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Vascular Flora of the upper Sestaione Valley (NW-Tuscany, Italy)

Abstract

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The vascular flora of the Upper Sestaione valley is here examined. The check-list reported consists of 580 species, from which 8 must be excluded (excludendae) and 27 considered doubtful. The checked flora totals 545 species: 99 of these were not found during our researches and cannot be confirmed. The actual flora consists of 446 species, 61 of these are new records for the Upper Sestaione Valley. The biological spectrum shows a clear dominance of hemicryptophytes (67.26 %) and geophytes (14.13 %); the growth form spectrum reveals the occurrence of 368 herbs, 53 woody species and 22 pteridophytes. From phytogeographical analysis it appears there is a significant prevalence of elements of the Boreal subkingdom (258 species), including the *Orohyssophyle* element (103 species). However the "linkage groups" between the Boreal subkingdom and Tethyan subkingdom are well represented (113 species). Endemics are very important from the phyto-geographical point of view: *Festuca riccerii*, exclusive to the Tuscan-Emilian Apennine and *Murbeckiella zanonii* exclusive of the Northern Apennine; *Saxifraga aspera* subsp. *etrusca* and *Globularia incanescens* are endemic to the Tuscan-Emilian Apennine and Apuan Alps whilst *Festuca violacea* subsp. *puccinellii* is endemic to the northern Apennines and Apuan Alps. The Apennine endemics total 11 species. A clear relationship with the Alpine area is evident from 13 Alpine-Apennine species. The Tuscan-Emilian Apennine marks the southern distribution limit of several alpine and northern-central European entities. Analysis of different habitats reveals a significant prevalence of grasslands (118 species) and woods (74 species), while the ecological spectrum shows a particular dominance of the grass (137 entities) and nemoral elements (74 entities). From the conservation point of view, the flora includes many species subject to L. R. 56/2000 (Tuscany); others are included in the "Directive 92/43/CEE"; according to Red-List many species are considered to be facing an extremely high risk of extinction in Tuscany.

Introduction

Floristic exploration of the Tuscan-Emilian Apennines began in the last years of the eighteenth century, thanks to the efforts of Vitman (1773), these were followed by Savi (1828) and Bertoloni (1833-1854). The collections of Parlatore (1836, 1843, 1845, 1847, 1849, 1857, 1863, 1865 and 1869), Giannini (1842-1843), Targioni-Tozzetti (1857) and Beccari (1861-1862, 1867 and 1869) all date to this period. All the information acquired up to 1870 can be found in "Prodromo della Flora Toscana" (Caruel 1860-1864) and in two subsequent supplements (Caruel 1865 and 1870). In the years following Caruel's

Prodromo, other contributions appeared in "Flora dell'Alto Serchio e della Lima" (Archbalb 1874), in "Flora del Modenese e del Reggiano" (Gibelli & Pirota 1882) and works such as "Contribuzione alla Flora Toscana" (Arcangeli 1882) and "Addenda ad Floram Etruriae" (Levier & Sommier 1891), all fundamentally important sources of information for those interested in the Flora of the Tusco-Emilian Apennines. Interest for this area is also testified by the large numbers of specimens deposited in the Herbarium Centrale (FI): the period between 1870 and the first years of the 1900's was particularly important for the collections of Levier (1868, 1873, 1875-1876, 1879-1889), Forsyth-Major (1875-1876, 1882-1883 and 1889), Bergeest (1875-1876 and 1888), Martelli (1882-1883, 1885-1887) and Sommier (1881, 1888, 1893, 1895, 1898, 1901, 1904 and 1906). The "Supplemento generale al Prodromo della Flora Toscana" (Baroni 1897-1908), further contributed to previous data derived from papers published between 1870 and 1906 and from the Tuscan Herbaria, offering a fairly complete picture of the floristic knowledge of the northern Apennines up to 1906. Between 1915 and the 1950's more expeditions to the Tuscan-Emilian Apennines were made, particularly to the Sestaione Valley, including: Fiori (1815, 1817 and 1927), Chiarugi (1935, 1938 and 1955) and Lanza (1955).

Recent contributions by Del Prete & al. (1980), Foggi & Ricceri (1988, 1989) and Ferrarini (1999) should also be remembered as well as studies on the genus *Festuca* (Foggi & Rossi 1996) and *Saxifraga* (Pignatti 1969).

Further information can be gathered from studies on the vegetation of this part of the Apennines (Barbero & Bonin 1980; Ferrarini & Alessandrini 1988; Gerdol & Tomaselli 1993). This remarkable quantity of data is further enhanced by information gained from studies on the wetlands (Provasi 1922 and 1926; Tomaselli & Gerdol 1983; Raffaelli & al. 1997), from research on the naturalised Norway Spruce (Chiarugi 1936; De Philippis & al. 1973; Giannini & Screm 1973; Ferrarini 1974 and 1977) and investigations into *Vaccinium* heaths (Sarfatti & Pedrotti 1967; Ronchieri & Mazzei 1997). Finally, mention should be made about the data derived from phyto-geographical analysis of the Tuscan-Emilian Apennines (Foggi 1989 and 1990)

Recent acquisitions in the taxonomical field have revealed the necessity of verifying and re-interpreting previous information, especially considering the important naturalist patrimony of the area. Indeed the Sestaione Valley has been included in the "Natura 2000" network as a Site of Community Importance (SCI) under the CEE 92/43 Directive and more recently inserted in paragraph "D" of the L. R. 56/2000 as one of the Sites of Regional Interest (SIR), together with the Zones of Special Protection (ZPS) "Campolino", "Abetone" and "Pian degli Ontani". Moreover, in 1972 the Orientata Campolino Nature Reserve was instituted to protect the *Picea abies* (L.) Karsten coenoses in the Upper Sestaione Valley.

Characteristics of the territory

The Upper Sestaione Valley (Fig. 1) is situated in the Tuscan-Emilian Apennines, near the Abetone Pass (1388 m) between the Tre Potenze Alps (1940 m) to the East, M. Gomito (1892 m) to the North and M. Fortezza (1691 m) and M. Poggione (1771 m) to the South. Near Ponte alla Sega (1187 m), the Sestaione Valley bends sharply south-east, joining the

Lima Valley in the locality of Ponte al Sestaione, opposite the settlement of Cutigliano.

The area under floristic study is situated at an altitude between 1220 and 1940 m of the Tre Potenze Alps, and includes the entire water basin of the Upper Sestaione Valley above Ponte alla Sega, covering a total of 758,48 ha.

Geomorphology

The study area consists almost entirely of Lower Miocene - Oligocene Macigno sandstone; the emerging strata slope gently towards the Po Valley. Thus the south facing escarpment, where the summit is visible, is steep, whilst northwards the top strata back slope displays a more gentle morphology. This is one of the rare cases where the northern slopes of the Tuscan-Emilian Apennines fall within the Tuscan administrative boundaries.

The morphology of the Upper Sestaione Valley clearly exhibits the action of quaternary glaciers with a typical glacial cirque, steep inner slopes and flat, wide plain at the bottom,

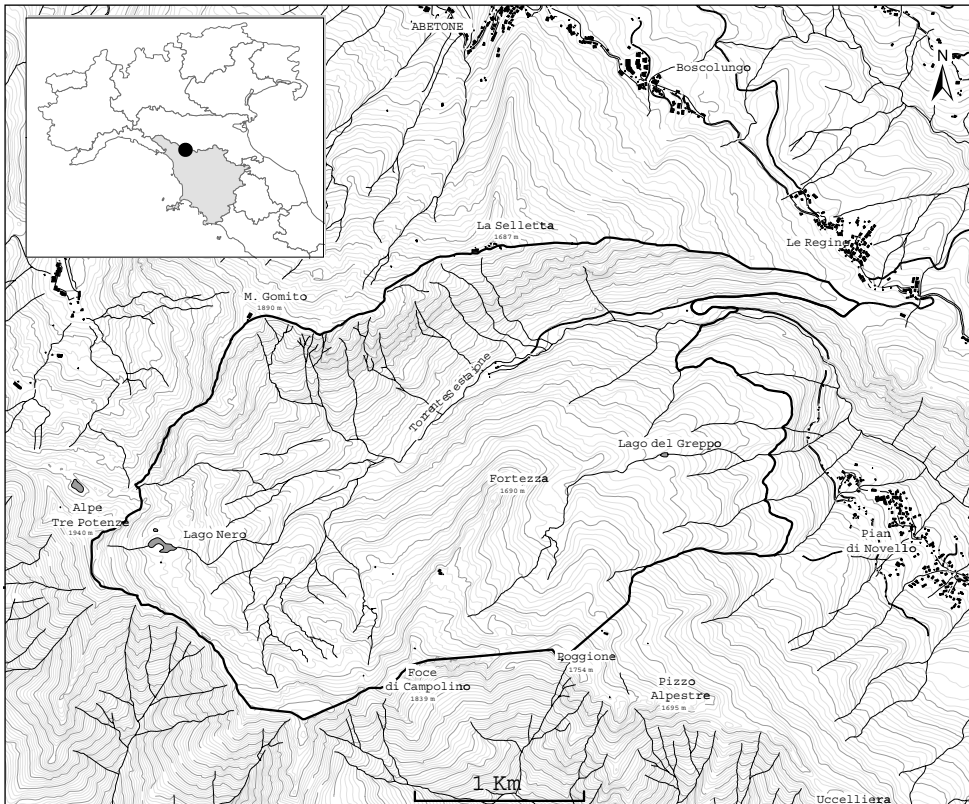


Fig. 1. The Upper Sestaione Valley situated in the Tuscan-Emilian Apennines. Scale 1: 50,000, UTM grid 1km per side.

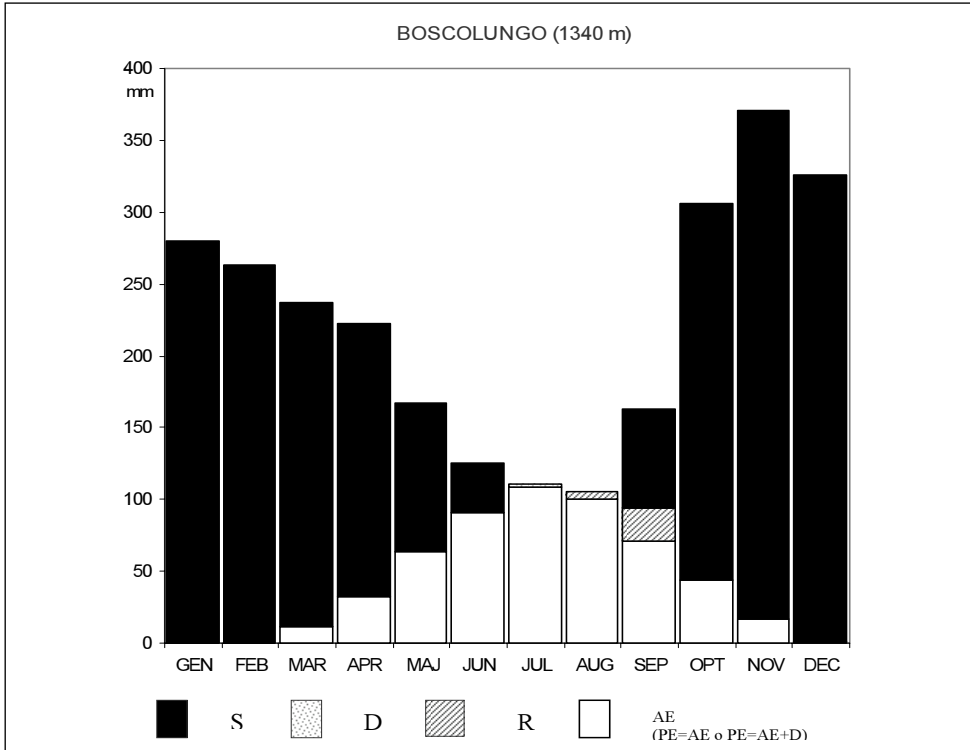


Fig.2. Water balance according to the Thornthwaite and Mather (1957) method.

morainic detritus, smoothed boulders and roches moutonnée, interspersed with depressions and kettle and kame lakes as found at Lago Nero (1742 m). The ancient glacier seems to have extended as far as Ponte alla Sega reaching a length of 3.5 km (Losacco 1982).

On the right side of the Sestaione Valley, at an altitude of 1442 m, lies Lago Greppo that according to De Stefani (1883) was caused by a landslide and so is not of true glacial origin like the majority of the other small lakes in this part of the Apennines.

Climate

The data available for classifying the climate of the Upper Sestaione Valley were taken from the thermo-pluvial Station at Boscolungo (1340 m) and consist of a series of records of the temperature registered from 1929-1955 (27 years). Rainfall is considered for the period 1929-1950 (22 years).

These data show that January is the coldest month (with a temperature of -0.9°C). Mean temperature for the hottest month (July) is 16.2°C . The annual thermic excursion is 17.1°C and the mean annual temperature 7°C .

With regard to rainfall, the wettest month is November with 382 mm, the driest July (69

mm). Mean annual rainfall is 2524 mm, with 124 rainy days.

Available data also allows the climate to be defined using the classification by Thornthwaite & Mather (1957). The climate of the Upper Sestaione Valley can be considered microthermal (C'2, PE = 541 mm), perhumid (A2, Im = 366,6), with no or only modest water deficit in summer (r, Ia = 1.8), with a summer concentration of thermal efficiency equal to 55.8% (b'3). Thus the climatic formula is: C'2 A2 r b'3.

A diagram of the water balance, calculated using the methods of Thornthwaite & Mather (1957) is given in Fig. 2.

Habitat

The study area comprises a wealth of habitats. Indeed there are two vegetation belt (sensu Chiarugi, 1939), the mountain belt of mesophytic broad-leaf forest and the hypsophilous or cacuminal belt, within which well evolved vegetation types and secondary vegetation can be recognised. As well as the climactic vegetation, other azonal types of vegetation must also be considered, such as those pertaining to rocks and cliffs, gravel beds and wetlands.

Woods

The woods cover even the steepest slopes up to an altitude of 1750-1800 m. The forest vegetation mainly consists of mixed Silver Fir and Beech woods where a few other species grow such as *Sorbus aucuparia* L., *Acer pseudoplatanus* L. and *Laburnum alpinum* (Miller) Berchtold & Presl. Above the beech woods on the north-east slopes of M. Campolino and M. Poggione stretch a relict coenosis of Norwegian Spruce (*Picea abies* (L.) Karsten). The floristic component accompanying the Norwegian Spruce consists of the same species that grow in the myrtle heathlands with *Vaccinium myrtillus* L., *Juniperus communis* L. subsp. *nana* (Willd.) Syme and *Lycopodium annotinum* L.

Riparian Woods

The water courses are flanked with coenoses dominated by Grey Alder (*Alnus incana* (L.) Moench), often with Beech.

Megaforbs

At the edges of the woods and in the water openings within the woods often grow consortiums of megaforbs where the most common species are *Imperatoria ostruthium* L., *Doronicum austriacum* Jacq., *Petasites albus* (L.) Gaertner, *Festuca gigantea* (L.) Vill., *Gentiana asclepiadea* L., *Stachys sylvatica* L., *Veratrum lobelianum* Bernh., *Rubus hirtus* Waldst. & Kit, *Rubus idaeus* L. and *Sambucus racemosa* L.

Fringe Vegetation

This term embraces all the typically ecotonal habitats such as the margins of woods,

edges of paths, grassy glades. The vegetation types found in these habitats are dominated by herbaceous plants needing much light and nutritive substances, such as *Fragaria vesca* L., *Silene dioica* (L.) Clairv. and *Ajuga reptans* L.

Heathland

Heathlands mainly occur along the northern slopes of M. Poggione and M. Campolino and on the eastern slope of the Tre Potenze Alps and La Fariola. In areas at higher altitude, on the steep slopes and surface layers, grow alpine heathlands that can be referred to the *Empetro-Vaccinietum gaultherioidis* Br.- Bl. 1926 (Ferrari & Piccoli 1997) association, with *Empetrum hermaphroditum* Hagerup, *Diphasiastrum alpinum* (L.) Rothm., *Lycopodium annotinum* L., *Lycopodium clavatum* L. At lower altitudes, on the more gentle slopes and in the areas where soil has accumulated, the heaths are dominated by *Vaccinium myrtillus* L., *Vaccinium gaultherioides* Bigelow and *Hypericum richeri* Viv. and can be attributed to *Hyperico richeri-Vaccinietum gaultherioidis* Pirola & Corbetta 1971 em. Ferrari & Piccoli 1994.

Grasslands

There are two main types of meadows: high altitude meadows, growing at over 1800 m, found on the crests that derive from degradation of the *Vaccinium* heaths, or, usually 1700 m, from beech woods. The high altitude meadows are characterised by species of *Caricetea curvulae* and can be referred to the *Sileno-Trifolietum alpini* Tomaselli & Rossi 1994 association. In stations where the snow accumulates and the soils tend to be rich in nutrients and humidity, compact meadow coenosis develop that can be ascribed to *Trifolio thalii-Festucetum puccinellii* Tomaselli & Rossi 2001. The secondary meadows are less heterogenous and in general are dominated by mat grass: these formations derive from the degradation of the heathland by over-grazing. The nardurus grasslands merit preservation at priority level, under EEC Directive 92/43.

Snow bed vegetation

The snow beds occur where geomorphological conditions favour snow to accumulate on the ground for most of the year, for example near the M. Campolino. The vegetation is characterised by small herbaceous plants with the prevalence of *Omalotheca supina* (L.) DC., *Euphrasia minima* Jacq. ex DC. in Lam. & DC., *Sagina saginoides* (L.) Karsten and *Sedum alpestre* Vill. From the phyto-sociological point of view, the nival valleys of the Upper Sestaione Valley can be considered as belonging to *Oligotricho-Gnaphalietum supini* Tomaselli 1991.

