and the genera *Syntrichia* Brid. (Gallego, 2002) and *Schistidium* Bruch & Schimp. (Blom, 1996). Nomenclature of phorophytes follows Pignatti (1982). Authors' names are abbreviated according to Brummitt & Powell (1992).

National records are remarked with ** and regional records with *. Taxa known from less than three towns in Europe are also commented.

Voucher specimens are kept at the Herbarium of the Laboratory of Bryology, Universidad Autónoma de Madrid.

HEPATICAE

***Conocephalum conicum* (L.) Dumort. –** Old town, modern town, outer park and riverside. – Riverbank, wet limestone, sunny dry soil and shaded humid soil.

***Frullania dilatata* (L.) Dumort. –** Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, sunny volcanic rock, shaded humid soil, tree base (*Aesculus hippocastanum* L.) and tree trunk (*Acer negundo* L., *A. pseudoplatanus* L., *Ailanthus altissima* (Mill.) Swingle, *Prunus cerasifera* Ehrh. var. *pissardii* (Carrière) L. H. Bailey, *Quercus petraea* (Matt.) Liebl. and *Tilia americana L.*).

***Jungermannia leiantha* Grolle** – Outer park. – Wet limestone, shaded volcanic rock, shaded humid soil and tree base (*Tilia americana*). Previously recorded in Berlin (Schaepe, 1986).

***Lejeunea cavifolia* (Ehrh.) Lindb.** – Outer park. – Shaded volcanic rock. Previously reported from urban areas in the surroundings of Lisbon (Sérgio & Sim-Sim, 1985).

***Lunularia cruciata* (L.) Dumort. *ex* Lindb.** – Old town and inner parks. – Shaded humid soil.

***Marchantia polymorpha* L. subsp. *ruderalis* Bischl. & Boissel.-Dub.** – Old town, modern town, inner parks and outer park. – Wet limestone, sunny dry soil, shaded humid soil, nitrified soil and tree base (*Diospyros lotus* L.).

***Metzgeria furcata* (L.) Dumort.** – Outer park. – Wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, shaded humid soil, tree base (*Aesculus hippocastanum*, *Alnus glutinosa* (L.) Gaertn., *Carpinus betulus* L., *Ostrya carpinifolia* Scop., *Platanus orientalis* L. and *Tilia americana*) and tree trunk (*Aesculus hippocastanum*, *Alnus glutinosa*, *Liriodendron tulipifera* L., *Robinia pseudoacacia* L. and *Tilia americana*).

***Pellia endiviifolia* (Dicks.) Dumort.** – Outer park and riverside. – Riverbank, wet limestone and shaded humid soil.

***Plagiochila porelloides* (Torr. *ex* Nees) Lindenb.** – Outer park. – Shaded volcanic rock and tree base (*Carpinus betulus*). Only recorded in Szczecin, Poland (Fudali, 1998).

***Porella obtusata* (Taylor) Trevis.** – Modern town, inner parks and outer park. – Wet limestone, shaded volcanic rock, shaded humid soil, tree base (*Aesculus hippocastanum*) and tree trunk (*Aesculus hippocastanum* and *Juglans regia* L.)

Besides Trento, it has only been found in Santiago de Compostela, Spain (Reinoso & Smyth, 1985).
***Porella platyphylla* (L.) Pfeiff.** – Outer park. – Dry limestone, shaded volcanic rock and tree trunk (*Aesculus hippocastanum*, *Ostrya carpinifolia* and *Tilia americana*).
***Radula complanata* (L.) Dumort.** – Old town, inner parks and outer park. – Dry limestone, shaded volcanic rock, tree base (*Aesculus hippocastanum*, *Ostrya carpinifolia* and *Tilia americana*) and tree trunk (*Ailanthus altissima* and *Tilia americana*).

MUSCI

***Amblystegium radicale* (P. Beauv.) Schimp.** – Old town, modern town and inner parks. – Wet limestone, dry limestone, shaded humid soil, tree base (*Acer negundo*, *Aesculus hippocastanum*, *Diospyros lotus*, *Platanus orientalis*, *Populus nigra* cv. *italica* and *Ulmus minor*) and tree trunk (*Tilia americana*).
***Amblystegium serpens* (Hedw.) Bruch, Schimp. & Gümbel** – Old town, modern town, inner parks, outer park and riverside. – Riverbank, concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny volcanic rock, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Acer campestre* L., *A. negundo*, *Aesculus hippocastanum*, *Diospyrus lotus*, *Ostrya carpinifolia*, *Platanus orientalis*, *Populus nigra* L. cv. *italica*, *Pyrus communis* L., *Sambucus nigra* L., *Tilia americana*, *Ulmus minor* Mill. and *Viburnum lantana* L.) and tree trunk (*Acer negundo*, *Ginkgo biloba* Kaempf. *ex* L., *Platanus orientalis*, *Robinia pseudoacacia*, *Tilia americana* and *Ulmus minor*).
***Anomodon attenuatus* (Hedw.) Huebener** – Outer park. – Concrete and mortar, wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, shaded humid soil, tree base (*Acer campestre*, *Carpinus betulus*, *Ostrya carpinifolia* and *Tilia americana*) and tree trunk (*Aesculus hippocastanum* and *Ostrya carpinifolia*).
***Anomodon viticulosus* (Hedw.) Hook. & Taylor** – Outer park. – Concrete and mortar, dry limestone, shaded volcanic rock sunny volcanic rock, shaded humid soil and tree trunk (*Aesculus hippocastanum*, *Juglans regia* and *Ostrya carpinifolia*).
***Archidium alternifolium* (Hedw.) Schimp.** – Riverside. – Riverbank. This species has previously been recorded in urban environments from Wrocław, Poland (Fudali, 1998) and Treia, Italy (Aleffi & Taruschio, 1996).
***Atrichum undulatum* (Hedw.) P. Beauv.** – Outer park. – Shaded humid soil.
****Barbula ehrenbergii* (Lorentz) M. Fleisch.** – Riverside. – Riverbank. Also reported from Granada, Spain (Esteve Chueca *et al*., 1977).
***Barbula unguiculata* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Acer negundo* and *Aesculus hippocastanum*) and tree trunk (*Acer negundo*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Robinia pseudoacacia* and *Ulmus minor*).
***Brachythecium mildeanum* (Schimp.) Schimp.** – Old town, modern town and inner parks. – Wet limestone, dry limestone, sunny dry soil and shaded humid soil.
***Brachythecium plumosum* (Hedw.) Bruch, Schimp. & Gümbel** – Inner parks and outer park. – Nitrified soil, tree base (*Carpinus betulus*) and tree trunk (*Aesculus hippocastanum*).

***Brachythecium populeum* (Hedw.) Bruch, Schimp. & Gümbel** – Inner parks and outer park. – Concrete and mortar, wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, nitrified soil, tree base (*Acer campestre*, *Aesculus hippocastanum*, *Diospyros lotus*, *Ostrya carpinifolia* and *Tilia americana*) and tree trunk (*Aesculus hippocastanum*).

***Brachythecium rivulare* Bruch, Schimp. & Gümbel** – Old town and outer park. – Wet limestone and shaded humid soil.

***Brachythecium rutabulum* (Hedw.) Bruch, Schimp. & Gümbel** – Old town, modern town, inner parks, outer park and riverside. – Riverbank, concrete and mortar, wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, sunny dry soil, shaded humid soil, nitrified soil and tree base (*Aesculus hippocastanum*, *Diospyros lotus*, *Koelreuteria paniculata* Laxm., *Pyrus communis* and *Tilia americana*).

***Brachythecium salebrosum* (F. Weber & D. Mohr) Bruch, Schimp. & Gümbel** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, shaded volcanic rock, sunny volcanic rock, shaded humid soil, tree base (*Acer campestre*, *A. negundo*, *Aesculus hippocastanum*, *Ostrya carpinifolia* and *Tilia americana*) and tree trunk (*Platanus orientalis*).

***Brachythecium velutinum* (Hedw.) Bruch, Schimp. & Gümbel** – Old town, modern town, inner parks and outer park. – Dry limestone, sunny dry soil, tree base (*Acer negundo*, *Aesculus hippocastanum*, *Platanus orientalis* and *Tilia americana*) and tree trunk (*Betula pendula* Roth and *Robinia pseudoacacia*).

***Bryoerythrophyllum recurvirostrum* (Hedw.) P. C. Chen** – Inner parks and outer park. – Dry limestone and tree trunk (*Platanus orientalis*).

***Bryum argenteum* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Acer negundo*, *Aesculus hippocastanum*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Tilia americana*, *Ulmus minor* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Betula pendula*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Tilia americana* and *Ulmus minor*).

***Bryum bicolor* Dicks.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, dry limestone, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Acer negundo*) and tree trunk (*Pyrus communis*).

***Bryum capillare* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, shaded humid soil and nitrified soil.

***Bryum imbricatum* (Schwägr.) Bruch & Schimp.** – Old town. – Concrete and mortar.

***Bryum laevifilum* Syed** – Old town, modern town and inner parks. – Concrete and mortar, dry limestone, shaded volcanic rock, sunny volcanic rock, sunny dry soil, nitrified soil, tree base (*Acer campestre*, *A. negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Alnus glutinosa*, *Diospyros lotus*, *Ostrya carpinifolia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Pyrus communis*, *Tilia americana* and *Ulmus minor*) and tree trunk (*Acer negundo*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Alnus glutinosa*, *Juglans regia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Quercus petraea*, *Robinia pseudoacacia*, *Tilia americana* and *Ulmus minor*).

***Bryum pseudotriquetrum* (Hedw.) P. Gaertn., B. Mey. & Scherb.** – Riverside. – Riverbank.

***Bryum radiculosum* Brid.** – Old town, modern town and inner parks. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny dry soil, shaded humid soil, nitrified soil and tree base (*Aesculus hippocastanum*).
***Bryum rubens* Mitt.** – Old town, inner parks. – Concrete and mortar and shaded humid soil.
***Bryum weigelii* Spreng.** – Riverside. – Riverbank. Previously reported from urban environment in Szczecin, Poland (Fudali, 1998).
***Calliergonella cuspidata* (Hedw.) Loeske** – Modern town and outer park. – Dry limestone and shaded humid soil.
***Calliergonella lindbergii* (Mitt.) Hedenäs** – Outer park. – Concrete and mortar.
***Campyliadelphus chrysophyllus* (Brid.) Kanda** – Old town. – Concrete and mortar.
***Campylophyllum calcareum* (Crundw. & Nyholm) Hedenäs** – Outer park. – Wet limestone.
***Ceratodon purpureus* (Hedw.) Brid.** – Old town and modern town. – Concrete and mortar, sunny dry soil, shaded humid soil, tree base (*Tilia americana*) and tree trunk (*Tilia americana*).
***Cinclidotus riparius* (Brid.) Arn.** – Riverside. – Riverbank. Besides Trento, this reophilic moss has only been found in Vienna, Austria (Hohenwallner, 2000).
***Cirriphyllum tommasinii* (Sendtn. *ex* Boulay) Grout –** Modern town and inner parks. – Dry limestone, nitrified soil and tree base (*Platanus orientalis*). It has been also found in Kraków, Poland (Fudali, 1998).
***Cratoneuron filicinum* (Hedw.) Spruce** – Old town, inner parks, outer park and riverside. – Riverbank, concrete and mortar, wet limestone, shaded humid soil and nitrified soil.
***Ctenidium molluscum* (Hedw.) Mitt.** – Outer park. – Tree base (*Carpinus betulus* and *Tilia americana*).
***Cynodontium polycarpon* (Hedw.) Schimp.** – Outer park. – Sunny volcanic rock and tree trunk (*Quercus petraea*). Previously found in Bolesławiec, Poland (Fudali, 1998).
***Dialytrichia mucronata* (Brid.) Broth.** – Outer park. – Sunny volcanic rock. Previously reported from the surroundings of Lisbon, (Sérgio & Sim-Sim, 1985).
***Dicranella schreberiana* (Hedw.) Dixon** – Outer park. – Shaded humid soil.
***Dicranella varia* (Hedw.) Schimp.** – Old town, modern town, inner parks and outer park. – Shaded humid soil and nitrified soil.
***Didymodon acutus* (Brid.) K. Saito** – Inner parks. – Shaded humid soil.
***Didymodon fallax* (Hedw.) R. H. Zander** – Old town. – Wet limestone.
***Didymodon luridus* Hornsch. –** Old town, inner parks and riverside. – Riverbank, concrete and mortar, tiles and bricks, wet limestone, dry limestone, shaded humid soil and nitrified soil.
***Didymodon rigidulus* Hedw.** – Old town, modern town, inner parks, outer park and riverside. – Riverbank, concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny volcanic rock, sunny dry soil, shaded humid soil, nitrified soil and tree base (*Acer negundo*, *Diospyros lotus*, *Ulmus minor* and *Viburnum lantana*).
***Didymodon tophaceus* (Brid.) Lisa** – Old town and modern town. – Wet limestone and sunny dry soil.
***Didymodon vinealis* (Brid.) R. H. Zander** – Inner parks. – Shaded humid soil.
***Encalypta streptocarpa* Hedw.** – Old town and outer park. – Concrete and mortar, dry limestone and shaded volcanic rock.
***Eucladium verticillatum* (Brid.) Bruch, Schimp. & Gümbel** – Old town and outer park. – Wet limestone.