Rock vegetation

Rocky cliffs mostly occur between Fortezza and the M. Campolino and on the southeastern slopes, between Denti della Vecchia and La Selletta. The most common rock-loving species are *Globularia incanescens* Viv., *Draba aizoides* L., *Saxifraga paniculata*

Miller, *Saxifraga exarata* Vill. s. l., *Asperula aristata* L. subsp. *oreophila* (Briq.) Hayek, *Silene saxifraga* L., in the sunny stations and *Asplenium viride* Hudson and *Cystopteris fragilis* (L.) Bernh. in Schrader in the shadier stations.

Ledge vegetation

The rocky cliffs are often interrupted by ledges; between Fortezza and the M. Campolino, in the ledges exposed north-east, grow *Pulsatilla alpina* (L.) Delarbre subsp. *millefoliata* (Bertol.) D. M. Moser, *Aquilegia alpina* L., *Scabiosa lucida* Vill. and *Gentiana purpurea* L., whilst the south-facing exposed to the south of Denti della Vecchia, La Fariola and M. Gomito shelter *Genista radiata* (L.) Scop., *Juniperus communis* L. subsp. *nana* (Willd.) Syme, *Brachypodium genuense* (DC.) Roemer & Schultes and *Cerastium arvense* L. subsp. *suffruticosum* (L.) Nym.

Vegetation of stony fields and screes

The stony fields at the base of the rock walls of M. Poggione, M. Campolino and Fortezza are often colonized by *Cryptogramma crista* (L.) R. Br., associated with *Dryopteris affinis* (Lowe) Fraser-Jenkins subsp. *borreri* (Newman) Fraser-Jenkins, *Dryopteris expansa* (C. Presl) Fraser-Jenkins & Jermy, *Dryopteris oreades* Fomin, *Phegopteris connectilis* (Michx) Watt and *Polystichum lonchitis* (L.) Roth, whilst on finer detritus the dominating species is *Rumex scutatus* L., accompanied with *Senecio rupestris* Waldst. & Kit., *Alchemilla saxatilis* Buser and *Hypochoeris robertia* Fiori.

Wetland Vegetation (peatbogs and temporary ponds, streams and small lakes)

This is a highly heterogenous habitat composed of several microhabitats with areas of sphagnum bog, sedge beds, station tending to hygrophyl, mountain streams etc. True peat bogs grow by the Lago Greppo, at "Le Bruciate", "Le Lamace" and between Foce di Campolino and Lago Nero. These are flat lowlands characterised by the presence of several species of *Sphagnum* (Raffaelli & al., 1997) on which *Carex nigra* (L.) Reichard, *Pinguicula vulgaris* L., *Eriophorum latifolium* Hoppe and *Juncus alpino-articulatus* Chaix coenoses grow. Coenoses dominated by *Carex rostrata* Stocke tend to grow round the margins that indicate that these coenoses are tending to move away from the water. The meadows dominated by *Deschampsia cespitosa* (L.) Beauv. are a further evolution in this sense.

Anthrophytic Vegetation (Human settlements)

Human activity in the Upper Sestaione Valley is mainly linked to skiing activity, which moreover is losing its appeal these days. Anthrophytic vegetation is composed of species such as *Arctium minus* Bernh., *Leucanthemum vulgare* Lam., *Medicago lupulina* L., *Plantago major* L., *Tussilago farfara* L., *Melilotus albus* Medicus and *Melilotus altissimus* Thuill. This type of habitat also includes reforestation of *Pseudotsuga menziesii* (Mirbel) Franco, *Betula pendula* Roth. and *Pinus mugo* Turra.

The Flora

Our collections in the Upper Sestaione Valley date to the period between 1998-2003 during which we carried out expeditions in the months of April, May, June, July, August and September. These expedition brought to light entities that had previously not been reported previously and to the discovery of new station of locally rare plants.

The flora of Sestaione Valley that have proved to continue to grow without the intervention of man: thus those plants that grow in built up areas, such as those in the Forestry Botanical Gardens at Abetone have been excluded. List comprises all the species found and/or reported in the bibliography for the Upper On the other hand, new species and wild cultivar are included, as well as those species that were once grown and have continued to grow without the intervention of man and within the natural vegetation: these species are marked with the letter "c" in the floristic list.

The systematic order and delimitation of the families follows that of Arrigoni (1989). The following works have been consulted for the nomenclature: Ferrarini & al. (1996), Pignatti (1982), Tutin & al. (1964-1980; 1993), Greuter & al. (1984-1989), Gamisans & Jeanmonod (1993), Kerguélen (1993) and Rossi (2002), except where specifically indicated in the text. In some cases, after the names we used, we have added synonymys or alternative names. The floristic list gives: currently occurring species; doubtful species (?) derived from reports that we were unable to verify because there are no samples reference in the herbarium; those species to be excluded because they were mis-identified (#); species reported by various AA but which we did not find (§); new sightings (*). An attached list gives entities indicated generically in the literature for Boscolungo and Abetone but which were not found in the Upper Sestaione Valley (those reported for localities situated near the Upper Sestaione Valley, but outside the study area, for example "Pra di Lanna", "Macerino", etc., are not included).

The following information for each entity pertaining to the present flora is given:

- the biological form;
- the main growth form according to the classification of Arrigoni (1996);
- geographic element, according to Christ (1867), Arrigoni (1974), Foggi (1990) and Arrigoni (1996). The distribution area was determined by consulting the works of Meusel & al. (1965-1992), Hulten (1950, 1958), Pignatti (1982), Jalas & Suominen (1972-1994), Jalas & al. (1996, 1999) Tutin & al. (1964-1980; 1993) and Greuter & al. (1984-1989). Chorological analysis was performed by comparing the distribution maps and phytogeographical subdivisions by Takhtajan (1986), choronomic unity at higher hierarchical level or equal to Region and Arrigoni (1983), for subregions;
- preferred habitat;
- notes and observations where necessary;
- aspects of conservation:
 - whether the species is of regional interest (L. R. 56/2000, Annex A);
 - whether the species is included in the list of protected plants of Tuscany (L. R. 56/2000, Annex C);
 - whether the species is included in the list of plant species subject to picking regulations (L. R. 56/2000, Annex C1);
 - whether the species is included in Paragraph IV and V of the 92/43/CEE "Habitat

Directive";

- whether the species is included in the "Regional Red Lists of Italian Plants".

Abbreviations used by the authors are those of Brummitt & Powell (1992).

Floristic List

All entities are marked with one or more of the following symbols / characters:

escludendae; ? inquirindae; c cultivated; § not found; * new sighting

LYCOPODIACEAE

Lycopodium annotinum L.

Savi 1828 - Ch rept - Pt - Boreal - Heathland.

Conservation: This species is included in Annex V of the 92/43/CEE "Habitat" Directive.

Lycopodium clavatum L.

Vitman 1773 - Ch rept - Pt - Cosmopolitan - Woods (Heathlands).

Conservation: This species is listed as a plant of Regional Interest (L. R. 56/2000, Annex A) and is included in Annex V of the 92/43/CEE "Habitat" Directive.

Diphasiastrum alpinum (L.) J. Holub

Lycopodium alpinum L.

Arcangeli 1882 sub *Lycopodium alpinum* L. - Ch rept - Pt - Holarctic - Heathland.

Obs. Reported by Arcangeli (1882 sub *Lycopodium alpinum* L.) in the Valle delle Pozze under the summit of the Tre Potenze, we found it near Denti della Vecchia.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Huperzia selago (L.) Bernh. ex Schrank & C. F. P. Mart.

Lycopodium selago L.

Caruel 1870 sub *Lycopodium selago* L. - Ch rept - Pt - Holarctic - Heathland.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red List of Italian Plants" as at "Low Risk" for Tuscany (LR).

EQUISETACEAE

* *Equisetum arvense* L.

G rhiz - Pt - Holarctic - Paleotropical - Fringe.

* *Equisetum fluviatile* L.

G rhiz - Pt - Holarctic - Streams.

§ *Equisetum hyemale* L.

Levier & Sommier 1891.

Conservation: This species is listed as a plant of Regional Interest (L. R. 56/2000, Annex A).

Equisetum palustre L.

Caruel 1870 - G rhiz - Pt - Boreal - Peat bogs and temporary ponds.

*BOTRYCHIACEAE**Botrychium lunaria* (L.) Swartz in Schrader

Caruel 1870 - G rhiz - Pt - Cosmopolitan - Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

OPHIOGLOSSACEAE§ *Ophioglossum vulgatum* L.

Levier & Sommier 1891.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

*POLYPODIACEAE**Polypodium vulgare* L.

Ferrarini 1977 - H ros - Pt - Holarctic-Capense - Rocky cliffs.

*CRYPTOGRAMMACEAE**Cryptogramma crispa* (L.) R. Br. in Hooker

Caruel 1870 sub *Allosorus crispus* Bernh. in Schrad. - H ros - Pt - Europe - Stony fields.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

HYPLOLEPIDACEAE§ *Pteridium aquilinum* (L.) Kuhn in Kersten

Ferrarini 1977

*THELYPTERIDACEAE**Phegopteris connectilis* (Michx) Watt

Polypodium phegopteris L.

Gibelli & Pirotta 1882 sub *Polypodium phegopteris* L. - G rhiz - Pt - Boreal - Stony fields.

Conservation: This species (sub *Phegopteris polypodioides* Fèe) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ASPLENIACEAE§ *Asplenium septentrionale* (L.) Hoffm.

Caruel 1870.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Asplenium trichomanes L.

Ferrarini 1977 - H ros - Pt - Cosmopolitan - Rocky cliffs.

Asplenium viride Hudson

Caruel 1870 - H ros - Pt - Holarctic - Rocky cliffs.

ATHYRIACEAE

§ *Athyrium distentifolium* Tausch ex Opiz

Ferrarini 1999.

Athyrium filix-femina (L.) Roth

Caruel 1870 sub *Asplenium filix-foemina* (L.) Bernh. - H ros - Pt - Holarctic - Scree.

Cystopteris fragilis (L.) Bernh. in Schrader subsp. *fragilis*

Caruel 1870 - H caesp - Pt - Cosmopolitan - Rocky cliffs.

Gymnocarpium dryopteris (L.) Newman

Polypodium dryopteris L.

Caruel 1870 sub *Polypodium dryopteris* L. - G rhiz - Pt - Holarctic - Woods.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ASPIDACEAE

Dryopteris affinis (Lowe) Fraser- Jenkins subsp. *borreri* (Newman) Fraser-Jenkins

Ferrarini 1977 - G rhiz - Pt - European-Tethydic - Stony fields (Megaforb).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Dryopteris carthusiana* (Vill.) H. P. Fuchs

Caruel 1870 sub *Aspidium spinulosum* Doll.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Dryopteris dilatata* (Hoffm.) A. Gray

Ferrarini 1977.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Dryopteris expansa (C. Presl) Fraser-Jenkins & Jermy

Ferrarini 1999 - G rhiz - Pt - Boreal - Stony fields.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Dryopteris filix-mas (L.) Schott

Caruel 1870 sub *Aspidium filix-mas* (L.) Swartz - G rhiz - Pt - Cosmopolitan - Scree

(Megaforb).

* *Dryopteris oreades* Fomin

G rhiz - Pt - Oro-hypsophilous - Stony fields.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red Books of Italian Plants" as at "Minor risk" for Tuscany (LR).

§ *Dryopteris villarii* (Bellardi) Woyнар ex Schinz & Thell.

Ferrarini 1977.

§ *Polystichum aculeatum* (L.) Roth

Gibelli & Pirotta 1882 sub *Aspidium aculeatum* Sw.

Polystichum lonchitis (L.) Roth

Caruel 1870 sub *Aspidium lonchitis* (L.) Swartz - G rhiz - Pt - Holarctic - Stony fields (Scree).

BLECHNACEAE

Blechnum spicant (L.) Roth

Gibelli & Pirotta 1891 - H ros - Pt - Boreal-Tethydic - Woods.

CUPRESSACEAE

Juniperus communis L. subsp. *communis*

Archbald 1874 - P caesp - WB - Holarctic - Margins (Ledge).

Juniperus communis L. subsp. *nana* (Willd.) Syme

Juniperus nana Willd.

Caruel 1863 sub *Juniperus nana* Willd. - NP - WB - Boreal - Heathlands.

Conservation: The species (sub *Juniperus nana* Willd.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

PINACEAE

c *Pinus mugo* Turra

P rept - WB - Cultivated.

Abies alba Miller

Caruel 1863 sub *Abies pectinata* DC. - P scap - W - European-Oro-Mediterranean - Woods.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Picea abies (L.) Karsten

Picea excelsa Link

Chiarugi 1936 sub *Picea excelsa* Link - P scap - W - Eurosibiric - Woods.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red List of Italian plants" as at "Low Risk" for Tuscany (L.R).

c Pseudotsuga menziesii (Mirbel) Franco
P scap - W - Cultivated.

ARISTOLOCHIACEAE

§ *Asarum europaeum* L. subsp. *italicum* Kukkonen & Uotila
Vitman 1773 sub *Asarum europaeum* L.

Obs.: In agreement with Kukkonen & Uotila (1977) records such as *Asarum europaeum* L. must be referred to this species here.

Conservation: This species (sub *Asarum europaeum* L.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" (LR).

RANUNCULACEAE

Ranunculus aconitifolius L.

Caruel 1860 - H scap - HP - European- Megaforb.

Ranunculus apenninus (Chiov.) Pignatti

Baroni 1897 sub *Ranunculus montanus* Willd. var. *gracilis* (Schleich.) - H scap - HP - Apennine - High altitude grasslands.

Obs.: According to Chioyenda (1892) the most important character that distinguishes *Ranunculus montanus* Willd. var. *apenninus* Chiov. from the true *Ranunculus montanus* Willd is the shape of the leaves; in *Ranunculus montanus* Willd. var. *apenninus* Chiov. they are rounded. Pignatti (1982b) retains that representatives of the *Ranunculus montanus* group on the Peninsular, that Chioyenda considers as a distinct variety, can be raised to the level of species. There are several specimens belonging to the *Ranunculus montanus* group in FI! from the Abetone area, again with circular basal leaves divided into 5 segments. They vary from glabrous to downy, although hairiness is more evident on young basal leaves. Sommer identified all these specimens as being intermediate between *Ranunculus aduncus* and *Ranunculus montanus* Willd. var. *gracilis* (Schleich.). In our opinion, they are all *Ranunculus apenninus* (Chiov.) Pignatti. The specimens we found during this study also corresponds to *Ranunculus apenninus* (Chiov.) Pignatti; only one specimen collected on a grassy slope between La Selletta and M. Gomito has basal leaves very similar to the ones Pignatti (1982) attributes to *Ranunculus pollinensis* (Terracc.) Chiov. There are 1(2) cauline leaves with 5 lanceolate segments. The achenes are still immature, but the beak is very long.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Ranunculus lanuginosus L.

Caruel 1860 - H scap - HP - Mid-Europe - Woods.

Ranunculus platanifolius L.

Gibelli & Pirota 1882 sub *Ranunculus aconitifolius* L. var. *platanifolius* L. - H scap - HP - Europe - Megaforb.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Ranunculus pollinensis* (Terracc.) Chiov.

Baroni 1897.

Obs.: Reported by Baroni (1897), Provasi (1926 sub *Ranunculus geraniifolius* Pourr. var. *pollinensis* (Chiov.) and Foggi (1989) for Lago Bacciolo. All the above records refer to a specimen Levier collected in 1885; since then the species has never been found again in the Upper Sestaione Valley. The reference for Lago Bacciolo in the 1:25000 Italian Ordinance Survey Map is Map n° 97 III NE "Abetone", IGM 1947, above the settlement of Le Regine, on the eastern limit of our study area. Unfortunately the construction of so many roads in the area over the last 50 years has led to the total disappearance of this small lake.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

Ranunculus repens L.

Caruel 1860 - H rept - HP - Boreal-Tethydic - Woods.

? *Ranunculus tuberosus* Lapeyr.

Ranunculus nemorosus DC.

Caruel 1866 sub *Ranunculus nemorosus* DC.

Obs.: Reported by Caruel (1866 sub *Ranunculus nemorosus* DC.) and Archbald (1874 sub *Ranunculus nemorosus* DC.) for Boscolungo and by Baroni (1897 sub *Ranunculus nemorosus* DC.) for Boscolungo in the Upper Sestaione Valley. These indications do not allow us to give the species as certain for the Upper Sestaione Valley.

* *Helleborus foetidus* L.

Ch suffr - HP - Atlantic-Mid-European - Marginal.

? *Trollius europaeus* L. subsp. *europaeus*

Caruel 1860.

Obs.: Reported by Caruel (1860) and Archbald (1874) for Boscolungo and by Del Prete & al. (1980). There are several specimens for the Abetone area in FI!: "Boscolungo, 24.7.1834, Parlatore"; "Boscolungo, luglio 1883, Biondi"; "Abetone, 7.7.1888, Bergest"; "Abetone, luglio 1935, Cortesi"; "Sestaione, 4.7.1883, Levier". The last indication does not allow us to attribute the species as certain for the Upper Sestaione Valley.

Conservation: This species is listed as a protected plant in Tuscany (L. R. 56/2000, Annex C), as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

Actaea spicata L.

Levier & Sommier 1891 - G rhiz - HP - Eurosibiric - Woods.

Caltha palustris L. subsp. *palustris*

Vitman 1773 - H ros - HP - Boreal - Springs (Streams).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Anemone narcissifolia* L.

Barbero & Bonin 1980.

Obs.: Reported by Barbero & Bonin (1980) for M. Gomito, by Archbald (1874) for Boscolungo and Caruel (1860) for Macerino near Boscolungo; this last locality is outside the study area.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Anemone nemorosa L.

Caruel 1860 - G rhiz - HP - Boreal-Oro-Mediterranean - Woods.

§ *Anemone ranunculoides* L. subsp. *ranunculoides*

Ferrarini 1999.

§ *Hepatica nobilis* Miller

Barbero & Bonin 1980.

Pulsatilla alpina (L.) Delarbre subsp. *millefoliata* (Bertol.) D. M. Moser

Caruel 1860 sub *Anemone alpina* L. - H scap - HP - Oro-hypsophilous-Corsican - Ridges.

Obs.: In agreement with Moser (2003), reports such as *Pulsatilla alpina* L. must be referred to this subspecies.

Conservation: This species is listed as a protected plant of Tuscany (L. R. 56/2000, Annex C) and as a plant of Regional interest (L. R. 56/2000, Annex A).

Aquilegia alpina L.

Gibelli & Pirota 1882 - H scap - HP - Alpine-northern Apennine - Ridges.

Obs.: First reported by Gibelli & Pirota (1882) for the Tre Potenze and later by Levier & Sommier (1891 sub *Aquilegia alpina* L. var. *subbrachyceras* Borb.) and Baroni (1897 sub *Aquilegia alpina* L. var. *subbrachyceras* Borb.) for the rocky slopes of the Tre Potenze, and finally reported by Ferrarini (1977) for the north-facing grassy ledges of Campolino. According to Tomaselli & al. (1996) populations from the northern Apennines differ from those from the Alps on account of several morphological characters and could be interpreted at a sub-species rank or even at species level. Without an in-depth study we prefer to attribute specimens from the Upper Sestaione Valley to *Aquilegia alpina* L.

Conservation: The species is listed as a protected plant of Tuscany (L. R. 56/2000, Annex C), as a plant of Regional interest (L. R. 56/2000, Annex A), it is included in Annex IV of the 92/43/CEE "Habitat" Directive and in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

Aquilegia atrata Koch.

Caruel 1860 sub *Aquilegia vulgaris* L. - H scap - HP - Alpine-Apennine - Megaforb (Fringe).

Obs.: In agreement with Del Prete & al. (1980) reports for *Aquilegia vulgaris* L. for the Upper Sestaione Valley must be attributed to *Aquilegia atrata* Koch.

* *Thalictrum aquilegifolium* L.

H scap - HP - Europe - Megaforb.

Thalictrum flavum L.

Caruel 1860 - H scap - HP - Eurosibiric - Grasslands.

§ *Thalictrum minus* L.

Caruel 1860.

FUMARIACEAE

* *Corydalis solida* (L.) Clairv.

Corydalis bulbosa (L.) DC.

G bulb - HP - Mid-European - Fringe.

URTICACEAE

Urtica dioica L.

Caruel 1863 - H scap - HP - Holarctic - Anthropic.

FAGACEAE

Fagus sylvatica L.

Gibelli & Pirotta 1882 - P scap - W - Atlantic-Mid-European - Woods.

BETULACEAE

c *Betula pendula* Roth

Betula alba L.

Caruel 1863 sub *Betula alba* L. - P scap - W - Cultivated.

Alnus incana (L.) Moench

Caruel 1863 - P scap - W - Eurosibiric - Riparian Woods.

CHENOPODIACEAE

Chenopodium bonus-henricus L.

Caruel 1863 - H scap - HP - Europe - Anthropic.

CARYOPHYLLACEAE

§ *Arenaria bertolonii* Fiori in Fiori & Paoletti

Caruel 1860 sub *Arenaria saxifraga* Fenzl. in Gren. & Godr.

Conservation: The species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Moehringia muscosa* L.

Barbero & Bonin 1980.

Moehringia trinervia (L.) Clairv.

Caruel 1860 sub *Moehringia trinervia* Clairv. var. *vulgaris* - T scap - HA - Eurosibiric-Tethydic - Woods.

Minuartia verna (L.) Hiern. subsp. *verna*

Caruel 1860 sub *Alsine verna* Bartl. - Ch suffr - WS - Boreal-Tethydic - High altitude grasslands (Scree).

§ *Stellaria alsine* Grimm

Stellaria uliginosa Murray

Caruel 1860 sub *Stellaria uliginosa* Murray.

Stellaria graminea L.

Caruel 1860 - H scap - HP - Boreal-Tethydic - Grasslands (Megaforb).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Stellaria nemorum L. subsp. *montana* (Pierrat) Berher in L. Louis

Stellaria nemorum L. subsp. *glochisperma* Murb.

Caruel 1860 sub *Stellaria nemorum* L. - H scap - HP - Atlantic-Mid-European - Woods.

Cerastium arvense L. subsp. *suffruticosum* (L.) Cesati

Baroni 1898 sub *Cerastium arvense* L. subsp. *strictum* (L.) Fiori - Ch suffr - WS - Western Alps-Apennines - Grasslands (Ledges).

Obs.: Reports of *Cerastium strictum* L. for the Upper Sestaione Valley are to be referred to *Cerastium arvense* L. subsp. *suffruticosum* (L.) Cesati in agreement with Bechi (1998).

§ *Cerastium fontanum* Baumg. subsp. *vulgare* (Hartman) Greuter & Burdet

Cerastium triviale Link

Cerastium holosteoides Fries subsp. *triviale* Link

Caruel (1860) sub *Cerastium triviale* (Link) Moschl

Reported by Caruel (1860 sub *Cerastium triviale* Link), Archbald (1874 sub *Cerastium triviale* Link) and Gibelli & Pirota (1882 sub *Cerastium triviale* Link) for the Tre Potenze.

Sagina glabra (Willd.) Fenzl

Caruel 1860 - H caesp - HP - Alpine-Apennine - Grasslands (Snow beds).

§ *Sagina procumbens* L.

Vitman 1773.

Sagina saginoides (L.) Karsten

Ferrarini 1977 - H caesp - HP - Holarctic - Snow beds.

* *Spergularia rubra* (L.) J. & C. Presl

Ch suffr - WS - Holarctic-Paleotropical - Fringe.

§ *Silene acaulis* (L.) Jacq. subsp. *bryoides* (Jord.) Nyman

Barbero & Bonin 1980 sub *Silene acaulis* (L.) Jacq.

Obs.: Reported by Barbero & Bonin (1980 sub *Silene acaulis* (L.) Jacq.) for M. Gomito but we did not find it.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Silene dioica (L.) Clairv.

Caruel 1860 sub *Lychnis sylvestris* Hoppe - H scap - HP - Eurosibiric - Fringe.

Silene nutans L.

Caruel 1860 - H ros - HP - Eurosibiric - Grasslands (Ledges).

Silene parnassica Boiss. & Spruner in Boiss.

Ferrarini 1977.

Obs.: Reported by Ferrarini (1977) for the exposed northern cliffs of the Campolino Ridge (sub *Silene saxifraga* L. var. *parnassica* Boiss. & Spruner). It was not possible to trace the reference specimen for this last report. We did not find any reference specimens in FI! nor we did find it in the study area. The species is undoubtedly *Silene saxifraga* L. and therefore must be excluded from the flora of the Upper Sestaione Valley.

Silene pusilla Waldst. & Kit. subsp. *pusilla*

Silene quadrifida auct. non L.

Silene quadridentata (Murray) Pers.

Caruel 1860 sub *Silene quadrifida* L. - H caesp - HP - Oro-hypsophilous - Springs.

Silene rupestris L.

Caruel 1860 - H bienn - HB - Arctic-Oro-hypsophilous - Rocky cliffs.

Silene saxifraga L.

Caruel 1860 - H caesp - HP - Oro-hypsophilous - Rocky cliffs (Scree slopes).

Silene vulgaris (Moench) Garcke subsp. *vulgaris*

Caruel 1860 sub *Silene inflata* Sm. - H scap - HP - Cosmopolitan - Fringe.

* *Saponaria ocymoides* L.

H scap - HP - Oro-hypsophilous - Scree slopes.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Dianthus deltoides L. subsp. *deltoides*

Caruel 1860 - H caesp - HP - Boreal-Tethydic - Grasslands.

Conservation: This species is protected by law regarding the quantity that can be picked (L. R. 56/2000, Annex C1).

Dianthus hyssopifolis L. subsp. *hyssopifolis*

Dianthus monspessulanus L.

Caruel 1860 sub *Dianthus monspessulanus* L. - H scap - HP - Oro-hypsophilous - Ledges (Grasslands).

Conservation: This species is protected by law regarding the quantity that can be picked (L. R. 56/2000, Annex C1).

Dianthus sylvestris Wulfen in Jacq.

Ferrarini 1999 - H scap - HP - Oro-hypsophilous - Ledges (Grasslands).

Conservation: This species is protected by law regarding the quantity that can be picked (L. R. 56/2000, Annex C1).

POLYGONACEAE

Polygonum alpinum All.

Caruel 1863 - G rhiz - HP - Boreal-Tethydic - Ledges.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Polygonum bistorta L. subsp. *bistorta*

Caruel 1863 - G rhiz - HP - Boreal-Oro-Mediterranean - Grasslands.

* *Polygonum persicaria* L.

T scap - HA - Boreal-Tethydic - Bogs and temporary ponds.

Rumex acetosa L.

Caruel 1863 - H scap - HP - Boreal-Tethydic - Anthropic.

Rumex acetosella L.

Caruel 1863 - H scap - HP - Cosmopolitan - Scree Slopes.

Rumex arifolius All.

Rumex montanus Desf.

Rumex alpestris Jacq.

Levier & Sommier 1891 - H scap - HP - Boreal-Oro-Mediterranean - Fringe.

* *Rumex nebroides* Campd.

H scap - HP - Oro-hypsophilous-Oro-Mediterranean - High altitude Grasslands

§ *Rumex obtusifolius* L.

Caruel 1863.

Rumex pseudoalpinus Hofft.

Rumex alpinus L.

Caruel 1863 sub *Rumex alpinus* L. - H scap - HP - Eurosibiric-Oro-Mediterranean -
Megaforb (Margins) - Fringe.

Rumex scutatus L.

Caruel 1863 - H scap - HP - Cosmopolitan - Scree Slopes.

CLUSIACEAE

Hypericum perforatum L.

Caruel 1860 - H scap - HP - Eurosibiric-Tethydic - Fringe.

Hypericum richeri Vill. subsp. *richeri*

Caruel 1860 - H scap - HP - Alpine-Appennine - Heathland.

MALVACEAE

Malva moschata L.

Caruel 1860 - H scap - HP - European - Fringe.

VIOLACEAE

Viola biflora L.

Vitman 1773 - H scap - HP - Holarctic - Springs.

Viola calcarata L. subsp. *cavillieri* (W. Becker) Negodi

Vitman 1773 sub *Viola calcarata* L. - H scap - HP - Western Alps-Northern Apennines -
High Altitude Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Viola canina* L.

Caruel 1860.

Viola palustris L.

Arcangeli 1882 - H ros - HP - Boreal - Bogs and temporary ponds.

Viola reichenbachiana Jordan ex Boreau

Ferrarini 1977 - H scap - HP - Eurosibiric-Mediterranean - Woods.

Viola riviniana Reichenb.

Baroni 1898 sub *Viola sylvestris* Lam. var. *riviniana* (Reichenb.) Fiori - H scap - HP - European-Mediterranean - Woods.

Viola saxatilis F. W. Schimdt subsp. *saxatilis*

Viola tricolor L. subsp. *subalpina* Gaudin

Archbald (1874) sub *Viola tricolor* L. - H bienn - HB - European - Grasslands.

SALICACEAE

Salix apennina A. Skvortsov

Caruel 1863 sub *Salix nigricans* Smith var. *eriocarpa* Koch - NP - WB - Apennine - Riparian woods.

Typus: "Italia, provincia Toscana, Apenninus Pistoriensis, ad lacum Greppo, 9 VII 1888, E. Levier" (FI).

Obs.: Records for the Upper Sestaione Valley of *Salix nigricans* Smith var. *eriocarpa* Koch (Caruel, 1863), *Salix nigricans* Smith (Archbald, 1874; Gibelli & Pirota, 1882), *Salix phyllicifolia* L. var. *nigricans* Sm. (Chiarugi, 1936) and *Salix phyllicifolia* L. (Ferrarini, 1974 and 1977) should all be referred to *Salix apennina* A. Skvortsov in agreement with Skvortsov (1965).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Salix caprea L.

Caruel 1863 - P caesp - WB - Boreal - Megaforb.

* *Salix eleagnos* Scop.

P caesp - WB - European-Oro-Mediterranean - Riparian woods.

§ *Salix purpurea* L. subsp. *purpurea*

Caruel 1863.

* *Populus tremula* L.

P scap - W - Boreal-Oro-Mediterranean - Woods.

BRASSICACEAE

Murbeckiella zanonii (Ball) Rothm.

Caruel 1860 sub *Sisymbrium pinnatifidum* DC. - H scap - HP - Apennine Tosco-Emilian -

Scree slopes.

Obs.: Reported by Caruel (1860) for Boscolungo sub *Sisymbrium pinnatifidum* DC. and re-identified by the same Caruel (1866) as sub *Sisymbrium zanonii* Gay. More recently it has been reported for Campolino (Ferrarini, 1977) and for M. Gomito (Barbero & Bonin, 1980).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

* *Hesperis laciniata* All.

H scap - HP - European-Oro-Mediterranean - Ledges.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Barbarea bracteosa Guss.

Caruel 1860 - H scap - HP - Oro-hypsophilous-Oro-Mediterranean - Anthropic - Marginal.

Rorippa islandica (Oeder) Barbàs

Caruel 1860 sub *Nasturtium palustre* DC. - T scap - HA - Boreal - Small lakes (Bogs and temporary ponds)

Cardamine amara L. subsp. *amara*

Caruel 1860 - H scap - HP - Boreal-Mediterranean - Springs.

Cardamine asarifolia L.

Caruel 1860 - H scap - HP - European - Springs.

Cardamine bulbifera (L.) Crantz

Caruel 1860 sub *Dentaria bulbifera* L. - G rhiz - HP - European - Woods.

Cardamine chelidonia L.

Caruel 1860 - H scap - HP - Apennine-Balkan - Woods.

Cardamine flexuosa With. in Stokes

Levier & Sommier 1891 sub *Cardamine sylvatica* Link. - H scap - HP - Holarctic - Riparian Woods

Cardamine heptaphylla (Vill.) O. E. Schulz

Caruel 1860 sub *Dentaria pinnata* Lam. - G rhiz - HP - Medio-European - Woods.

Cardamine hirsuta L.

Caruel 1860 - T scap - HA - Cosmopolitan - Fringe.

Cardamine impatiens L. subsp. *impatiens*

Caruel 1860 - T scap - HA - Boreal-Tethydic - Megaforb.

Cardamine resedifolia L.

Caruel 1860 sub *Cardamine resedifolia* L. var. *subintegrifolia* Caruel - H scap - HP - Oro-hypsophilous-Oro-Mediterranean - Scree slopes (Rocky cliffs).

Arabis hirsuta (L.) Scop.

Caruel 1860 - H bienn - HB - Holarctic - Scree slopes.

* *Arabis pauciflora* (Grimm.) Garcke

Arabis brassica (Leers) Rauschert

H scap - HP - Oro-hypsophilous - High altitude grasslands.

Obs.: This is the first confirmed station for Tuscany. The population consists of a few plants growing on a grassy slope at the base of a cliff near Passo della Vecchia. The species must therefore be considered as "Seriously threatened" for Tuscany and needs to be included in updates for L. R. 56/2000.

Draba aizoides L.

Gibelli & Pirotta 1882 - H ros - HP - Oro-hypsophilous - Rocky cliffs.

Obs.: Reported by Gibelli & Pirotta (1882 sub *Draba aizoides* L.) and Caruel in Parlatore (1893 sub *Draba aizoides* L.) for the Tre Potenze, by Levier & Sommier (1891) on alpine cliffs above Boscolungo at Balzo del Valloncello, at Buca dell'Ortica and at the Tre Potenze (sub *Draba longirostra* Schott, Nyman & Kotschy) and by Baroni (1897) at the Tre Potenze and Balzo del Valloncello (sub *Draba aspera* Bertol.) and on the alpine cliffs above Boscolungo at Balzo del Valloncello, at Buca dell'Ortica and at the Tre Potenze (sub *Draba longirostra* Schott, Nyman & Kotschy). Specimens identified as *Draba longirostra* Schott, Nyman & Kotschy (including some from above Boscolungo at Balzo del Valloncello, at Buca dell'Ortica) exhibit a glabrous scape and a style reaching 4,2 mm in length; therefore these specimens belong to *Draba aizoides* L. For this reason reports of *Draba longirostra* Schott, Nyman & Kotschy and *Draba aspera* Bertol. for the Upper Sestaione Valley should be considered as *Draba aizoides* L.

* *Noccaea caerulea* (J. & C. Presl.) F. K. Meyer

Thlaspi alpestre L.

H scap - HP - Oro-hypsophilous - Scree slopes.

Conservation: The species (sub *Thlaspi alpestre* L.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Biscutella laevigata L. subsp. *laevigata*

Caruel 1860 - H scap - HP - Oro-hypsophilous - Ledges (high altitude grasslands).

EMPETRACEAE

Empetrum hermaphroditum Hagerup

Caruel 1863 sub *Empetrum nigrum* L. - Ch suffr - WB - Holarctic - Heathland.

Obs.: All reports for *Empetrum nigrum* L. for the Upper Sestaione Valley must be referred to *Empetrum hermaphroditum* Hagerup.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ERICACEAE

Calluna vulgaris (L.) Hull

Gibelli & Pirotta 1882 - Ch frut - WS - European - Heathland.

Vaccinium gaultherioides Bigelow

Caruel 1863 sub *Vaccinium uliginosum* L. - Ch frut - WB - Holarctic - Heathland.

Vaccinium myrtillus L.

Caruel 1863 - Ch frut - WF - Boreal - Heathland.

Obs.: Levier (in Levier & Sommier, 1891) reports plants with white fruits (sub var. *leucocarpum* Hausm.) for "M. Cardoso presso Boscolungo". In this locality, that lies outside the study area, plants with white fruits have recently been found by Sichi ed Innocenti.

Vaccinium vitis-idaea L.

Ferrarini 1999 - Ch frut - WB - Holarctic - Heathland.

Obs.: Reported by Levier (in Levier & Sommier, 1891) "crinale del M. Cardoso presso Boscolungo, in grandi cespugli, ma per lo più sterile" outside the study area and by Ferrarini (1999) near Campolino. We found a few sterile individuals under the ski-lift station at M. Gomito, in the *Vaccinium gaultherioides* Bigelow and *Vaccinium myrtillus* L. heaths near the ski-slope fences. This station appears to be under great danger considering the vicinity of the ski-lift installation.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

PYROLACEAE

Pyrola media Swartz

Gibelli & Pirota 1882 - H ros - HP - Eurosibiric - Woods.