***Eurhynchium crassinervium* (Wilson) Schimp.** – Outer park. – Concrete and mortar, wet limestone, shaded volcanic rock and tree base (*Platanus orientalis*).
***Eurhynchium hians* (Hedw.) Sande Lac.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, wet limestone, dry limestone, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Diospyros lotus*, *Populus nigra* cv. *italica*, *Pyrus communis* y *Tilia americana*) and tree trunk (*Acer negundo*).
***Fabronia ciliaris* (Brid.) Brid.** – Outer park. – Dry limestone, sunny volcanic rock and tree base (*Acer campestre*). Not previously recorded in urban environments.
***Fabronia pusilla* Raddi** – Old town, modern town and outer park. – Sunny volcanic rock and tree trunk (*Ailanthus altissima* and *Tilia americana*).
***Fissidens crassipes* Wilson** – Old town, inner parks and outer park. – Wet limestone.
***Fissidens dubius* P. Beauv.** – Outer park. – Wet limestone, shaded volcanic rock and shaded humid soil.
Fissidens taxifolius* Hedw. subsp. *taxifolius – Outer park and riverside. – Riverbank, dry limestone and shaded humid soil.
***Funaria hygrometrica* Hedw.** – Old town, modern town and inner parks. – Wet limestone, sunny dry soil, shaded humid soil and nitrified soil.
***Grimmia hartmanii* Schimp.** – Outer park. – Sunny volcanic rock. Previously recorded in Berlin, (Shaepe, 1986) and Gdynia, (Fudali, 1998).
***Grimmia laevigata* (Brid.) Brid.** – Outer park. – Sunny volcanic rock. Previously recorded in Ávila and Madrid (Ron *et al*, 1987).
***Grimmia lisae* De Not.** – Outer park. – Sunny volcanic rock. Not previously recorded in European towns. However, this could be due to confusion with *G. trichophylla*.
***Grimmia ovalis* (Hedw.) Lindb.** – Inner parks and outer park. – Concrete and mortar and sunny volcanic rock.
***Grimmia pulvinata* (Hedw.) Sm.** – Old town, modern town and inner parks. – Concrete and mortar, tiles and bricks, dry limestone and tree trunk (*Acer negundo*, *Ailanthus altissima* and *Platanus orientalis*).
***Habrodon perpusillus* (De Not.) Lindb.** – Old town. – Tree base (*Ginkgo biloba* and *Koelreuteria paniculata*). Previously recorded in Vitoria (Heras & Soria, 1990).
***Hedwigia ciliata* (Hedw.) P. Beauv.** – Old town, modern town, inner parks and outer park. – Dry limestone, sunny volcanic rock, nitrified soil, tree base (*Aesculus hippocastanum*) and tree trunk (*Acer negundo*, *Ailanthus altissima*, *Platanus orientalis* and *Prunus cerasifera* var. *pissardii*).
***Homalothecium sericeum* (Hedw.) Bruch, Schimp. & Gümbel** – Modern town, inner parks and outer park. – Concrete and mortar, dry limestone, sunny volcanic rock, tree base (*Acer campestre* and *Ostrya carpinifolia*) and tree trunk (*Acer negundo*).
***Hygroamblystegium fluviatile* (Hedw.) Loeske** – Riverside. – Riverbank.
***Hygroamblystegium tenax* (Hedw.) Jenn.** – Old town, modern town and inner parks. – Wet limestone and shaded humid soil.
***Hygrohypnum luridum* (Hedw.) Jenn.** – Outer park. – With sporophytes on dry limestone by the Salè Stream.
***Hypnum cupressiforme* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, tree base (*Acer campestre*, *Aesculus hippocastanum*, *Alnus glutinosa*, *Ostrya carpinifolia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Pyrus communis* and *Tilia americana*) and tree trunk (*Aesculus hippocastanum*, *Liriodendron tulipifera*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Quercus petraea* and *Tilia americana*).

***Hypnum resupinatum* Taylor** – Old town, modern town, inner parks and outer park. – Concrete and mortar, shaded humid soil, tree base (*Acer negundo*, *Aesculus hippocastanum*, *Diospyros lotus*, *Ostrya carpinifolia*, *Platanus orientalis*, *Sambucus nigra*, *Tilia americana* and *Ulmus nigra*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Ginkgo biloba*, *Juglans regia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Robinia pseudoacacia*, *Tilia americana* and *Ulmus nigra*). Previously recorded in Jesi, Italy (Aleffi, 1991).