Pyrola minor L.

Caruel 1863 - H ros - HP - Holarctic - Woods.

§ *Orthilia secunda* (L.) House*Pyrola secunda* L.

Caruel 1863 sub *Pyrola secunda* L.

§ *Moneses uniflora* (L.) A. Gray*Pyrola uniflora* L.

Arcangeli 1882 sub *Pyrola uniflora* L.

Obs. Reported by Arcangeli (1882 sub *Pyrola uniflora* L.) for Boscolungo, Gibelli & Pirota (1882 sub *Pyrola uniflora* L.) for "Apennine shady woods at Abetone", by Levier & Sommier (1891 sub *Pyrola uniflora* L.) and Baroni (1901 sub *Pyrola uniflora* L.) at "strada dei Buoi a Boscolungo, nella valle del Sestaione presso gli Isolotti e sul versante modenese sotto il Casotto" but we did not find it.

Monotropa hypopitys L.

Caruel 1866 sub *Hypopitys multiflora* Scop. - G par - O - Eurosibiric - Woods.

PRIMULACEAE

Primula veris L. subsp. *columnae* (Ten.) Maire & Petitm.

Caruel 1863 sub *Primula suaveolens* Bertol. - H ros - HP - Oro-hypsophilous-Oro-Mediterranean - Grasslands.

Obs.: In agreement with Tutin & al. (1972) reports for *Primula veris* L. subsp. *suaveolens* (Bertol.) Guterm. & Ehrend. (sub *Primula suaveolens* Bertol.) must be referred to this

species here.

Conservation: The species (sub *Primula veris* L.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the list of species protected by law regarding the quantity that can be picked (L. R. 56/2000, Annex C1).

§ *Soldanella alpina* L. subsp. *alpina*

Barbero & Bonin 1980.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

GROSSULARIACEAE

§ *Ribes petraeum* Wulfen in Jacq.

Barbero & Bonin 1980.

CRASSULACEAE

Sempervivum arachnoideum L. subsp. *arachnoideum*

Ferrarini 1977 - Ch succ - WS succ - Oro-hypsophilous-Corsican - Scree slopes (Ledges).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Sempervivum montanum L. subsp. *montanum*

Caruel 1862 - Ch succ - WS succ - Oro-Hypsophilous - Scree slopes (Ledges).

Sempervivum tectorum L.

Caruel 1862 - Ch succ - WS succ - Oro-hypsophilous - Scree slopes (Ledges).

§ *Sedum album* L.

Ferrarini 1977.

Sedum alpestre Vill.

Caruel 1862 - Ch succ - WS succ - Oro-Hypsophilous- Snow beds (Scree slopes).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Sedum anacampseros L.

Tomaselli, Alessandrini & Gerdol 1986 - Ch succ - WS succ - Oro-hypsophilous - Scree slopes.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

* *Sedum dasyphyllum* L.

Ch succ - WS succ - Eurosibiric-Oro-Mediterranean - Rocky cliffs.

Sedum monregalense Balbis

Caruel 1862 - Ch succ - WS succ - Oro-hypsophilous-Corsa - Rocky cliffs (Scree slopes).

SAXIFRAGACEAE

Saxifraga aizoides L.

Bertoloni 1839 - H scap - HP - Holarctic - Springs.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Saxifraga aspera L. subsp. *etrusca* (Pignatti) Foggi & Romagnoli comb. nova
= *S. etrusca* Pignatti, Giorn. Bot. Ital., 63: 172 (1969).

Vitmann 1773 sub *Saxifraga aspera* L. - Ch suffr - WS - Apennine Tuscan-Emilian-Apuan Alps - Rocky cliffs (Scree slopes).

Typus: "Pigelleto Chiarugi (Sestaione), 28 VI.1968, lg. Hofmann, Lausi & Pignatti" (TSB).

Locus classicus: Sestaione prope Abetone m 1700 substrato siliceo (arenaria macigno).

Obs.: In agreement with Pignatti (1969) all reports of *Saxifraga aspera* L. for the northern Apennines should be referred to the subspecies here.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

Saxifraga exarata Vill.

Vitmann 1773 sub *Saxifraga hypnoides* Vitm. non L. - H scap - HP - Oro-Hypsophilous-Pontine - Rocky cliffs (Scree slopes).

Obs.: Several works on the Abetone area give both *Saxifraga moschata* Wulfen in Jacq (Ferrarini, 1977; Foggi, 1989), and *Saxifraga exarata* Vill. (Foggi, 1989) for the Upper Sestaione Valley. The *Saxifraga exarata* group is composed of scarcely different entities which are very difficult to distinguish from each other, especially when dealing with dry specimens. Even the recent revision by Webb (in Tutin & al., 1993) did not help matters and we therefore prefer to treat the complex as *Saxifraga exarata* Vill. Reports for the Sestaione Valley by Vitmann (1773) sub *Saxifraga hypnoides* Vitm. non L. and Caruel (1862), Archbald (1874) and Gibelli & Pirotta (1882) sub *Saxifraga muscoides* Wulfen should thus be referred to this species here.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and as a plant (sub *Saxifraga exarata* Vill. subsp. *pseudoexarata* (Br. Bl.) Webb) of Regional interest (L. R. 56/2000, Annex A).

? *Saxifraga oppositifolia* L.

Ferrarini 1977.

Obs.: Reported by Ferrarini (1977) for Campolino fissures of the cliffs exposed to the North of the ridge. We could not find any reference specimens in FI! nor did we find the species in the field.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Saxifraga paniculata Miller

Vitmann 1773 sub *Saxifraga cotyledon* Vitm. - H ros - HP - European - Rocky cliffs.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Saxifraga rotundifolia L.

Caruel 1862 - H scap - HP - European - Woods - Nemoral.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Saxifraga stellaris L. subsp. *robusta* (Engler) Gremler

Caruel 1862 sub *Saxifraga stellaris* L. - H ros - HP - Oro-hypsophilous - Springs.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Chrysosplenium alternifolium L.

Vitmann 1773 sub *Chrysosplenium oppositifolium* Vitm. non L. - H scap - HP - Boreal - Woods.

Parnassia palustris L.

Caruel 1860 - H scap - HP - Eurosibiric-Oro-Mediterranean - Bogs and temporary ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ROSACEAE

Rosa pendulina L.

Rosa alpina L.

Caruel 1862 sub *Rosa alpina* L. - NP - WF - European - Heathland (Woods).

§ *Rosa pimpinellifolia* L.

Rosa spinosissima L.

Caruel 1870 sub *Rosa spinosissima* L.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

§ *Rosa serafinii* Viv.

Gibelli & Pirotta 1882.

Obs.: Reported by Gibelli & Pirotta (1882) for Abetone, by Arcangeli (1882) at the inn at Abetone and by Baroni (1899) between the inn at Abetone and the Piramidi. There is a specimen in FI! that Savi collected and another Beccari collected at Poggio alle Lastre (La Lastra), a locality outside the study area.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

? *Rosa villosa* L.

Gibelli & Pirotta 1882 sub *Rosa pomifera* Hermann

Obs.: Reported by Gibelli & Pirotta (1882) for "le siepi lungo l'abetaje dell'Abetone" (sub *Rosa pomifera* Hermann) and "all'Abetone" (sub *Rosa pomifera* Hermann var *appennina* Cres.); the latter variety, according to Arcangeli (1882), also refers to "pianta scoperta a Boscolungo dal prof. Parlatore e da lui riferita alla *R. cinnamomea*". Finally, Baroni (1899) reported the plant for Boscolungo and Abetone. There are several specimens coming from

the Abetone area in FI! : Boscolungo in the Mago Forest, Boscolungo, Abetone along via Nazionale, Abetone, Boscolungo along the road from the inn at Abetone to the Piramidi, Fivizzani and in the Sestaione Valley above Boscolungo. This report does not allow us to give this species as certain for the Upper Sestaione Valley.

Rubus hirtus Waldst. & Kit.

Rubus glandulosus Bellardi

Caruel 1862 sub *Rubus glandulosus* Bellardi - NP - WF - European - Megaforb.

Obs.: The report of *Rubus guentheri* Weihe & Nees. (Gibelli & Pirota, 1882) "Near Lago Greppo at the Tre Potenze" should be referred to the species here.

Rubus idaeus L.

Caruel 1862 - NP - WF - Boreal - Megaforb - Fringe.

Aruncus dioicus (Walter) Fernald

Caruel 1862 sub *Spiraea aruncus* L. - H scap - HP - Boreal - Megaforb (Fringe).

§ *Aremonia agrimonioides* (L.) DC.

Caruel 1866.

Sanguisorba officinalis L.

Caruel 1862 - H scap - HP - Boreal - Bogs and temporary ponds.

Geum montanum L.

Caruel 1862 - H ros - HP - Oro-hypsophilous - Grasslands (Heathland).

Geum urbanum L.

Caruel 1862 - H scap - HP - Eurosibiric-Tethydic - Fringe (Megaforb).

Potentilla aurea L. subsp. *aurea*

Caruel 1862 - H scap - HP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Potentilla crantzii (Crantz) G.Beck ex Fritsch subsp. *crantzii*

Ferrarini 1977 - H scap - HP - Holarctic - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Potentilla erecta (L.) Rauschel

Potentilla tormentilla Stokes

Caruel 1862 sub *Potentilla tormentilla* Stokes - H scap - HP - Eurosibiric - Bogs and temporary ponds.

* *Potentilla micrantha* Ramond ex DC. in Lam. & DC.

H ros - HP - European-Mediterranean - Woods.

? *Potentilla nitida* L.

Caruel 1862.

Obs.: Common species on the Alps, from the Julian Alps to the Grigne, reported by Caruel (1862) for the Tre Potenze, but never found again. The specimen in PI! ("Tre Potenze, sine

data, sine coll.") actually correspondes to *Potentilla nitida* L. This is a calcicolous chas-mophyte whose occurrence in the Tuscan-Emilian Apennines is difficult to explain. There is probably an error in naming the locality on the herbarium label. Otherwise, it must be considered as extinct.

Conservation: The species is included in the "Regional Red Books of Italian Plants" and listed under "Insufficient Data" for Tuscany (DD).

? *Potentilla nivea* L.

Caruel 1862.

Obs.: Arctic-Alpine species occurring on the Alps in Italy, Reported by Caruel (1862) for the Tre Potenze, but never found again. The specimen in PI! ("Tre Potenze, 1830, Savi") actually correspondes to *Potentilla nivea* L. There was probably an error in naming the locality on the herbarium label. Otherwise the species must be considered extinct.

Conservation: The species is included in the "Regional Red Books of Italian Plants" under "Insufficient Data" for Tuscany (DD).

§ *Potentilla rupestris* L. subsp. *rupestris*

Caruel 1862.

Fragaria vesca L.

Caruel 1862 - H rept - HP - Cosmopolitan- Fringe.

Alchemilla alpina L.

Caruel 1862 - H ros - HP - Boreal-Oro-Mediterranean - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

* *Alchemilla flabellata* Buser

H ros - HP - Oro-hypsophilous - High altitude grasslands (Bogs and temporary ponds).

Alchemilla glabra Neygenf.

Barbero & Bonin 1980 - H ros - HP - European - High altitude grasslands.

* *Alchemilla glaucescens* Wallr.

H ros - HP - Oro-hypsophilous-Corsican - High altitude grasslands.

? *Alchemilla hoppeana* (Rchb.) Della Torre

Barbero & Bonin 1980.

Obs.: Reported for M. Gomito by Barbero & Bonin (1980). There are no specimens for Tuscany in FI!

Alchemilla saxatilis Buser

Foggi 1989 - H ros - HP - Oro-hypsophilous-Corsican - High altitude grasslands (Scree slopes).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Alchemilla vetteri Buser

Foggi 1989 - H ros - HP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex

A) and included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

Alchemilla xanthochlora Rothm.

Caruel 1862 sub *Alchemilla vulgaris* L. - H ros - HP - European - Bogs and temporary pondss.

Sorbus aria (L.) Crantz

Caruel 1862 sub *Pyrus aria* Ehrh. - P caesp - WB - Eurosibiric-Oro-Mediterranean - Woods.

Sorbus aucuparia L.

Caruel 1862 sub *Pyrus aucuparia* Gaertner - P caesp - WB - Boreal-Oro-Mediterranean - Woods.

Obs.: The report for *Sorbus domestica* L. for Lago Greppo (Raffaelli & al., 1997) must be referred to this species.

* *Sorbus chamaemespilus* (L.) Crantz

NP - WB - Oro-hypsophilous - Heathland.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

Amelanchier ovalis Medicus

Baroni 1899 - P caesp - WB - European-Oro-Mediterranean - Ledges.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

* *Cotoneaster integerrimus* Medicus

NP - WB - Eurosibiric-Oro-Mediterranean - Ledges.

Prunus avium L.

Caruel 1862 - P scap - W - European-Mediterranean - Woods.

FABACEAE

Cytisus scoparius (L.) Link

Caruel 1862 sub *Sarothamnus vulgaris* Wimmer - P caesp - WF - Atlantic-Medio-European - Woods.

§ *Genista pilosa* L.

Ferrarini 1977.

Genista radiata (L.) Scop.

Caruel 1862 - Ch suffr - WF - Oro-hypsophilous - Ledges - Shrub.

Genista tinctoria L. subsp. *ovata* (Waldst. & Kit.) Arcang.

Caruel 1862 sub *Genista tinctoria* L. - Ch suffr - WF - European - Heathland (Grasslands).

Obs.: Reports by Caruel (1862), Archbald (1874), Ferrarini (1977) sub *Genista tinctoria* L. and Gibelli & Pirotta (1882) sub *Genista tinctoria* L. var. *mantica* Reichb. must be referred to this species.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Laburnum alpinum (Miller) Berchtold & J. Presl

Caruel 1862 sub *Cytisus alpinus* Miller - P scap - W - Oro-hypsophilous-Pontic - Woods (Fringe).

Astragalus glycyphyllos L.

Caruel 1862 - H rept - HP - Eurosibiric - Megaforb.

Astragalus hypoglottis L. subsp. *gremlii* (Burnat) Greuter & Burdet

Astragalus purpureus Lam. subsp. *gremlii* (Burnat) Ascherson & Graebner

Gibelli & Pirota 1882 sub *Astragalus purpureus* Lam. - H scap - HP - Oro-hypsophilous - Grasslands.

§ *Lathyrus occidentalis* (Fisher & C. A. Meyer) Fritsch

Lathyrus laevigatus (Waldst. & Kit.) Gren. subsp. *occidentalis* (Fisher & C. A. Meyer) Beistr.

Vitman 1773 sub *Orobis luteus* L.

* *Lathyrus linifolius* (Reichard) Bassler subsp. *montanus* (Bernh.) Bassler

Lathyrus montanus Bernh.

G rhiz - HP - Atlantica-MedioEuropean - Megaforb.

Lathyrus pratensis L.

Caruel 1862 - H scap - HP - Holarctic-Paleotropicale - Fringe.

Lathyrus vernus (L.) Bernh.

Caruel 1862 - G rhiz - HP - Eurosibiric - Woods.

Vicia cracca L.

Caruel 1862 sub *Vicia gerardi* Vill. - CH scap - HP - Boreal - Grasslands.

Vicia sepium L.

Caruel 1862 - H scap - HP - Eurosibiric - Woods.

* *Melilotus albus* Medicus

T scap - HA - Eurosibiric-Tethydic - Anthropic.

* *Melilotus altissimus* Thuill.

G rhiz - HP - Boreal - Anthropic.

Medicago lupulina L.

Caruel 1862 - T scap - HA - Holarctic-Paleotropical - Anthropic.

Trifolium alpinum L.

Caruel 1862 - H ros - HP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Trifolium aureum Pollich

Caruel 1862 - T scap - HA - Medio-European - Fringe.

§ *Trifolium hybridum* L. subsp. *elegans* (Savi) Ascherson & Graebner
Caruel 1862 sub *Trifolium elegans* Savi.

* *Trifolium ochroleucon* Hudson
H caesp - HP - European-Mediterranean - Grasslands.

§ *Trifolium pallescens* Schreb. in Sturm
Gibelli & Pirota 1882.
Obs.: Reported by Gibelli & Pirota (1882) for the Tre Potenze.

§ *Trifolium pratense* L. subsp. *nivale* Cesati in Cattaneo
Barbero & Bonin 1980 sub *Trifolium pratense* L. var. *nivale* Sieber

Trifolium pratense L. subsp. *pratense*
Caruel 1862 - H scap - HP - Boreal-Tethydic - Grasslands.

§ *Trifolium repens* L.
Caruel 1862.

Trifolium thalii Vill.
Caruel 1862 sub *Trifolium caespitosum* Reyn. - H caesp - HP - Oro-hypsophilous - High
altitude grasslands.

* *Anthyllis vulneraria* L. sensu lato
H scap - HP - European-Mediterranean - Grasslands (Ledges).

Lotus alpinus (DC.) Ramond
Foggi 1989 - H scap - HP - Oro-hypsophilous - Ledges (Grasslands).

Lotus corniculatus L.
Chiarugi 1936 - H scap - HP - Holarctic-Paleotropical - Ubiquist.

Hippocrepis comosa L.
Caruel 1862 - H caesp - HP - European-Mediterranean - Ledges (Grasslands).

* *Hippocrepis emerus* (L.) Lassen
Coronilla emerus L.
NP - WF - European - Woods.

LYTHRACEAE

Lythrum portula (L.) D. A. Webb
Arcangeli 1882 sub *Elatine triandra* Link.
Obs.: Reported by Mr. Duthie and mentioned by Arcangeli (1882 sub *Elatine triandra*
Link.) for the banks of Lago Nero. Levier (in Levier & Sommier, 1891) wrote that it is a
"forma minuscola della *Peplis portula* L., piuttosto comune nei luoghi acquitrinosi intorno
a Boscolungo". Moreover, Levier described it as "apparsa in gran copia nel 1887 nella poz-
zanghera del Taglio Raso della Fornace a Boscolungo, scomparsa nel 1888 con il prosci-
ugamento di quella", "presso il Lago del Greppo, sul Lago Baccioli, ecc. fino al Lago Nero
dove diventa minuscola".