***Leptodictyum riparium* (Hedw.) Warnst.** – Old town, inner parks and riverside. – Riverbank and wet limestone.

***Leskea polycarpa* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, sunny volcanic rock, shaded humid soil, nitrified soil, tree base (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Diospyros lotus*, *Ostrya carpinifolia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Sambucus nigra* and *Ulmus minor*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ginkgo biloba*, *Juglans regia*, *Platanus orientalis*, *Robinia pseudoacacia* and *Tilia americana*).

***Leucodon sciuroides* (Hedw.) Schwägr.** – Modern town and outer park. – Dry limestone and tree trunk (*Aesculus hippocastanum*, *Juglans regia* and *Ostrya carpinifolia*).

***Mnium stellare* Hedw.** – Outer park. – Wet limestone.

***Neckera besseri* (Lobarz.) Jur.** – Outer park. – Dry limestone, shaded volcanic rock, sunny volcanic rock and tree trunk (*Aesculus hippocastanum*, *Juglans regia*, *Ostrya carpinifolia* and *Tilia americana*). Previously recorded in Kraków (Fudali, 1998).

***Orthotrichum affine* Brid.** – Old town, modern town, inner parks and outer park. – Tree base (*Aesculus hippocastanum*, *Diospyros lotus* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *Ailanthus altissima*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii* and *Robinia pseudoacacia*).

***Orthotrichum anomalum* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, wet limestone, dry limestone, sunny volcanic rock, sunny dry soil, nitrified soil, tree base (*Sambucus nigra*) and tree trunk (*Acer negundo* and *Platanus orientalis*).

***Orthotrichum cupulatum* Brid.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone and sunny volcanic rock.

***Orthotrichum diaphanum* Brid.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, sunny dry soil, shaded humid soil, nitrified soil, tree base (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Diospyros lotus*, *Ginkgo biloba*, *Koelreuteria paniculata*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Tilia americana*, *Ulmus minor* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Betula pendula*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Sambucus nigra*, *Tilia americana* and *Ulmus minor*).

***Orthotrichum lyellii* Hook. & Taylor** – Modern town, outer park. – Tree trunk (*Populus nigra* cv. *italica* and *Robinia pseudoacacia*).

***Orthotrichum obtusifolium* Brid.** – Old town, modern town and inner parks. – Dry limestone, tree base (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Sambucus nigra*, *Tilia americana* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus*

hippocastanum, *Ailanthus altissima*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Tilia americana* and *Ulmus minor*).
***Orthotrichum rupestre* Schleich. *ex* Schwägr.** – Old town, inner parks and outer park. – Sunny volcanic rock and tree trunk (*Acer negundo* and *Ailanthus altissima*).
***Orthotrichum scanicum* Grönvall –** Old town. – Tree trunk (*Tilia americana*). Also found in the city of Szczecin, Poland (Fudali, 1998).
***Orthotrichum schimperi* Hammar** – Old town, modern town and inner parks. – Concrete and mortar, tiles and bricks, dry limestone, shaded humid soil, tree base (*Aesculus hippocastanum*, *Ginkgo biloba*, *Platanus orientalis*, *Tilia americana* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Betula pendula*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Sambucus nigra*, *Tilia americana* and *Ulmus nigra*).
***Orthotrichum speciosum* Nees *in* Sturm** – Old town, modern town and inner parks. – Tree base (*Populus nigra* cv. *italica*) and tree trunk (*Ailanthus altissima*, *Acer negundo*, *Aesculus hippocastanum*, *Betula pendula* and *Populus nigra* cv. *italica*).
***Orthotrichum striatum* Hedw.** – Old town. – Tree trunk (*Ailanthus altissima*).
***Palustriella commutata* (Hedw.) Ochyra** – Old town. – Wet limestone.
***Phascum cuspidatum* Hedw. –** Modern town. – Shaded humid soil.
***Philonotis arnellii* Husn. –** Riverside. – Riverbank. Not previously recorded in urban environments.
***Physcomitrium pyriforme* (Hedw.) Brid.** – Old town and modern town. – Shaded humid soil.
***Plagiomnium cuspidatum* (Hedw.) T. J. Kop.** – Old town, modern town, inner parks, outer park and riverside. – Riverbank, concrete and mortar, wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock, shaded humid soil, tree base (*Acer campestre*, *Aesculus hippocastanum*, *Alnus glutinosa*, *Koelreuteria paniculata*, *Ostrya carpinifolia*, *Platanus orientalis* and *Sambucus nigra*) and tree trunk (*Robinia pseudoacacia*).
***Plagiomnium rostratum* (Schrad.) T. J. Kop.** – Outer park, riverside. – Riverbank, concrete and mortar, wet limestone, dry limestone, shaded humid soil and tree base (*Tilia americana*).
***Plagiomnium undulatum* (Hedw.) T. J. Kop.** – Outer park and riverside. – Riverbank and shaded humid soil.
***Plagiothecium cavifolium* (Brid.) Z. Iwats.** – Outer park. – Shaded humid soil and tree base (*Carpinus betulus*).
***Platygyrium repens* (Brid.) Bruch, Schimp. & Gümbel** – Outer park. – Tree base (*Alnus glutinosa*) and tree trunk (*Aesculus hippocastanum* and *Quercus petraea*).
***Pohlia wahlenbergii* (F. Weber & D. Mohr) A. L. Andrews** – Modern town, outer park and riverside. – Riverbank and shaded humid soil.
***Pottia intermedia* (Turner) Fürnr.** – Old town and modern town. – Shaded humid soil and nitrified soil.
***Pseudocrossidium hornschuchianum* (Schultz) R. H. Zander** – Old town. – Shaded humid soil.
***Pseudoleskea incurvata* (Hedw.) Loeske** – Outer park. – Concrete and mortar and tree base (*Alnus glutinosa*). Only known in urban environments from Oświęcim, Poland (Fudali, 1998).
***Pseudoleskeella nervosa* (Brid.) Nyholm** – Outer park. – Concrete and mortar, dry limestone and tree trunk (*Aesculus hippocastanum* and *Tilia americana*).
***Pylaisia polyantha* (Hedw.) Schimp.** – Outer park. – Tree trunk (*Aesculus hippocastanum* and *Robinia pseudoacacia*).