*THYMELAEACEAE**Daphne laureola* L.

Ferrarini 1977 - P caesp - WF - European-Mediterranean - Woods.

Daphne mezereum L.

Caruel 1863 - NP - WF - Eurosibiric - Heathland (Megaforbs).

ONAGRACEAE§ *Circaea alpina* L.

Vitman 1773.

§ *Circaea lutetiana* L. subsp. *lutetiana*

Barbero & Bonin 1980.

Epilobium alsinifolium Vill.

Vitman 1773 sub *Epilobium alpinum* Vitm. non L. - H scap - HP - Arctic-Oro-hypsophilous - Bogs and temporary ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Epilobium anagallidifolium* Lam.

Caruel 1866 sub *Epilobium alpinum* L.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Epilobium angustifolium L. subsp. *angustifolium*

Bertoloni 1839 sub *Epilobium spicatum* Lam. - H scap - HP - Holarctic - Megaforb.

Epilobium montanum L.

Bertoloni 1839 sub *Epilobium montanum* L. var. - H scap - HP - Boreal - Megaforb.

§ *Epilobium obscurum* Schreber*Epilobium virgatum* Fries

Baroni 1899.

Epilobium palustre Moris

Caruel 1862 - H scap - HP - Holarctic - Bogs and temporary ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Epilobium parviflorum* Schreber

Caruel 1862.

*SANTALACEAE**Thesium alpinum* L.

Caruel 1863 - H scap - HP - MedioEuropean-Pontica - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex

A).

§ *Thesium sommieri* Heidrych ex Bechi

Foggia 1989.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

EUPHORBIACEAE

Euphorbia cyparissias L.

Caruel 1863 - H scap - HP - European -Fringe.

Euphorbia dulcis L. subsp. *dulcis*

Caruel 1863 - G rhiz - HP - European - Megaforb.

Euphorbia esula L.

Caruel 1863 - H scap - HP - European -Fringe.

RHAMNACEAE

Rhamnus alpinus L. subsp. *alpinus*

Caruel 1862 - P caesp - WB - Oro-hypsophilous-Oro-Mediterranean - Ledges.

LINACEAE

Linum alpinum Jacq. subsp. *gracilius* (Bertol.) Pignatti

Caruel 1860 sub *Linum alpinum* Jacq. - H scap - HP - Apennine - High altitude grasslands (Ledges) .

Obs.: This species is reported by Caruel (1860) for Balzo del Valloncello near Boscolungo (sub *Linum alpinum* Jacq.). According to Pignatti (1982) the subsp. *alpinum* is exclusive to the northern Alpine chain in Austria and Baviera and does not occur in Italy. Latest studies do not seem to recognise the subsp. *gracilius* (Bertol.) Pignatti as valid and give subsp. *alpinum* for the Northern Alps

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

POLYGALACEAE

Polygala alpestris Reichenb. subsp. *alpestris*

Caruel 1860 sub *Polygala amara* L. - H scap - HP - Oro-hypsophilous - High altitude grasslands.

Polygala vulgaris L.

Caruel 1860.

Obs.: Reported by Caruel (1860) and Archbald (1874) for Boscolungo and by Ferrarini (1977) for Campolino. It was not possible to find the reference species for the latter report. There are many specimens of *Polygala vulgaris* L. in FI!; actually because of the larger dimensions of the upper leaves compared to the lower, they all seem to corresponds to *Polygala alpestris* Reichenb. This species should probably be excluded from the flora of

the Upper Sestaione Valley.

ACERACEAE

Acer pseudoplatanus L.

Caruel 1860 - P scap - W - European - Woods.

OXALIDACEAE

Oxalis acetosella L.

Caruel 1860 - G rhiz - HP - Boreal - Woods.

GERANIACEAE

Geranium nodosum L.

Caruel 1860 - G rhiz - HP - European - Woods.

Geranium pyrenaicum Burm. fil. subsp. *pyrenaicum*

Caruel 1860 - H scap - HP - Eurosibiric-Oro-Mediterranean - Fringe.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Geranium robertianum L. subsp. *robertianum*

Gibelli & Pirota 1882 - H bienn - HB - European-Tethydic - Woods.

Geranium sylvaticum L.

Ferrarini 1974 - H scap - HP - Holarctic - Grasslands.

APIACEAE

Bupleurum falcatum L. subsp. *cernuum* (Ten.) Arcangeli

Caruel 1862 sub *Bupleurum falcatum* L. var. *angustifolium* Caruel - H scap - HP - Medio-European - High altitude grasslands.

§ *Bunium bulbocastanum* L.

Caruel 1862.

Pimpinella saxifraga L. subsp. *alpina* (Host) Nyman

Pimpinella alpestris (Sprengel) Schultes

Pimpinella saxifraga L. subsp. *alpestris* (Sprengel) Arcangeli

Caruel 1862 sub *Pimpinella saxifraga* L. var. *alpestris* Koch - H scap - HP - Oro-hyp-sophilous - Scree slopes (High altitude grasslands).

Aegopodium podagraria L.

Caruel 1862 - G rhiz - HP - Eurosibiric - Woods.

§ *Anthriscus sylvestris* (L.) Hoffm.

Ferrarini 1977.

Chaerophyllum aureum L.

Caruel 1862 - H scap - HP - Eurosibiric - Megaforb.

Chaerophyllum calabricum Guss.

1882a - H scap - HP - Apennine - Megaforb (Bogs and temporary ponds).

Obs.: Levier & Sommier (1891 sub *Chaerophyllum calabricum* Guss.) report "il tipo con fiori rosei, raro nella valle delle Pozze presso Boscolungo", whilst they describe dwarf plants, almost glabrous with shiny leaves found along the "ruscelletti alpini del M. Prataccio sopra Boscolungo, per esempio alla Buca dell'Ortica" as *Chaerophyllum calabricum* Guss. var. *alpinum* Lev. Baroni (1899) confirmed this sighting and reports *Chaerophyllum calabricum* Guss. near Boscolungo in the Fir stands and in the Valle delle pozze, whilst at Lago Nero, above Lago Greppo and the mountain streams of M. Prataccio above Boscolungo, *Chaerophyllum calabricum* Guss. var. *alpinum* Lev. is reported. Gibelli & Pirota (1882) also report one *Chaerophyllum hirsutum* L. var. *glabrum* for Abetone. According to Pignatti (1982 sub *Chaerophyllum hirsutum* L. var. *calabricum* (Guss.) Paoletti) this species is an entity that falls within the wide variability of *Chaerophyllum hirsutum* L., glabrous and has a distribution in the Apennine Arc from Emilia to the Sila. The specimens we collected are totally glabrous, a character that allows us to attribute specimens from the Upper Sestaione Valley to *Chaerophyllum calabricum* Guss. Therefore the reports by Gibelli & Pirota (1882 sub *Chaerophyllum hirsutum* L. var. *glabrum*), Levier & Sommier (1891 sub *Chaerophyllum calabricum* Guss., *Chaerophyllum calabricum* Guss. var. *alpinum* Lev.), Baroni (1899 sub *Chaerophyllum calabricum* Guss. and *Chaerophyllum calabricum* Guss. var. *alpinum* Lev.) must for the moment all be referred to *Chaerophyllum calabricum* Guss.

Chaerophyllum hirsutum L.

Caruel 1862 - H scap - HP - European - Grasslands.

Chaerophyllum magellense Ten.

Chaerophyllum hirsutum L. subsp. *magellense* (Ten.) Pignatti

Gibelli & Pirota 1882 - H scap - HP - Apennine - Grasslands.

Seseli libanotis (L.) Koch subsp. *libanotis*

Caruel 1870 - H scap - HP - European - Ledges.

§ *Katapsuxis silaifolia* (Jacq.) Rafin.

Cnidium silaifolium (Jacq.) Simonkai

Cnidium apioides Sprengel

Ferrarini 1977 sub *Cnidium silaifolium* (Jacq.) Simonkai.

Obs.: Reported for the cliffs of M. Cardoso above Cecchetto, just outside the study area, by Levier & Sommier (1891 sub *Cnidium apioides* Sprengel) and for Campolino by Ferrarini (1977 sub *Cnidium silaifolium* (Jacq.) Simonkai).

Trochiscanthes nodiflora (Vill.) Koch

Caruel 1862 - H scap - HP - Alpine-Apennine - Woods.

Imperatoria ostruthium L.

Peucedanum ostruthium (L.) Koch

Caruel 1866 sub *Peucedanum ostruthium* Koch - H scap - HP - Oro-hypsophilous-Corsican - Megaforb.

Conservation: The species (sub *Peucedanum ostruthium* (L.) Koch) is listed as a plant of

Regional interest (L. R. 56/2000, Annex A).

Pteroselinum austriacum (Jacq.) Reichenb.

Peucedanum austriacum (Jacq.) Koch

Caruel 1866 sub *Peucedanum sulcatum* Nym. - H scap - HP - Medio-European - Woods.
 Obs: Reported by Caruel (1866 sub *Peucedanum sulcatum* Nym.) for the Sestaione Valley at Sega. Levier & Sommier (1891 sub *Peucedanum sulcatum* Nym.) reported that "il tipo glabro è comunissimo sulla sponda destra del Sestaione nella regione del faggio presso Boscolungo", whilst they described plants covered with a velvety down found along the path leading to M. Torto as *Peucedanum sulcatum* Nym. var. *velutinum* Lev. Fiori confirmed this identification (1925 sub *Peucedanum austriacum* (Jacq.) Koch var. *velutinum* Paol.). According to Pignatti (1982 sub *Peucedanum austriacum* (Jacq.) Koch) this species could be extremely variable; on the Apennines it has lanceolate segments 3-4 times longer than wide, corresponding to *Peucedanum montanum* (Schleicher) Koch (= *Peucedanum sulcatum* Nym.). The specimen we collected on a small cliff along the path leading to Lago Nero (n° 102) bears hairs on the rays. In the absence of an in-depth study, we prefer to attribute the specimen from the Upper Sestaione Valley to *Pteroselinum austriacum* (Jacq.) Reichenb. (= *Peucedanum austriacum* (Jacq.) Koch). Therefore reports by Caruel (1866 sub *Peucedanum sulcatum* Nym.), Levier & Sommier (1891 sub *Peucedanum sulcatum* Nym., *Peucedanum sulcatum* Nym. var. *velutinum* Lev.), Baroni (1899 sub *Peucedanum sulcatum* Nym., *Peucedanum sulcatum* Nym. var. *velutinum* Lev.) and Fiori (1925 sub *Peucedanum austriacum* (Jacq.) Koch var. *velutinum* Paol.) should for the moment all be referred to *Pteroselinum austriacum* (Jacq.) Reichenb.

Heracleum sphondylium L. subsp. *pyrenaicum* (Lam.) Bonnier & Layens

Heracleum pyrenaicum Lam.

Caruel 1862 sub *Heracleum panaces* L. - H scap - HP - European - Megaforb.

Obs.: The reports of *Heracleum panaces* L. should probably be referred to *Heracleum sphondylium* L. subsp. *pyrenaicum* (Lam.) Bonnier & Layens even though there are still doubts on the taxonomic rank of *Heracleum panaces* L.

Laserpitium latifolium L.

Ferrarini 1977 - H scap - HP - Medio-European - Grasslands.

Laserpitium siler L.

Caruel 1862 - H scap - HP - Oro-hypsophilous - Scree slopes (Rocky cliffs).

Sanicula europaea L.

Caruel 1862 - H scap - HP - Holarctic-Paleotropical - Woods.

Astrantia pauciflora Bertol. in Desv.

Barbero & Bonin 1980.

Obs.: Endemism of the Apuan Alps, reported by Barbero & Bonin (1980) for Tre Potenze Alps. The species must be excluded from the flora of the Upper Sestaione Valley.

GENTIANACEAE

Gentiana acaulis L.

Gentiana kochiana Perr. & Song

Caruel 1863 - H ros - HP - Oro-hypsophilous - High altitude grasslands (Heathland).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Gentiana asclepiadea L.

Caruel 1863 - H scap- HP - Oro-hypsophilous - Megaforb.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Gentiana lutea L.

Miniati & Romagnoli 2001 - H scap - HP - Oro-hypsophilous-Tethydica - Grasslands (Scree slopes).

Obs.: The first station confirmed for Tuscany is situated in the Upper Sestaione Valley, a little above the ski-station arrival point at M. Gomito (Miniati & Romagnoli 2001) along a grassy canyon interrupted by ledges and heaps of stones. There is a specimen collected by Cherici in FI (!) bearing the following information: "Grotta dei Mattei. Velino, 8 ag. 75, Cherici". The herbarium label has the Tuscany stamp, consequently Foggi (1989) referred the specimen to the Region with doubt. The date when the specimen was entered in the herbarium records, 1876, corresponds to that of the specimens that Cherici collected on M. Velino in Abruzzo. This confirms that the indication "Grotta dei Mattei" refers to M. Velino in Abruzzo and not to Tuscany.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in Annex V of the CEE 92/43/CEE "Habitat" Directive.

Gentiana purpurea L.

Caruel 1863 - H scap - HP - Arctic-Oro-hypsophilous - Heathland.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

§ *Gentiana utriculosa* L.

Caruel 1863.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and a plant of Regional interest (L. R. 56/2000, Annex A).

Gentiana verna L.

Ferrarini 1977 - H ros - HP - Arctic-Oro-hypsophilous - Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Gentianella campestris (L.) Borner subsp. *campestris*

Gentiana campestris L.

Caruel 1863 sub *Gentiana campestris* L. - T scap - HA - Arctic-Oro-hypsophilous - Grasslands (Snow beds).

? *Gentianella ciliata* (L.) Borkh.

Gentiana cilioata L.

Levier & Sommier 1891.

Obs.: Reported by Levier (in Levier & Sommier, 1891) for Boscolungo on the main road as far as Pianosinatico, but we did not find it in the study area although it has been sighted over the last few years near Fontana Vaccaia. As well as several specimens for Boscolungo, Fontana Vaccaia and Cecchetto in FI!, there is also a plant that Levier collected from "Boscolungo al Sestaione"; this report does not allow us to give this species as certain for the Upper Sestaione Valley.

Swertia perennis L.

Caruel 1866 - H scap - HP - Boreal - Bogs and temporary ponds (Streams).

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), it is a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

ASCLEPIADACEAE

§ *Vincetoxicum hirundinaria* Medicus

Vincetoxicum officinale Moench.

Caruel 1863 sub *Vincetoxicum officinale* Moench.

SOLANACEAE

Atropa bella-donna L.

Caruel 1863 - H scap - HP - European-Oro-Mediterranean - Megaforb (Fringe).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

CUSCUTACEAE

* *Cuscuta epithimum* (L.) L.

T par - O - Eurosibiric-Tethydica - Heathland.

MENYANTHACEAE

§ *Menyanthes trifoliata* L.

Caruel 1866.

Obs.: Reported for Lago Nero by Caruel (1866), Archbald (1874), Baroni (1901) and Provasi (1926) but we did not find it. Recently, (Miniati & Romagnoli, 2001), it has been confirmed for Val di Luce below the Passo di Annibale.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

BORAGINACEAE

? *Pulmonaria officinalis* L.

Ferrarini 1977.

Obs.: Reported by Ferrarini (1977) for Campolino, unfortunately it was not possible to confirm this report. There are no specimens for the Abetone area in FI!. In our opinion this

record should be referred to *Pulmonaria apennina* Cristofolini & Puppi or to *Pulmonaria picta* Rouy, the latter species has been found within the study area.

Pulmonaria picta Rouy

Puppi & Cristofolini 1998 - H scap - HP - Western Apennines - Woods.

* *Symphytum officinale* L. subsp. *officinale*

H scap - HP - Eurosibiric-Oro-Mediterranean - Fringe.

§ *Anchusa barrelieri* (All.) Vitman

Levier & Sommier 1891.

Myosotis alpestris F.W. Schmidt

Caruel 1863 sub *Myosotis sylvatica* Hoffm. var. *alpestris* Koch - H scap - HP - Oro-hyp-sophilous-Pontine - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

* *Myosotis arvensis* (L.) Hill

T scap - HA - Boreal-Mediterranean -Fringe.

Myosotis decumbens Host subsp. *florentina* Grau

Caruel 1863 sub *Myosotis sylvatica* Hoffm. p. p. - H scap - HP - Apennines - Woods.

Myosotis scorpioides L.

Baroni 1901 sub *Myosotis palustris* (L.) Hill - H scap - HP - Eurosibiric - Fringe (Grasslands).

Myosotis sylvatica Hoffm.

Gibelli & Pirota 1882 - H scap - HP - Boreal-Tethydic - Fringe.

Cynoglossum officinale L.

Caruel 1863 - H bienn - HB - Eurosibiric-Tethydic - Woods.

LAMIACEAE

Lamium maculatum (L.) L.

Caruel 1863 - H scap - HP - European - Fringe.

Lamium galeobdolon (L.) L.

Lamiastrum galeobdolon (L.) Ehrend. & Polatschek

Caruel 1863 sub *Lamium galeobdolon* (L.) L. - H scap - HP - Eurosibiric-Oro-Mediterranean - Woods - Nemoral.

Ajuga reptans L.

Caruel 1863 - H rept - HP - European-Mediterranean - Fringe.

* *Galeopsis pubescens* Besser

T scap - HA - European - Fringe.

Galeopsis tetrahit L.

Caruel 1863 - T scap - HA - European - Megaforb.

Stachys pradica (Zanted.) Greuter & Pignatti

Levier & Sommier 1891 sub *Betonica hirsuta* L. - H scap - HP - Oro-hypsophilous - Grasslands.

Conservation: This species is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

Stachys recta L. subsp. *labiosa* (Bertol.) Briq.

Stachys recta L. var. *grandiflora* Caruel

Caruel 1863 sub *Stachys recta* L. var. *grandiflora* Caruel - H scap - HP - Oro-hypsophilous - Scree slopes.

Stachys sylvatica L.

Caruel 1863 - H scap - HP - Eurosibiric - Megaforb.