***Rhynchostegium confertum* (Dicks.) Bruch, Schimp. & Gümbel** – Old town and inner parks. – Wet limestone and shaded humid soil.
***Rhynchostegium megapolitanum* (F. Weber & D. Mohr) Bruch, Schimp. & Gümbel** – Old town. – Tree base (*Ulmus minor*).
***Rhynchostegium murale* (Hedw.) Bruch, Schimp. & Gümbel** – Old town, inner parks and outer park. – Concrete and mortar, wet limestone, dry limestone and tree trunk (*Platanus orientalis*).
***Rhynchostegium riparioides* (Hedw.) C. E. O. Jensen** – Inner parks and outer park. – Wet limestone.
***Rhynchostegium rotundifolium* (Brid.) Bruch, Schimp. & Gümbel** – Old town, modern town and outer park. – Wet limestone, dry limestone, sunny dry soil and tree base (*Aesculus hippocastanum*). Not previously recorded in urban environments.
***Schistidium apocarpum* (Hedw.) Bruch & Schimp.** – Old town, inner parks and outer park. – Concrete and mortar, dry limestone, shaded volcanic rock, tree base (*Platanus orientalis*) and tree trunk (*Platanus orientalis* and *Ailanthus altissima*). In literature dealing with urban bryophytes, *S. apocarpum* references mostly include the words "complex" or "group". Most species of this genus have traditionally been included in this complex (Blom, 1996), so it is very difficult to know how common *Schistidum* species are in urban habitats.
***Schistidium crassipilum* H. H. Blom** – Modern town and inner parks. – Concrete and mortar and dry limestone. No previous records have been found for this species in other towns.
***Schistidium dupretii* (Thér.) W. A. Weber** – Inner parks. – Concrete and mortar. Not previously recorded in urban environments.
Schistidium elegantulum* H. H. Blom subsp. *elegantulum – Old town, modern town, inner parks and outer park. – Concrete and mortar, wet limestone, dry limestone, sunny volcanic rock, sunny dry soil, nitrified soil and tree base (*Acer negundo* and *Aesculus hippocastanum*). No previous records have been found for this species in other towns.
****Schistidium lancifolium* (Kindb.) H. H. Blom** – Outer park. – Sunny volcanic rock. No previous records have been found for this species in other towns.
****Schistidium pruinosum* (Wilson *ex* Schimp.) G. Roth** – Outer park. – Dry limestone. No previous bibliographic records have been found for this species in other towns.
****Schistidium pulchrum* H. H. Blom** – Modern town, inner parks and outer park. – Concrete and mortar, sunny volcanic rock and nitrified soil. No previous records have been found for this species in other towns.
***Schistidium robustum* (Nees & Hornsch.) H. H. Blom** – Old town and inner parks. – Concrete and mortar, tiles and bricks. No previous records have been found for this species in other towns.
***Syntrichia fragilis* (Taylor) Ochyra** – Old town. – Sunny dry soil. No previous records have been found for this species in other towns.
***Syntrichia laevipila* Brid.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, sunny volcanic rock, sunny dry soil, nitrified soil, tree base (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ginkgo biloba*, *Koelreuteria paniculata*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Pyrus communis*, *Sambucus nigra*, *Tilia americana* and *Ulmus minor*) and tree trunk (*Acer negundo*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Ostrya carpinifolia*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Robinia pseudoacacia* and *Tilia americana*).
***Syntrichia montana* Nees** – Old town. – Concrete and mortar.

***Syntrichia papillosa* (Wilson) Jur.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, dry limestone, shaded humid soil, nitrified soil, tree base (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Pyrus communis*, *Sambucus nigra*, *Tilia americana*, *Ulmus minor* and *Viburnum lantana*) and tree trunk (*Acer negundo*, *A. pseudoplatanus*, *Aesculus hippocastanum*, *Ailanthus altissima*, *Betula pendula*, *Ginkgo biloba*, *Platanus orientalis*, *Populus nigra* cv. *italica*, *Prunus cerasifera* var. *pissardii*, *Robinia pseudoacacia*, *Tilia americana* and *Ulmus minor*).
***Syntrichia virescens* (De Not.) Ochyra** – Old town and modern town. – Tree base (*Aesculus hippocastanum* and *Tilia americana*) and tree trunk (*Acer pseudoplatanus*).
***Taxiphyllum wissgrillii* (Garov.) Wijk & Margad.** – Outer park. – Wet limestone, dry limestone, shaded volcanic rock, sunny volcanic rock and tree base (*Ostrya carpinifolia*).
***Tortella tortuosa* (Hedw.) Limpr.** – Modern town, inner parks and outer park. – Concrete and mortar, dry limestone, shaded and sunny volcanic rock.
***Tortula cuneifolia* (Dicks.) Turner** – Old town. – Shaded humid soil.
***Tortula mucronifolia* Schwägr.** – Inner parks. – Tree base (*Sambucus nigra*) and tree trunk (*Acer negundo*). Considered as a synonym of *T. subulata*, which could explain why no previous records have been found in the bibliography dealing with urban bryophytes for this species.
***Tortula muralis* Hedw.** – Old town, modern town, inner parks and outer park. – Concrete and mortar, tiles and bricks, wet limestone, dry limestone, sunny dry soil, shaded humid soil, nitrified soil and tree trunk (*Acer negundo* and *Platanus orientalis*).
***Tortula subulata* Hedw.** – Old town, modern town and outer park. – Sunny volcanic rock and tree trunk (*Ailanthus altissima* and *Platanus orientalis*).
***Zygodon rupestris* Schimp. *ex* Lorentz** – Outer park. – Tree base (*Ostrya carpinifolia*) and tree trunk (*Aesculus hippocastanum*).

DISCUSSION

The city of Trento is remarkable for: 1. its high bryophyte richness and diversity; 2. the high presence of non-urbanicolous taxa, (*i.e.* bryophytes that very rarely colonize urban environments) some of them being very significant from a chorological point of view; and 3. the occurrence of threatened moss species that are unknown in the surrounding natural areas.

The bryophyte flora in the studied area consists of 136 species, 9% of which are liverworts, while 91% correspond to mosses. Among these bryophytes, 57% were found fertile and 59 species had sporophytes. The 12 liverworts belong to 11 families and 11 genera (Fig. 2). Only Porellaceae has 2 species in the city, while the remaining families are represented each by one species. Although in urban areas thallose liverworts usually predominate because of their higher ability to resist air pollution and drought (Gilbert, 1970), most of the liverworts found in this city are foliose. Among mosses, 7 families (Pottiaceae, Brachytheciaceae, Grimmiaceae, Amblystegiaceae, Orthotrichaceae, Bryaceae and Hypnaceae) comprise nearly the 70% of the total catalogue, whereas the remaining 19 families of mosses share more than 20%; eleven of these families are represented by only

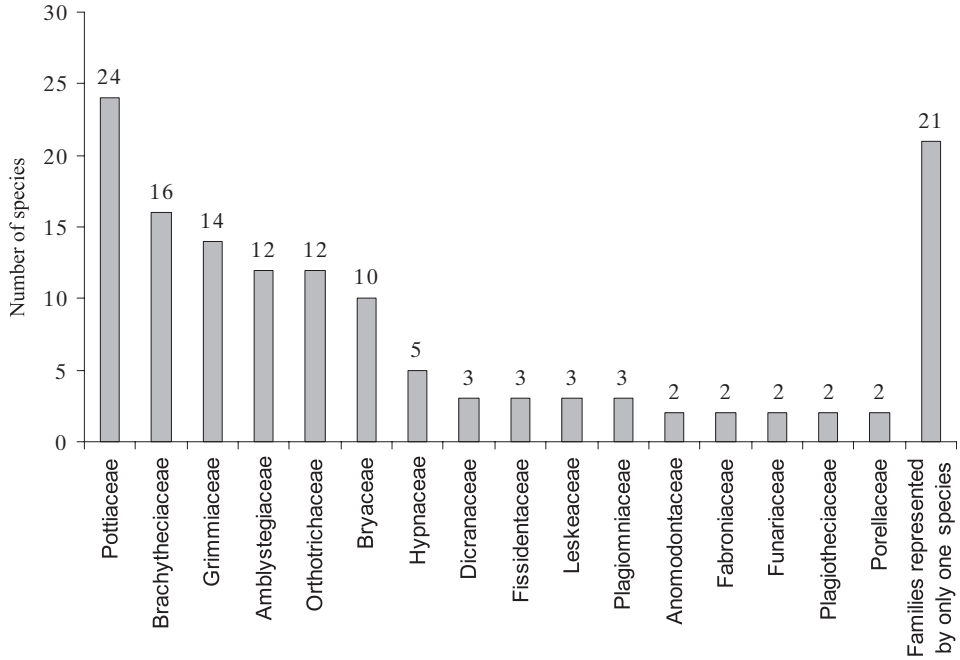

Fig. 2. Relative importance of the bryophyte families from Trento (species number indicated).

one species (Fig. 2). Like in other studied Mediterranean towns, the acrocarpous group predominates over the pleurocarpous one (Soria & Ron, 1995). The family Orthotrichaceae, consisting mainly of epiphytes very sensitive to climatic disturbances and pollution levels, is represented by 12 species in Trento.

Airborne pollutants often play a key role in urban ecosystems, since they influence the presence and distribution of plants and animals. In Trento, suspended particulate matter (PM10) and O_3 can be very abundant in certain periods of the year (mainly in winter). However SO_2, the major phytotoxicant for bryophytes in urban areas (Gilbert, 1970), is always found at low levels (data provided by the Provincial Agency for Environmental Protection [TN]). So, as the air quality of this city does not seem to be highly polluted, it is reasonable to think that its cryptogamic flora could be conditioned by other environmental factors. In fact, a previous study carried out in the city of Trento, which employed epiphytic lichens as biomonitors, pointed out that, not only the air quality, but also different microclimatic factors are determining the flora of this city and its abundance (Gottardini *et al*., 1999).

Among the Italian towns studied to date, Trento is the richest one (Fig. 3). This city doubles the taxa average in Italy and exhibits the highest number of liverworts. When compared with other Mediterranean towns (Fig. 4), Trento has the equivalent to 3 times the bryophyte flora of most Spanish towns, although there is a remarkable exception, Granada (Esteve Chueca *et al*. 1976, 1977 & 1978). This Andalusian town (S Spain) has some particular green areas that concentrate most bryophytes found there (medieval gardens that have preserved for ages many microhabitats suitable for bryophytes), while only 33 species