Prunella vulgaris L. subsp. *vulgaris*

Caruel 1863 sub *Brunella vulgaris* L. - H scap - HP - Boreal-Tethydic - Woods.

Acinos alpinus (L.) Moench subsp. *alpinus*

Caruel 1863 sub *Calamintha alpina* Lam. - Ch suffr - WS - Oro-hypsophilous - Grasslands.

Calamintha grandiflora (L.) Moench

Caruel 1863 - H scap - HP - European-Mediterranean - Woods.

* *Clinopodium vulgare* L.

H scap - HP - Holarctic - Fringe.

* *Thymus polytrichus* A.Kerner ex Borbas

Ch rept - WS - Oro-hypsophilous - Grasslands (Ledges).

Thymus pulegioides L.

Ferrarini 1977.

Obs.: Reported by Ferrarini (1977) for Campolino, unfortunately it was not possible to confirm this report. In our opinion this species should be excluded from the flora of the Upper Sestaione Valley. Perhaps it was confused with *Thymus polytrichus* A. Kerner ex Borbas.

Thymus serpyllum L.

Caruel 1863 sub *Thymus serpyllum* L. var. *montanus* Benth.

Obs.: Repeatedly reported, but probably it does not occur in Italy (Pignatti, 1982), it was reported by Caruel (1863) for Boscolungo at Teso (sub *Thymus serpyllum* L. var. *montanus* Benth.), by Archbald (1874), Gibelli & Pirotta (1882) at Boscolungo, Chiarugi (1936) at Campolino and Barbero & Bonin (1980) for M. Gomito. None of the specimens we examined in FI! seem to have the characters of *Thymus serpyllum* L. In our opinion, this species should be excluded from the flora of the Upper Sestaione Valley. Perhaps it was confused with *Thymus polytrichus* A. Kerner ex Borbas.

Salvia glutinosa L.

Parlatore in Caruel 1884 - H scap - HP - European - Megaforb.

CALLITRICHACEAE

Callitriche palustris L.

Callitriche verna L.

Caruel 1866 sub *Callitriche verna* L. var. *pedunculata* (DC) Caruel = *Callitriche verna* L. var. *alpina* Parl. - I rad - HY - Boreal - Bogs and temporary ponds - Hygrophytic.

Obs.: The reports by Caruel (1866) for Lago Nero of *Callitriche verna* L. var. *pedunculata* (DC) Caruel, by Parlatore in Caruel (1884), di Levier & Sommier (1891) and by Baroni (1899) of *Callitriche verna* L. var. *alpina* Parl. for Lago Nero at Pianaccio above Lago Greppo and elsewhere over 1600 m, by Archbald (1874, sub *Callitriche verna*) for Lago Nero, Gibelli & Pirota (1882, sub *Callitriche verna*) for Lago Greppo below the Tre Potenze and by Provasi (1926) for Lago Nero as *Callitriche palustris* L. var. *verna* (L.) f. *minima* (Hoppe) and Lago Greppo as *Callitriche palustris* L. var. *verna* (L.) should all be referred to *Callitriche palustris* L.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

PLANTAGINACEAE

Plantago alpina L. subsp. *alpina*

Gibelli & Pirota 1882 - H ros - HP - Oro-hypsophilous - High altitude grasslands (Snow beds).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Plantago lanceolata L.

Caruel 1863 - H ros - HP - Eurosibiric-Tethydic -Fringe.

Plantago major L.

Caruel 1863 - H ros - HP - Cosmopolitan - Anthropic.

Plantago maritima L. subsp. *serpentina* (All.) Arcangeli*Plantago serpentina* All.

Caruel 1863 sub *Plantago maritima* L. - H ros - HP - Oro-hypsophilous - Scree slopes (Grasslands).

SCROPHULARIACEAE

Scrophularia alpestris J. Gay ex Bentham in DC.*Scrophularia scopolii* Hoppe ex Pers.

Bertoloni 1844 sub *Scrophularia scopolii* Hoppe ex Pers. - H scap - HP - Medio-European-Pontine - Megaforb (Fringe).

Scrophularia nodosa L.

Caruel 1863 - H scap - HP - Eurosibiric - Woods.

§ *Gratiola officinalis* L.

Levier & Sommier 1891.

Verbascum thapsus L. subsp. *montanum* (Schrader) Bonnier & Layes*Verbascum thapsus* L. subsp. *crassifolium* (Lam. & DC.) Murb.

Baroni 1901 sub *Verbascum montanum* Schrader - H bienn - HB - Atlantic-Medio-European - Grasslands (Ledges).

Linaria purpurea (L.) Miller subsp. *montana* (Caruel) Arcangeli

Linaria purpurea (L.) Miller var. *montana* Caruel

Caruel 1863 sub *Linaria purpurea* (L.) Miller var. *montana* Caruel - H scap - HP - Apennines - Scree slopes.

Conservation: The species (sub *Linaria purpurea* (L.) Miller) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Linaria vulgaris Miller

Baroni 1901 - H scap - HP - Boreal-Tethydic - Fringe.

Digitalis lutea L. subsp. *lutea*

Caruel 1863 - H scap - HP - Medio-European - Fringe.

Obs.: Levier in (Levier & Sommier 1891) reported a var. *pubescens* Levier for the Sestaione Valley for which he wrote "vedasi la descrizione di PARLATORE nella Flora d'Italia, Vol. VI, pag. 544". Parlatore in Caruel (1885) to describe *Digitalis lutea* L. mentioned a "pianta di Boscolungo nell'Appennino toscano". For this reason, the indications sub *Digitalis lutea* L. var. *pubescens* Levier must be referred to the species reported here.

? *Veronica austriaca* L.

Barbero & Bonin 1980.

Obs.: Reported by Barbero & Bonin (1980) for the Upper Sestaione Valley and for the Tre Potenze Alps, unfortunately it was not possible to confirm these reports. There are no specimens for the Abetone area in FI!. The species should be considered as dubious for the Upper Sestaione Valley.

Veronica beccabunga L. subsp. *beccabunga*

Caruel 1863 - H rept - HP - Holarctic-Paleotropical - Streams.

Veronica chamaedrys L. subsp. *chamaedrys*

Caruel 1863 - H scap - HP - Eurosibiric - Megaforb.

Veronica fruticans Jacq.

Foggi 1989 - Ch suffr - WS - Holarctic - High altitude grasslands (Scree slopes).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Veronica fruticolosa L.

Caruel 1863

Obs.: The reports by Caruel (1863), Archbald (1874), Gibelli & Pirota (1882) and Baroni (1901) must be attributed to *Veronica fruticans* Jacq. The two specimens of Levier examined in FI! ("Boscolungo. Tre Potenze pré la cima" and "Boscolungo. Buca dell'Ortica") should also be referred to *Veronica fruticans* Jacq. The species should therefore be excluded from the flora of the Upper Sestaione Valley.

Veronica officinalis L.

Caruel 1863 - H rept - HP - Boreal- Grasslands.

Veronica serpyllifolia L.

Caruel 1863 - H rept - HP - Cosmopolitan - Woods.

Veronica urticifolia Jacq.

Caruel 1863 - H scap - HP - Oro-hypsophilous - Woods.

? *Melampyrum sylvaticum* L.

Giannini & Screm 1973.

Obs.: Reported by Giannini & Screm (1973) for M. Poggione. We could not find any reference specimens in FI! nor did we find it in the field.

Euphrasia alpina Lam.

Levier & Sommier 1891 - T scap - HA - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Euphrasia minima Jacq ex DC. in Lam. & DC.

Levier & Sommier 1891 - T scap - HA - Oro-hypsophilous - Snow beds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

* *Euphrasia salisburgensis* Funck in Hoppe

T scap - HA - European - Scree slopes.

Pedicularis tuberosa L.

Vitman 1773 sub *Pedicularis rostrata* L. - H ros - HP - Oro-hypsophilous - High altitude grasslands (Ledges).

Obs.: The reports by Vitman (1773), Caruel (1863) and Archbald (1874) of *Pedicularis rostrata* L. for the Sestaione Valley should be referred to this species here.

* *Rhinanthus angustifolius* C. C. Gmelin subsp. *angustifolius*

Rhinanthus serotinus (Scönh.) Oborny

T scap - HA - Eurosibiric - Grasslands.

§ *Rhinanthus minor* L.

Caruel 1863 sub *Rhinanthus crista-galli* L.

GLOBULARIACEAE

Globularia incanescens Viviani

Caruel 1863 - H scap - HP - Apennine Tosco-Emiliana-Alpi Apuane - Rocky cliffs.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is a plant of Regional interest (L. R. 56/2000, Annex A).

O ROBANCHACEAE

? *Orobanche alba* Stephan ex Willd.

Gibelli & Pirota 1882 sub *Orobanche epithymum* DC.

Obs.: Reported for the Modenese Apennines by Gibelli & Pirota (1882 sub *Orobanche epithymum* DC.). There is a single specimen (in FI!) collected by Sommier at Balzo del

Valloncello above Boscolungo which carries a label with the following information "Stigma violetto. Antere violette. Corolla e tutta la spiga violetta con strie più cariche. Credo su *Thymus serpyllum*". However, the specimen is difficult to identify.

Orobanche gracilis Sm.

Caruel 1863 sub *Orobanche cruenta* Bertol. - T par - O - European-Tethydic - Ledges.

LENTIBURACEAE

? *Pinguicula leptoceras* Reichenb.

Gerdol & Tomaselli 1993.

Obs.: In our opinion the reports of *Pinguicula leptoceras* Reichenb. for the Tuscan-Emilian Apennines should be referred to *Pinguicula vulgaris* L. The species should therefore be considered as dubious for the Upper Sestaione Valley.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), it is a plant of Regional interest (L. R. 56/2000, Annex A) and included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

§ *Pinguicula longifolia* Ramond ex DC. subsp. *reichenbachiana* (Schindler) Casper

Pinguicula reichenbachiana Schindler

Foggi 1989.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

Pinguicula vulgaris L.

Vitman 1773 sub *Pinguicula alpina* Vitm. non L. - H ros - HP - Boreal - Bogs and temporary ponds (Streams).

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is a plant of Regional interest (L. R. 56/2000, Annex A).

CAMPANULACEAE

§ *Campanula latifolia* L.

Ferrarini 1977.

Campanula rotundifolia L. subsp. *rotundifolia*

Gibelli & Pirotta 1882 - H scap - HP - Holarctic - Grasslands (Ledges).

Campanula scheuchzeri Vill. subsp. *scheuchzeri*

Caruel 1863 - H scap - HP - Oro-hypsophilous - Heathland (Grasslands).

Campanula trachelium L. subsp. *trachelium*

Levier & Sommier 1891 sub *Campanula trachelium* L. var. *albiflora* (L.) - H scap - HP - European-Mediterranean - Woods.

Phyteuma hemisphaericum L.

Caruel 1863 - H scap - HP - Oro-hypsophilous - High altitude grasslands.

Phyteuma michelii All.

Phyteuma scorzonerifolium Vill.

Caruel 1863 - H scap - HP - Western Alps-Northern Apennines - Grasslands - Pastures.

Obs.: Caruel (1863) in his introduction to the Flora of Tuscany, writes "Questa è certamente la pianta di Micheli, la sola fra le affini che nasca in Toscana, e per conseguenza quella di Allioni che la riceve appunto di Toscana. Non ne differisce la pianta si Savoja e del Delfinato descritta dal Villars col nome di *P. scorzonerifolia*". According to Caruel (1863) and Kerguélen (1993) we use the name *P. michelii*.

Phyteuma orbiculare L.

Caruel 1863 - H scap - HP - Oro-hypsophilous - Grasslands (Ledges).

Phyteuma ovatum Honckeney subsp. *pseudospicatum* Pignatti

Caruel 1863 sub *Phyteuma halleri* All. - H scap - HP - Apennine - Megaforb.

Obs.: All reports of *Phyteuma halleri* All. for the Upper Sestaione Valley should be referred to this species here.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

RUBIACEAE

Asperula aristata L. fil. subsp. *oreophila* (Briq.) Hayek in Hegi

Caruel 1863 sub *Asperula longiflora* Waldst. & Kit. - Ch suffr - WS - Oro-hypsophilous - Rocky cliffs (Scree slopes).

Obs.: The records by Gibelli & Pirota (1882) and Ferrarini (1977) for *Asperula cynanchica* L., by Caruel (1863), Archbald (1874), Gibelli & Pirota (1882) and Baroni (1899) as *Asperula longiflora* Waldst. & Kit. should probably be referred to this species.

Asperula taurina L.

Barbero & Bonin 1980 - G rhiz - HP - Medio-European-Pontine - Woods.

Galium album Miller*Galium erectum* Hudson*Galium mollugo* L. subsp. *erectum* Syme in Sowerby

Caruel 1863 sub *Galium erectum* Hudson - H scap - HP - Eurosibiric-Mediterranean - Grasslands (Margins).

Galium anisophyllum Vill.

Caruel 1863 sub *Galium sylvestre* Pollich - H scap - HP - Oro-hypsophilous - Grasslands.

* *Galium aparine* L.

T scap - HA - Holarctic - Woods - Nemoral.

Galium aristatum L.

Ferrarini 1977 sub *Galium sylvaticum* L. var. *aristatum* (L.) Fiori - H scap - HP - Medio-European - Woods

Galium laevigatum L.*Galium aristatum* L. subsp. *laevigatum* (L.) Arcangeli

Gibelli & Pirota 1882 sub *Galium aristatum* L. var. *laevigatum* Vill. - H scap - HP -

European - Woods.

Galium mollugo L.

Caruel 1863 - H scap - HP - European-Mediterranean - Megaforb.

Galium odoratum (L.) Scop.

Asperula odorata L.

Caruel 1863 sub *Asperula odorata* L. - G rhiz - HP - Boreal - Woods.

Galium palustre L.

Caruel 1863 - H scap - HP - Boreal - Pondss (Bogs and temporary ponds).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

? *Galium pusillum* L.

Ferrarini 1999.

Obs.: Reported by Ferrarini (1999) for Campolino. Endemic to the Western Alps whose distribution area reaches as far as the Maritime Alps as far as Provence and the Massif Central. Also reported for many parts of the Alps, the northern Apennines and Corsica, but everywhere to be confirmed (Pignatti, 1982). We did not find and reference specimens in FI! nor we did find it in the field. Very probably the species was confused with *Galium anisophyllum* Vill.

Galium rotundifolium L.

Caruel 1863 - H scap - HP - Eurosibiric-Mediterranea - Woods.

? *Galium rubrum* L.

Caruel 1863

Obs.: Reported by Caruel (1863) for Boscolungo at Balzo. On examining the specimen in FI! ("Boscolungo. Buca Ortica pré le route .. vers Balzo, 12 aug 86, Levier") we could not establish the colour of the corolla, but which in any case does not seem to be purple as the dried plant was quite pale. The stalk does not have patent hairs at the base. The plant is about 30 cm. Tall. The floral peduncles are quite long, generally about 2 mm (sometimes reaching 3 mm). The corolla lobes are apiculate. Very probably the species was confused with *Galium obliquum* Vill.

§ *Galium sylvaticum* L.

Caruel 1863

Galium verum L. subsp. *verum*

Caruel 1863 - H scap - HP - Boreal - Grasslands.

Cruciata glabra (L.) Ehrend.

Galium vernum Scop.

Gibelli & Pirota 1882 sub *Galium vernum* Scop. - H scap - HP - Eurosibiric-Mediterranean - Fringe.

Cruciata laevipes Opiz

Galium cruciata (L.) Scop.

Caruel 1863 sub *Galium cruciata* (L.) Scop. - H scap - HP - Eurosibiric-Mediterranean -

Megaforb.

CAPRIFOLIACEAE

Sambucus racemosa L.

Caruel 1862 - P caesp - WB - European - Megaforb.

§ *Lonicera alpigena* L. subsp. *alpigena*

Arcangeli 1882

Lonicera nigra L.

Caruel 1863 - P caesp - WB - Oro-hypsophilous - Megaforb.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

ADOXACEAE

§ *Adoxa moschatellina* L.

Levier & Sommier 1891.

VALERIANACEAE

Valeriana officinalis L. subsp. *tenuifolia* Schulbler & Martens

Valeriana collina Wallroth

Caruel 1863 sub *Valeriana officinalis* L. - H scap - HP - Medio-European - Megaforb.

Conservation: The species (sub *Valeriana officinalis* L.) is a plant of Regional interest (L. R. 56/2000, Annex A).

Valeriana tripteris L.

Caruel 1863 - H scap - HP - Medio-European - Scree slopes (Ledges).

DIPSACACEAE

Knautia arvernensis (Briq.) Szabò

Knautia drymeia Heuffel

Caruel 1863 sub *Knautia sylvatica* Duby - H scap - HP - Oro-hypsophilous - Megaforb.

Knautia timeroyi Jordan subsp. *collina* (Schubler ex Martens) Breistr.

Knautia purpurea (Vill.) Borbàs var. *calabrica* Szabò

Knautia calycina (Presl) Guss.

Baroni 1899 sub *Knautia arvensis* Coulter - H scap - HP - Oro-hypsophilous - Grasslands.
Obs.: Reported by Baroni (1899 sub *Knautia arvensis* Coulter) for the Upper Sestaione Valley. There are several specimens in FI! for the Abetone Apennines (Prati di Macerino, Balzo del Valloncello and Doccion della Volpe) identified as *Knautia arvensis* Coulter or *Scabiosa arvensis* L. The specimens all have a few leaves along the stalk and very close lower internodes. Fiori (1927) reports *Knautia arvensis* (L.) Coulter var. *calabrica* Fiori (= *Knautia calycina* (Presl) Guss.) for Boscolungo. Pignatti (1982) reports *Knautia calycina* (Presl) Guss. (= *Knautia arvensis* (L.) Coulter var. *calabrica* Fiori) for Boscolungo, but

the same author writes that it is confused with *Knautia pupurea* (Vill.) Borbas. With regard to the latter, Pignatti himself confirms that the Pistoiese Apennine (Boscolungo, Abetone), central and southern Apennine populations corresponds to the var. *calabrica* Szabò and have an apical segment longer than the rest of the leaf. Sarfatti (1965) considers *Knautia pupurea* (Vill.) Borbàs var. *calabrica* Szabò and *Knautia arvensis* (L.) Coulter var. *calabrica* Fiori (= *Knautia calycina* (C. Presl) Guss.) to be synonyms. Without an in-depth study, we prefer to attribute the individuals in the Upper Sestaione Valley to *Knautia timeroyi* Jordan subsp. *collina* (Schubler ex Martens) Breistr. (= *Knautia pupurea* (Vill.) Borbàs). Consequently, reports by Baroni (1899 sub *Knautia arvensis* Coulter), Fiori (1927 sub *Knautia arvensis* (L.) Coulter var. *calabrica* Fiori) and Pignatti (1982 sub *Knautia calycina* (Presl) Guss. and *Knautia pupurea* (Vill.) Borbàs var. *calabrica* Szabò) should, for the moment, all be referred to this species.

Conservation: The species (sub *Knautia pupurea* (Vill.) Borbàs var. *calabrica* Szabò) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Scabiosa columbaria L.

Caruel 1863 - H scap - HP - Holarctic-Paleotropical - Ledges (Grasslands).

Scabiosa lucida Vill. subsp. *lucida*

Caruel 1863 - H scap - HP - Oro-hypsophilous - Ledges (Grasslands).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ASTERACEAE

Aster alpinus L. subsp. *alpinus*

Puccinelli 1848 - H scap - HP - Boreal - High altitude grasslands (Ledges).

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is a plant of Regional interest (L. R. 56/2000, Annex A).

Aster bellidiastrum (L.) Scop.

Bellidiastrum michelii Cass.

Gibelli & Pirota 1882 sub *Bellidiastrum michelii* Cass. - H ros - HP - Oro-hypsophilous - Rocky cliffs.

Obs.: All reports of *Bellidiastrum michelii* Cass. for the Upper Sestaione Valley should be referred to *Aster bellidiastrum* (L.) Scop.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Bellis perennis L.

Caruel 1863 - H ros - HP - Holarctic - Grasslands.

Erigeron alpinus L. subsp. *alpinus*

Caruel 1863 - H scap - HP - Oro-hypsophilous-Pontic - High altitude grasslands Hypsophilous.

* *Erigeron uniflorus* L. subsp. *uniflorus*

H scap - HP - Boreal - High altitude grasslands.

Solidago virgaurea L. subsp. *alpestris* (Waldst. & Kit. ex Willd.) Gremlí

Caruel 1863 sub *Solidago virgaurea* L. var. *alpestris* (Jan.) Caruel - H scap - HP - Boreal - Heathland

Gnaphalium uliginosum L. var. *prostratum* (Fiori) Fiori in Fiori & Béguinot

Baroni 1901 sub *Gnaphalium uliginosum* L. - T scap - HA - Apennine - Bogs and temporary ponds.

Obs.: Provasi (1922) for Lago Nero describes *Gnaphalium uliginosum* L. f. *pygmaeum* Provasi (*Lectotypus* in FI: Lago Nero - Valle del Sestaione, Appennino Settentrionale, 20 Oct 1921, legit T. Provasi). According to Signorini (1995) the latter falls within the variability of *Gnaphalium uliginosum* L. var. *prostratum* (Fiori) Fiori in Fiori & Béguinot and should be considered as a synonym of the same.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Omalotheca supina (L.) DC.

Gnaphalium supinum L.

Caruel 1863 sub *Gnaphalium supinum* L. - H scap - HP - Holarctic - Snow beds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Omalotheca sylvatica (L.) Schultz Bip. & F. W. Schultz

Gnaphalium sylvatica L.

Caruel 1863 sub *Gnaphalium sylvatica* L. - H scap - HP - Eurosibiric-Tethydica - Grasslands.

Antennaria dioica (L.) Gaertner

Caruel 1863 - Ch rept - HP - Holarctic - Grasslands (Scree slopes).

Tussilago farfara L.

Caruel 1863 - G rhiz - HP - European-Tethydic - Anthropic.

Petasites albus (L.) Gaertner

Caruel 1863 - G rhiz - HP - European - Megaforb.

Petasites hybridus (L.) Gaertner, B. Meyer & Scherb.

Petasites officinalis Moench

Ferrarini 1977 sub *Petasites officinalis* Moench - G rhiz - HP - European - Streams.

Homogyne alpina (L.) Cass.

Caruel 1863 - H ros - HP - Oro-hypsophilous - Heathland.

§ *Adenostyles alpina* (L.) Bluff. & Fingerh. subsp. *alpina*

Caruel 1863.

Obs.: The report of *Adenostyles australis* (Ten.) Nyman (Ferrarini, 1999) for M. Poggione at Campolino should probably be referred to this species.

Doronicum austriacum Jacq.

Caruel 1863 - G rhiz - HP - Oro-hypsophilous - Megaforb.

Doronicum columnae Ten.

Levier & Sommier 1891 - G rhiz - HP - Oro-hypsophilous-Pontine - Scree slopes (Ledges).
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Senecio ovatus (G. Gaertner, B. Meyer ex Scherb.) Willd. subsp. *alpestris* J. Herborg

Senecio fuchsii Gmelin

Vitman 1773 sub *Senecio sarracenicus* L. - H scap - HP - European - Woods (Megaforb).

Senecio provincialis (L.) Druce subsp. *provincialis*

Senecio doronicum (L.) L. subsp. *gerardii* (Godron & Gren.) Nyman

Baroni 1901 sub *Senecio doronicum* (L.) L. - H scap - HP - Oro-hypsophilous - Ledges.

Senecio rupestris Waldst. & Kit.

Caruel 1863 sub *Senecio laciniatus* Bertol. - H scap - HP - Oro-hypsophilous - Scree slopes (Fringe).

? *Achillea macrophylla* L.

Vitman 1773 sub *Achillea clavennae* L.

Obs.: Reported by Vitman (1773 sub *Achillea clavennae* L.) "...alla cima delle Alpi tra il Lago nero a mano manca and il Lago santo a destra; inviandoci quindi verso le Alpi di Lucca" and by Caruel (1863 sub *Achillea macrophylla* L.) "presso la cima dei monti che rimangono tra il Lago Nero ed il Lago Santo". There are no samples of this species for Tuscany in FI!.

Achillea millefolium L.

Caruel 1863 - H scap - HP - Eurosibiric - Grasslands.

* *Achillea stricta* (Koch) Schleicher ex Gremler

H scap - HP - Oro-hypsophilous - Grasslands.

* *Matricaria discoidea* DC.

T scap - HA - Avventizia - Anthropic.

Leucanthemum heterophyllum (Willd.) DC.

Caruel 1863 sub *Leucanthemum montanum* DC. - H scap - HP - Alpine-Apennine - Ledges.

Obs.: Levier (in Levier & Sommier, 1891) describes a *Leucanthemum lobulatum* Levier for "Taglio raso della Fornace at Boscolungo". Here we report the diagnosis written by Levier: "Capolini del *L. vulgare* var. *atratum* DC.; notevole per le foglie delle rosette estive, lunghe da 11 a 20 cent. largamente trilobata all'estremità, i lobi divisi in lobuli ottusi; rachide munita, dai due terzi superiori in su, di lobuli semplici ottusi. Caule ramoso, alto da 25 a 45 cent". Fiori (1927) includes *Leucanthemum lobulatum* Levier under *Chrysanthemum leucanthemum* L. var. *heterophyllum* Fiori & Paol.

* *Leucanthemum* cfr. *pallens* (Gay) DC.

H scap - HP - Oro-hypsophilous - Grasslands.

Leucanthemum vulgare Lam.

Caruel 1863 - H scap - HP - Holarctic - Anthropic.

* *Eupatorium cannabinum* L.

H scap - HP - European - Anthropic.

Carlina acaulis L. subsp. *caulescens* (Lam.) Schubler & Martens

Caruel 1863 sub *Carlina acaulis* L. - H ros - HP - MedioEuropean - Grasslands.

* *Arctium minus* Bernh.

H bienn - HB - European-Mediterranean - Anthropic.

Carduus carlinifolius Lam. subsp. *carlinifolius*

Caruel 1863 - H scap - HP - Oro-hypsophilous - Grasslands.

Cirsium acaule Scop. subsp. *acaule*

Caruel 1863 - H ros - HP - European - Scree slopes.

Obs.: Reported by Caruel (1863), Archbald (1874) and Gibelli & Pirotta (1882) for Boscolungo and the Tre Potenze. Levier (in Levier & Sommier, 1891) for the grasslands below Serrabassa "la varietà (del tipo acaule) con fiori bianchi", whilst for "Boscolungo nella Valle del Sestaione sopra il Ponte alla Segaccia, al Cecchetto e altrove" the var. *caulescens* DC. occurs. These sightings appear again in Baroni (1901) who describes the white flowered variety as occurring in the grasslands below Serrabassa as var. *floribus albis*. Levier (in Levier & Sommier, 1891) found a hybrid form in 1874 (*Cirsium lanceolatum* x *acaule*) in four "esemplari mono-tricefali" at Mago near Boscolungo; but Levier never found it again. With regarding to *Cirsium acaule* Scop., Fiori (1927) reports a var. *typicum* and a var. *dubium* Fiori (= *Cirsium acaule* Scop. var. *caulescens* DC.) with a stalk reaching 10-30 cm in height that also occurred at Boscolungo; moreover in his description of *Cirsium acaule* Scop. he writes that the flowers are purple and, rarely, white. The individuals from the Upper Sestaione Valley have a subnull stalk and therefore should be attributed to *Cirsium acaule* Scop. subsp. *acaule*. The reports by Levier (in Levier & Sommier, 1891 sub *Cirsium acaule* Scop. var. *caulescens* DC.), Baroni (1901 sub *Cirsium acaule* Scop. var. *caulescens* DC. and sub *Cirsium acaule* Scop. var. *floribus albis*) and Fiori (1927 sub *Cirsium acaule* Scop. var. *dubium* Fiori) are, for the moment, all referred to *Cirsium acaule* Scop. subsp. *acaule*.

Cirsium arvense (L.) Scop.

Caruel 1863 - G rad - HP - Holarctic - Megaforb (Fringe).

Cirsium bertolonii Sprengel

Vitman 1773 sub *Cirsium spinosissimum* Scop. - H scap - HP - Northern Apennine - Scree slopes.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

* *Cirsium eriophorum* (L.) Scop. subsp. *eriophorum*

H bienn- HB - European-Oro-Mediterranean - Grasslands.

Cirsium erisithales (Jacq.) Scop.

Bertoloni 1853 - H scap - HP - Oro-hypsophilous - Megaforb.

* *Cirsium vulgare* (Savi) Ten.

H bienn- HB - Eurosibiric-Tethydic - Anthropic.

* *Serratula tinctoria* L. subsp. *monticola* (Boreau) Berher in L. Louis

Serratula tinctoria L. var. *pinnata* Kit.

H scap - HP - European - Grasslands.

§ *Centaurea arrigoni* Greuter

Centaurea intermedia (Fiori) Arrigoni non Mutel; *C. maculosa* f. *intermedia* Micheletti Caruel 1863 sub *Centaurea maculosa* sensu Caruel non Lam.

Obs.: The taxonomic treatment is in accordance with Greuter (2003).

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Centaurea austriaca Willd.

Centaurea phrygia L. subsp. *pseudophrygia* (C. A. Meyer) Gugler Caruel 1863.

Obs.: Reported by Caruel (1863) for Boscolungo. There is a specimen collected by Sommier for the Pistoiese Apennines above Boscolungo towards Balzo del Valloncello in FI!. Sommier added several notes for this specimen: "Se si guarda camicia di *Centaurea nigrescens* si troverà esemplari dell'Abetone che sono un passaggio a questo" ... "non può essere quella che Levier chiama *rhaetica*. Almeno in erbario non torna" ... "escluso *nigra* perché appendici erectae nervosa esclusa perché ... squame scoperte and phrygia escluso .. Rimane solo *austriaca*" ... "Forma da esaminare con maggiore materiale è quasi passaggio dalla *nigra* o *nigrescens* alla *phrygia* o *austriaca*". This specimen has cauline leaves that are rough to the touch and single flower-head. Because of the aspect of its appendices, in our opinion it appears to belong to the *Centaurea nervosa* group but not to *Centaurea rhaetica* as it is a subglabrous plant.

Centaurea montana L.

Gibelli & Pirota 1882 - H scap - HP - MedioEuropean - Ledges.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Centaurea nigrescens Willd.

Gibelli & Pirota 1882 - H scap - HP - Medio-European - Megaforb.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Centaurea rhaetica Moritzi

Levier & Sommier 1891.

Obs.: Reported by Levier & Sommier (1891) near Boscolungo at Pra di Lanna on the Modenese slope and below the Tre Potenze, but never found again. There are no specimens for the Abetone area in FI!. The species must be excluded from the flora of the Upper Sestaione Valley.

* *Centaurea triumfetti* All.

H scap - HP - Eurosibiric-Oro-Mediterranean - Ledges.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Centaurea uniflora Turra subsp. *nervosa* (Willd.) Bonnier & Layens

Centaurea nervosa Willd.

Ferrarini 1977 sub *Centaurea uniflora* Turra var. *nervosa* (Willd.) Fiori - H scap - HP - Oro-hypsophilous - Grasslands.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is a plant of Regional interest (L. R. 56/2000, Annex A).

Hypochaeris robertia Fiori

Robertia taraxacoides (Loisel.) DC.

Archbald 1874 sub *Robertia taraxacoides* (Loisel.) DC. - H ros - HP - Apennine-Oro-central-west Mediterranean - Rocky cliffs.

Conservation: The species (sub *Robertia taraxacoides* (Loisel.) DC.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Leontodon anomalus* Ball

Caruel 1863.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Leontodon hispidus L.

Caruel 1863 sub *Leontodon hispidus* L. var. *glabratum* Koch - H ros - HP - European - Grasslands (Scree slopes).

Leontodon pyrenaicus Gouan subsp. *helveticus* (Mérat) Finch & P.D. Sell

Leontodon helveticus Mérat

Caruel 1866 sub *Leontodon pyrenaicus* Gouan - H ros - HP - Oro-hypsophilous - Heathland.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Scorzonera purpurea L. subsp. *rosea* (Waldst. & Kit.) Nyman

Scorzonera rosea Waldst. & Kit.

Caruel 1863 sub *Scorzonera purpurea* L. - H scap - HP - Oro-hypsophilous - Grasslands.

Obs.: In agreement with Pignatti (1982), reports of *Scorzonera purpurea* L. for the northern Apennines should be referred to *Scorzonera purpurea* L. subsp. *rosea* (Waldst. & Kit.) Nyman.

Conservation: The species (sub *Scorzonera rosea* Waldst. & Kit.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Cicerbita alpina (L.) Wallr.

Levier & Sommier 1891 sub *Mulgedium alpinum* Less. - H scap - HP - Oro-hypsophilous - Megaforb.

Obs.: The station mentioned by Baroni (1901 sub *Mulgedium alpinum* Less.) along the Doccione stream near Lago del Greppo has been confirmed by Ferrarini (1974, 1979) and more recently by Miniati & Romagnoli (2001). Reports by Caruel (1863) "presso la cima

del M. Gotro di Lunigiana (Bert.) e nell'Appennino Lucchese per la strada del Lago Nero a Montefegatesi alla serra di que macigni che pare scendino dalla montagna di Controne (Vitm.)" and by Archbald (1874) at "Lago Nero - Montefegatesi - Serra di Controne" do not allow us to list the species also for Lago Nero, where, moreover, we never found it during the present study.

Prenanthes purpurea L.

Caruel 1863 - H scap - HP - European - Woods.

Mycelis muralis (L.) Dumort.

Lactuca muralis (L.) G. F. W. Meyer

Caruel 1863 sub *Lactuca muralis* Fresen. - H scap - HP - Eurosibiric-Mediterranean - Woods.

* *Taraxacum laevigatum* (Willd.) DC. (aggregate)

H ros - HP - Cosmopolitan - Scree slopes.

Taraxacum officinale Weber in Wiggers (aggregate)

Caruel 1863 - H ros - HP - Boreal-Tethydic - Anthropic.

Crepis aurea (L.) Cass. subsp. *glabrescens* (Caruel) Arcangeli

Caruel 1863 sub *Crepis aurea* (L.) Cass. var. *glabrescens* Caruel - H ros - HP - Oro-hypsophilous - Grasslands (Snow beds).

Obs. Levier (in Levier & Sommier, 1891) for M. Majori (outside the study area) report a form that is "furcata & bifurcata con 2 o 3 capolini".

§ *Crepis leontodontoides* All.

Caruel 1863.

Crepis paludosa (L.) Moench

Caruel 1863 - H scap - HP - Boreal - Springs.

Hieracium amplexicaule L.

Gibelli & Pirotta 1882 - H scap - HP - European - Grasslands.

? *Hieracium apenninum* Levier nomen nudum

Levier & Sommier 1891.

Obs.: Reported by Levier (in Levier & Sommier, 1891) for a single locality in the Sestaione Valley below Belvedere in the Beech woods area. However no description of the species is given in his publication. There are no specimens of the species for Tuscany in FI! and it should therefore be considered as dubious for the Upper Sestaione Valley.

Hieracium brunelliforme Arv.-Touv.

Foggi 1989 - H scap - HP - Oro-hypsophilous - Rocky cliffs.

Obs.: Reported by Foggi (1989) for the M. Campolino.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Hieracium dentatum Hoppe in Sturm

Foggi 1989 - H ros - HP - Oro-hypsophilous - Rocky cliffs.

Obs.: Reported by Foggi (1989) for the M. Campolino.

Hieracium grovesianum Arvet-Touvet

Ferrarini 1999 - H scap - HP - Alpine-Apennine - Woods.

§ *Hieracium humile* Jacq.

Levier & Sommier 1891.

Hieracium lactucella Wallr.

Hieracium auricula Lam. & DC.

Barbero & Bonin 1980 - H ros - HP - European - Grasslands.

Hieracium pilosella L.

Caruel 1863 - H ros - HP - Eurosibiric-Oro-Mediterranean - Ledges (Grasslands).