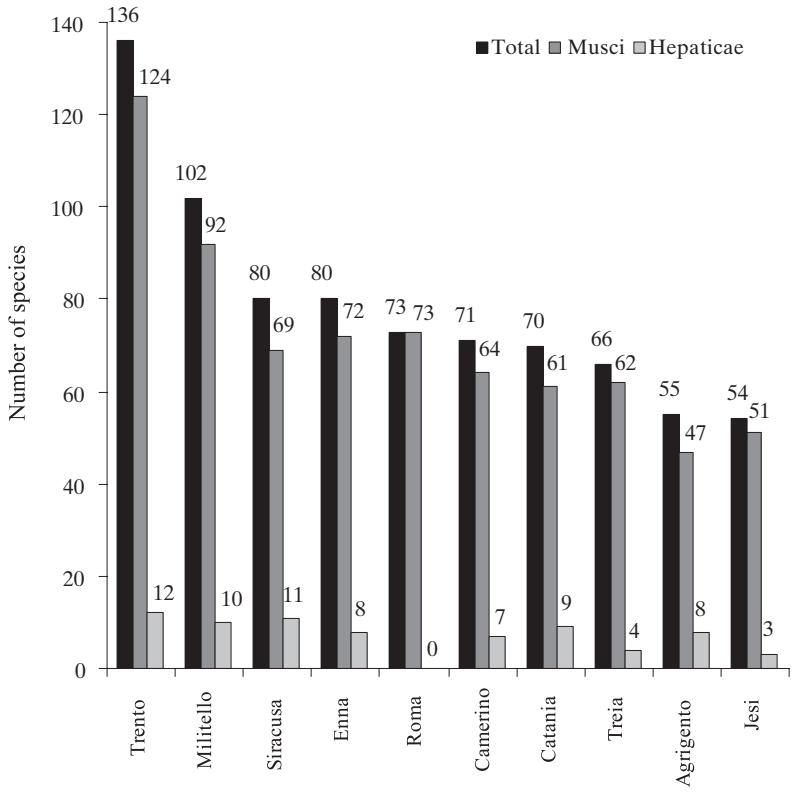

Fig. 3. Bryophyte richness in some Italian towns. Data after Aleffi, 1991 (Jesi); Aleffi & Taruschio, 1996 (Treia); Carcano, 1989 (Roma); Cortini-Pedrotti, 1989 (Camerino); Dia *et al*., 2002 (Agrigento & Siracusa); Gueli *et al*., 2004 (Militello in Val di Catania) Lo Giudice, 1992 (Catania); and Lo Giudice *et al*., 1997 (Enna).

grew in the built-up area. Oświęcim (Żarnowiec, 1996) is the only other European town with a similar richness as Trento and Granada, and presents, as well, more liverworts than expected in urban environments. The study area of this Polish town (30.3 km^2) comprises the whole town and its surroundings (including meadows and pastures nearby), but just 9 liverworts and 74 mosses grow in habitats influenced by man. Other central European towns, like Vienna or Szczecin, have a species average similar to that of the Italian ones.

When comparing the different Italian towns studied to date, it is possible to point out some chorological trends. In Sicily, the oceanic and Mediterranean floristic elements are the best represented, whereas in central Italy temperate species predominate. Most of the taxa recorded in Trento have, as in other peninsular Italian towns, a temperate distribution. However, in this town (Fig. 5), submediterranean and boreal elements are also very important and closely followed by subboreal and suboceanic elements (Düll, 1983, 1984 & 1985). The presence of these chorological elements is strongly influenced by the prevailing climatic conditions, although some elements are overrepresented because of inherent features

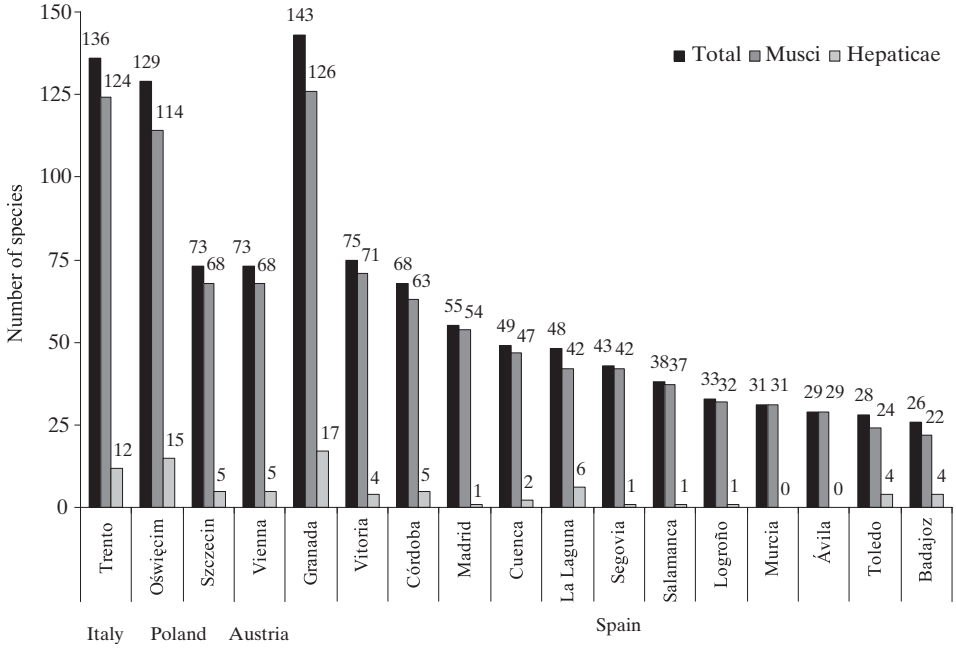

Fig. 4. Bryophyte richness in some European towns. Data after Ayuso *et al*., 1995 (Salamanca); Ballesteros Segura & Ron, 1985 (Toledo); Esteve Chueca *et al*., 1976, 1977 & 1978 (Granada); Fudali, 1994 (Szczecin); Heras & Soria, 1990 (Vitoria); Hohenwallner, 2000 (Vienna); Lara & Mazimpaka, 1989 (Segovia); Losada-Lima *et al*., 2001 (La Laguna); Mazimpaka *et al*., 1988 (Madrid); Mazimpaka *et al*., 1993 (Cuenca); Oliva Alonso, 2001 (Córdoba); Rams *et al*., 2000 (Murcia); Ron *et al*., 1987 (Ávila, Badajoz, Madrid & Toledo); Soria & Ron, 1990 (Logroño); Vicente *et al*., 1986 (Ávila); Viera Benítez & Ron Álvarez, 1986 (Badajoz); and Żarnowiec, 1996 (Oświęcim).

of urban ecosystems, like the dryer conditions – when compared to those found in the surroundings– that favour the temperate species (Sukkop & Wurzel, 2003).

The most frequent and abundant taxa in Trento are *Amblystegium serpens*, *Barbula unguiculata*, *Brachythecium rutabulum*, *Bryum argenteum*, *B. laevifilum*, *B. radiculosum*, *Didymodon rigidulus*, *Eurhynchium hians*, *Funaria hygrometrica*, *Grimmia pulvinata*, *Hypnum cupressiforme*, *H. resupinatum*, *Leskea polycarpa*, *Orthotrichum diaphanum*, *O. schimperi*, *O. obtusifolium*, *Plagiomnium cuspidatum*, *Schistidium elegantulum*, *Syntrichia laevipila*, *S. papillosa* and *Tortula muralis*. These mosses are quite well adapted to the environmental conditions of this city as they can even be found with sporophytes. Many of them have previously been considered urbanicolous (Soria & Ron, 1995) and appear in most of the studied Italian and Spanish towns. This happens with *Barbula unguiculata*, *Bryum argenteum*, *Funaria hygrometrica*, *Grimmia pulvinata*, *Orthotrichum diaphanum* and *Tortula muralis* (Soria & Ron, 1995; Lo Giudice *et al.*, 1997; Dia *et al*., 2002). Other common species, frequently found in towns from central and northern Europe, are *Amblystegium serpens*, *Brachythecium rutabulum*, *Eurhynchium hians*, *Hypnum cupressiforme* and *Syntrichia papillosa* (Fudali, 1994; Hohenwallner, 2000; Żarnowiec, 1996). However, some of these widespread

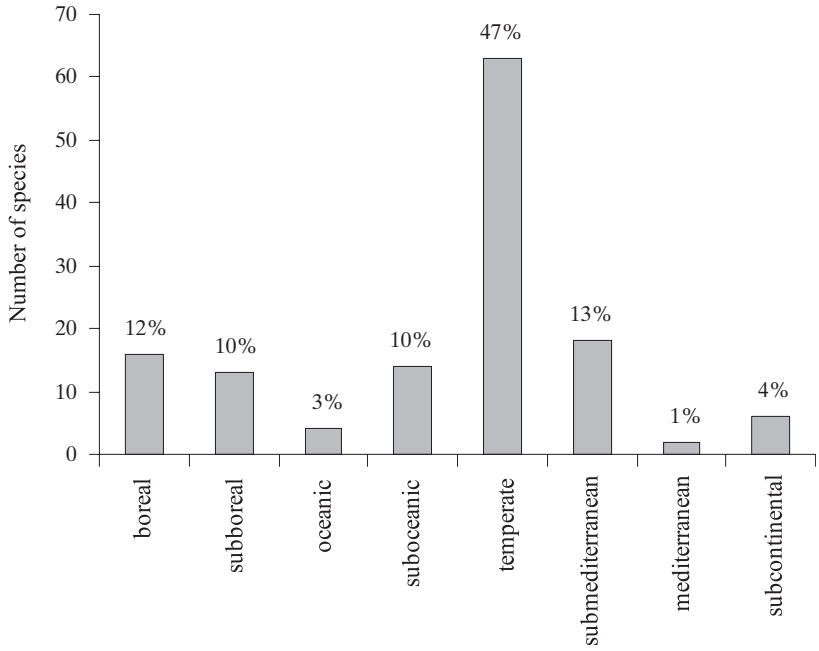

Fig. 5. Relative importance of the bryological chorological elements of Trento.

species have not been found in comparable amounts in other European towns, that is the case of *Bryum laevifilum*, *Orthotrichum obtusifolium* or *Schistidium elegantulum*, among others. But the most surprising fact is the high number of bryophytes found in Trento that do not usually grow in urban environments, or are very rarely found in them: 30 taxa, of which 12 are newly recorded in urban areas.

Several mosses found in Trento have not been recorded in the Trentino-Alto Adige region since 1950 (Cortini-Pedrotti & Aleffi, 1992). So, they could have been considered to be extinct in this Italian region. These mosses are: *Archidium alternifolium*, *Bryum bicolor*, *B. imbricatum*, *B. rubens*, *B. weigelii*, *Cynodontium polycarpon*, *Dicranella schreberiana*, *D. varia*, *Didymodon fallax*, *D. rigidulus*, *Fissidens crassipes*, *Hygroamblystegium fluviatile*, *H. tenax*, *Orthotrichum scanicum*, *O. schimperi*, *Physcomitrium pyriforme*, *Rhynchostegium rotundifolium* and *Scorpidium cossonii*. *Orthotrichum scanicum*, for instance, is included in the 2000 IUCN World Red List of Bryophytes and in the Italian Red List of Bryophytes (Cortini-Pedrotti & Aleffi, 1992). Another interesting record corresponds to *Rhynchostegium rotundifolium*, a sciophilous, neutrophilous and mesofilous species, that usually grows on stones or bark, and has been found with sporophytes in this town. In Italy it was only known from Sicily, Umbria and Friuli-Venezia Giulia (Cortini-Pedrotti, 2001). Other species considered to be threatened are *Barbula ehrenbergii*, *Bryum rubens*, *Bryum weigelii*, *Dicranella schreberiana*, *Hygrohypnum luridum*, *Neckera besseri*, *Orthotrichum obtusifolium*, *O. speciosum*, *Physcomytrium pyriforme* and *Pottia intermedia*. According to the Italian check-list (Cortini-Pedrotti, 2001), the Trentino-Alto Adige region is one of the richest in this country (80% of the Italian bryophyte flora is found there), and also one of the best studied. So, the find of 6 new regional records (*Barbula*

ehrenbergii, *Rhynchostegium megapolitanum*, *Schistidium apocarpum*, *S. elegantulum*, *S. pruinosum* and *Tortula cuneifolia*) and 2 new national records (*Schistidium lancifolium* and *S. pulchrum*; Pokorny *et al*., 2004) is very significant, even though most of these mosses belong to the recently revised *Schistidium apocarpum* complex (Blom, 1996). *Schistidium lancifolium*, for example, is a circumboreal species usually growing on acid rocks in deciduous forests. The closest known sites of this species are located in the Swiss and Austrian Alps. In Trento (Italian Alps) it grows in the outer park (forest garden with deciduous trees) on volcanic acid rocks.

CONCLUSIONS

Trento has a very remarkable bryophyte flora in the European context. Its climatic conditions and the availability of many microhabitats suitable for these cryptogams favour the species richness and taxonomical diversity. The presence of many species rare in urban environments or even threatened at a wider range is adding an extra value to its bryophyte flora.

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