§ *Hieracium racemosum* Walds & Kit.

Baroni 1901 sub *Hieracium heterospermum* Artv. var. *racemosum* (Walds & Kit.).

Hieracium sylvaticum (L.) L.

Caruel 1863 sub *Hieracium murorum* L. - H scap - HP - European - Woods.

Obs.: All reports of *Hieracium murorum* L. for the Upper Sestaione Valley should be referred to this species here.

Hieracium villosum Jacq.

Caruel 1863 sub *Hieracium villosum* Jacq. var. *nudiusculum* Bert. - H scap - HP - Oro-hyp-sophilous - Rocky cliffs (Scree slopes).

§ *Hieracium vulgatum* Fries

Hieracium lachenalii Gmelin

Gibelli & Pirota 1882.

* *Hieracium x niphostribes* Peter

Hieracium x niphobium Naegeli & Peter

H scap - HP - Alpine-Northern Apennine - Scree slopes.

Obs.: The specimen collected exhibits characters intermediate between *Hieracium auricula* and *Hieracium glaciale*.

TRILLIACEAE

Paris quadrifolia L.

Caruel 1864 - G rhiz - HP - Boreal - Woods.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

CONVALLARIACEA

§ *Polygonatum multiflorum* (L.) All.

Caruel 1864.

Polygonatum verticillatum (L.) All.

Caruel 1864 - G rhiz - HP - European-Iranic-Turanian - Megaforb.

Streptopus amplexifolius (L.) DC. in Lam. & DC.

Streptopus distortus Mich.

Caruel 1864 sub *Streptopus distortus* Mich. - G rhiz - HP - Boreal - Woods - Nemoral.

HYACINTHACEAE

Scilla bifolia L.

Ferrarini 1977 - G bulb - H bu - Eurosibiric-Oro-Mediterranean - Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

ALLIACEAE

* *Allium lusitanicum* Lam.

Allium montanum F. W. Schmidt

G bulb - H bu - European-Oro-Mediterranean - Grasslands (Ledges).

* *Allium schoenoprasum* L.

G bulb - H bu - Boreal - Bogs and temporary ponds.

§ *Allium sphaerocephalon* L. subsp. *sphaerocephalon*

Caruel 1864.

Obs.: Reported by Caruel (1864) for Diaccione della Volpe near Boscolungo on a specimen Parlatore collected in 1863.

MELANTHIACEAE

Veratrum lobelianum Bernh. in Schrader

Veratrum album L. subsp. *lobelianum* (Bernh.) Arcangeli

Caruel 1864 sub *Veratrum album* L. - G rhiz - HP - Oro-hypsophilous - Megaforb (Bogs and temporary ponds).

COLCHICACEAE

Colchicum alpinum DC. in Lam. & DC.

Parlatore 1858 - G bulb - H bu - Eurosibiric-Oro-Mediterranean - Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

LILIACEAE

Lilium bulbiferum L. var. *croceum* (Chaix.) Pers.

Lilium croceum Chaix

Caruel 1864 sub *Lilium bulbiferum* L. - G bulb - H bu - Alpine-Apennine - Woods.

Conservation: The plant (sub *Lilium croceum* Chaix) is listed as a protected species in Tuscany (L. R. 56/2000, Annex C) and is a plant of Regional interest (L. R. 56/2000, Annex A).

Lilium martagon L.

Caruel 1864 - G bulb - H bu - Eurosibiric - Megaforb.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), it is a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

* *Tulipa sylvestris* L. subsp. *australis* (Link) Pamp.

Tulipa australis Link

G bulb - H bu - Medio-European-Pontic - Ledges.

Conservation: The species (sub *Tulipa australis* Link) is listed as a protected plant in Tuscany (L. R. 56/2000, Annex C), it is a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

IRIDACEAE

Crocus vernus (L.) Hill*Crocus neapolitanus* Mord. & Loisel.

Gibelli & Pirota 1882 - G bulb - H bu - Medio-European - Grasslands.

ORCHIDACEAE

§ *Orchis mascula* (L.) L.

Ferrarini 1977.

Dactylorhiza fuchsii (Druce) Soò*Orchis fuchsii* Druce*Orchis maculata* L. subsp. *fuchsii* (Druce) Hylander

Gerdol & Tomaselli 1993 - G bulb - H tu - Boreal - Grasslands.

* *Dactylorhiza incarnata* (L.) Soò

Orchis incarnata L.

G bulb - H tu - Holarctic - Bogs and temporary ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

* *Dactylorhiza latifolia* (L.) H. Baumann & Künkele

Orchis latifolia L.

G bulb - H tu - European - Grasslands.

Obs.: Reported by Levier (in Levier & Sommier, 1891 sub *Orchis latifolia* L.) in the "palude di Pra di Lanna" outside the study area.

? *Dactylorhiza maculata* (L.) Soò

Caruel 1864 sub *Orchis maculata* L.

Obs.: Reported by Caruel (1864 sub *Orchis maculata* L.), Archbald (1874 sub *Orchis maculata*), Gibelli & Pirota (1882 sub *Orchis maculata* L.) for Boscolungo and by Chiarugi (1936 sub *Orchis maculata* L.) and Ferrarini (1977) for Campolino, but we were unable to

find any reference specimens. The specimens for the Abetone area in FI! we examined (sub *Orchis maculata*) all have the central lobe not much narrower than the lateral ones; therefore in agreement with Tutin & al. (1980) and Del Prete & Tosi (1988) they should be attributed to *Dactylorhiza fuchsii* (Druce) Soò. Probably the indication for the Sestaione Valley actually refers to *Dactylorhiza fuchsii* (Druce) Soò.

§ *Traunsteinera globosa* (L.) Reichenb.

Orchis globosa L.

Caruel 1864 sub *Orchis globosa* L.

Conservation: The species is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

? *Platanthera chlorantha* (Custer) Reichenb. in Moessler

Levier & Sommier 1891.

Obs.: Reported by Levier (in Levier & Sommier, 1891) for the Sestaione Valley near Boscolungo but never found again. This indication does not allow us to give this species as certain for the Upper Sestaione Valley.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Gymnadenia conopsea* (L.) R. Br. in Aiton

Orchis conopsea L.

Caruel 1864.

Pseudorchis albida (L.) A. & D. Love

Leucorchis albida (L.) E. H. F. Meyer

Caruel 1864 sub *Gymnadenia albida* (L.) L. C. M. Richard - G bulb - H tu - Boreal - High altitude grasslands.

§ *Coeloglossum viride* (L.) Hartman

Levier & Sommier 1891.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

§ *Listera cordata* (L.) R. Br. in Aiton

Parlatore 1858.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

§ *Listera ovata* (L.) R. Br. in Aiton

Caruel 1864.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Neottia nidus-avis (L.) L. C. M. Richard

Caruel 1864 - G rhiz - H tu - Holarctic - Woods.

Epipactis helleborine (L.) Crantz

Epipactis latifolia (L.) All.

Caruel 1864 sub *Epipactis latifolia* (L.) All. - G rhiz - H tu - Eurosibiric-Tethydic - Megaforb.

§ *Epipactis palustris* (L.) Crantz

Levier & Sommier 1891.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

Epipogium aphyllum Swartz

Epipogon gmelini L. C. M. Richard.

Parlatore 1858 sub *Epipogon gmelini* L. C. M. Richard. - G rhiz - H tu - Eurosibiric-Sino-Japanese - Woods.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

§ *Corallorrhiza trifida* Chatelain

Corallorrhiza innata R. Br.

Caruel 1864 sub *Corallorrhiza innata* R. Br.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

SPARGANIACEAE

Sparganium minimum Wallr.

Gibbelli & Pirota 1882 - I rad - HY - Eurosibiric - Small lakes and ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "under serious threat" for Tuscany (CR).

TYPHACEAE

§ *Typha minima* Funck in Hoppe

Provasi 1926.

JUNCACEAE

Juncus alpinoarticulatus Chaix subsp. *alpinoarticulatus*

Juncus alpinus Vill.

Caruel 1864 sub *Juncus alpinus* Vill. - G rhiz - HGP - Holarctic - Bogs and temporary ponds (Streams).

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).

§ *Juncus articulatus* L.

Juncus lampocarpus Ehrh.

Caruel 1864 sub *Juncus lampocarpus* Ehrh.

§ *Juncus bufonius* L.

Caruel 1864.

Obs.: Reported by Caruel (1864) and Gibelli & Pirotta (1882) for Boscolungo, by Archbald (1874) for Lago Nero and Boscolungo and by Provasi (1926 sub *Juncus bufonius* L. var. *hybridus* Brot.) for Lago Nero.

Juncus conglomeratus L.

Baroni 1908 sub *Juncus communis* E. H. F. Meyer - G rhiz - HGP - Eurosibiric-Mediterranean - Bogs and temporary ponds.

Juncus effusus L.

Ferrarini 1977 sub *Juncus conglomeratus* L. var. *effusus* (L.) Fiori - G rhiz - HGP - Holarctic - Pondss.

Juncus filiformis L.

Caruel 1864 - G rhiz - HGP - Arctic-Oro-hypsophilous - Bogs and temporary ponds.

Juncus trifidus L. subsp. *trifidus*

Caruel 1864 - G rhiz - HGP - Holarctic - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Luzula campestris (L.) DC. in Lam. & DC.

Juncus campestris L.

Vitman 1773 sub *Juncus campestris* L. - H caesp - HGP - Eurosibiric-Mediterranean - Grasslands.

Luzula lutea (All.) DC. in Lam. & DC. subsp. *lutea*

Caruel 1864 - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Luzula luzulina* (Vill.) Dalla Torre & Sarnth.

Luzula flavescens (Host) Gaudin

Caruel 1864 sub *Luzula flavescens* (Host) Gaudin.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Luzula luzuloides (Lam.) Dandy & Willmott

Luzula albida (Hoffm.) DC. in Lam. & DC.

Gibelli & Pirotta 1882 sub *Luzula albida* (Hoffm.) DC. in Lam. & DC. - H caesp - HGP - Medio-European - Heathland.

Luzula multiflora (Retz) Lej. subsp. *congesta* (Thuill.) Arcangeli

Caruel 1864 sub *Luzula erecta* Desv. - H caesp - HGP - Eurosibiric - High altitude grasslands (Bogs and temporary ponds).

Obs.: Reported for Boscolungo by Caruel (1864 sub *Luzula erecta* Desv.), Archbald (1874

sub *Luzula erecta* Desv.) and Gibelli & Pirota (1882 sub *Luzula multiflora* (Retz) Lej) and for Uccelliera by Baroni (1908 sub *Luzula campestris* (L.) DC. var. *multiflora*) should probably be referred to this species.

Luzula nivea (All.) DC. in Lam. & DC.

Caruel 1864 - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Obs.: Levier (in Levier & Sommier, 1891) reports *Luzula nivea x pedemontana* Levier for "Boscolungo in diversi luoghi come al taglio raso della Fornace, in quello dell'Amministrazione". However there is no description of the species in his publication.

§ *Luzula pedemontana* Boiss. & Reuter

Caruel 1864.

Luzula sieberi Tausch

Ronchieri & Mazzei 1997 - H caesp - HGP - Oro-hypsophilous - Heathland (Megaforb).

Luzula spicata (L.) DC. in Lam. & DC. subsp. *mutabilis* Chrtek & Krisa

Caruel 1864 sub *Luzula spicata* (L.) DC. - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Obs.: Reports of *Luzula spicata* (L.) DC. for the Sestaione Valley should be referred to this species.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Luzula sudetica (Willd.) Schultes

Foggi 1989 - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Luzula sylvatica* (Hudson) Gaudin

Luzula maxima DC.

Caruel 1864 sub *Luzula maxima* DC.

CYPERACEAE

Eleocharis palustris (L.) Roemer & Schultes

Caruel 1864 sub *Heleocharis palustris* R. Br. - G rhiz - HGP - Holarctic - Small lakes and ponds.

Obs.: Levier (in Levier & Sommier 1891, sub *Heleocharis palustris* R. Br.) reports the var. minor on the banks of Lago Greppo, whilst a gigantic form (perhaps var. *reptans* Parl.) grows in the middle of the ponds.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Eriophorum latifolium Hoppe

Caruel 1864 - H caesp - HGP - Boreal - Bogs and temporary ponds.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C), it is a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

§ *Eriophorum polystachyum* L.Gibelli & Pirotta 1882 sub *Eriophorum angustifolium* Roth. var. *minus* Koch.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

§ *Eriophorum scheuchzeri* Hoppe

Levier & Sommier 1891.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

? *Eriophorum vaginatum* L.

Giannini & Screm 1973.

Obs.: Reported by Giannini & Screm (1973) for Le Lamacce, where the same authors also report *Eriophorum scheuchzeri* Hoppe. We could not find any reference specimens in FI! nor we could find the species in the field.

Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

Blysmus compressus (L.) Panzer ex Link

Caruel 1864 - G rhiz - HGP - Eurosibiric-Oro-Mediterranean - Bogs and temporary ponds.

? *Carex digitata* L.

Barbero & Bonin 1980.

Obs.: Reported by Barbero & Bonin (1980) for the beech woods and high altitude Fir stand for the Upper Sestaione Valley but we could not find it.

Carex divisa HudsonGibelli & Pirotta 1882 sub *Carex oederi* Retz. - H caesp - HGP - European-Tethydic - Bogs and temporary ponds.*Carex divulsa* Stokes in With. subsp. *divulsa*Caruel 1864 sub *Carex muricata* L. var. *divulsa* Wahlenb. - H caesp - HGP - Cosmopolitan - Bogs and temporary ponds.*Carex echinata* Murray*Carex stellulata* Good.

Caruel 1864 - H caesp - HGP - Holarctic - Bogs and temporary ponds.

Conservation: The species (sub *Carex stellulata* Good.) is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as at "Low Risk" for Tuscany (LR).? *Carex ferruginea* Scop. subsp. *macrostachys* (Bertol.) Arcangeli*Carex macrostachys* BertoloniLevier & Sommier 1891 sub *Carex refracta* Balb.Obs.: Reported by Levier (in Levier & Sommier, 1891) for the Tre Potenze (sub *Carex refracta* Balb.). This species is endemic to the Apuan Alps, and there are sightings, to be confirmed, for some stations in the Tuscan-Emilian Apennines (Bechi & al., 1996). There is one specimen (sub *Carex macrostachys* Bertoloni) in FI! for the "Dirupi sopra il Lago Nero nell'Appennino Pistoiese" that Beccari collected on 28th July, 1861. It does not appear

to corresponds to *Carex ferruginea* Scop. subsp. *macrostachys* (Bertol.) Arcangeli. It is a plant 15cm tall, with 1 male spike on the apex and 1 female spike at more or less the same height, an utriculus 5 mm long with elongated tip (1,5 mm), angular with short hairs especially over the corners, 3 stigmas. Perhaps it is *Carex macrolepis* DC.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Carex flava L.

Caruel 1864 - H caesp - HGP - Boreal-Tethydic - Bogs and temporary ponds.

Carex frigida All.

Caruel 1864 - G rhiz - HGP - Oro-hypsophilous - Bogs and temporary ponds (Streams).

Carex lachenalii Schkuhr.

Carex leporina L.

Caruel 1864 sub *Carex leporina* L. - H caesp - HGP - Eurosibiric - Bogs and temporary ponds.

§ *Carex macrolepis* DC.

Levier & Sommier 1891.

Carex nigra (L.) Reichard

Carex vulgaris Fries

Carex fusca All.

Caruel 1864 sub *Carex vulgaris* Fries - G rhiz - HGP - Boreal - Bogs and temporary ponds.

§ *Carex ornithopoda* Willd.

Barbero & Bonin 1980.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Carex pallescens L.

Caruel 1864 - H caesp - HGP - Boreal - Grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Carex panicea* L.

Ferrarini 1977.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A) and is included in the "Regional Red Books of Italian Plants" as "Vulnerable" for Tuscany (VU).

? *Carex praecox* Schreber subsp. *praecox*

Carex schreberi Schrank

Caruel 1864.

Obs.: Reported by Caruel (1864), Archbald (1874) and Gibelli & Pirotta (1882) for Boscolungo and by Provasi (1926) for Lago Nero, but never found again. There are no specimens for Tuscany in FI!. There is only one specimen that Savi collected near Lago Nero (sub *Carex schreberi* Schrank) with male flowers at the base and female flowers at

the tip and reported for this locality by Archbald (1874 sub *Carex schreberi* Schrank). However the specimen is immature and cannot be identified as certain.

Carex remota L.

Caruel 1864 - H caesp - HGP - European-Mediterranean - Woods.

* *Carex rostrata* Stokes in With

G rhiz - HGP - Boreal - Ponds.

Carex sempervirens Vill. subsp. *sempervirens*

Caruel 1864 - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Carex sylvatica Hudson subsp. *sylvatica*

Caruel 1864 - H caesp - HGP - European-Mediterranean - Woods.

§ *Carex viridula* Michaux subsp. *oedocarpa* (N. J. Anderss.) B. Schmid
Gerdol & Tomaselli 1993.

POACEAE

Poa alpina L. subsp. *alpina*

Vitman 1773 - H caesp - HGP - Holarctic - High altitude grasslands.

Poa annua L.

Caruel 1864 - T caesp - HGA - Cosmopolita - Fringe.

§ *Poa compressa* L.

Caruel 1864

Reported by Caruel (1864) and Archbald (1874) for Boscolungo and by Gibelli & Pirota (1882) for the Tre Potenze and Boscolungo.

? *Poa hybrida* Gaudin

Levier & Sommier 1891.

Obs.: Reported by Levier (in Levier & Sommier, 1891) in the Sestaione Valley near Boscolungo, but never found again. There are no specimens for the Abetone area in FI!. This indication does not allow us to give this species as certain for the Upper Sestaione Valley.

Poa nemoralis L.

Caruel 1864 - H caesp - HGP - Boreal-Tethydica - Woods.

Festuca alfrediana Foggi & Signorini

Festuca alpina Suter

Barbero & Bonin 1980 sub *Festuca alpina* Suter - H caesp - HGP - Oro-hypsophilous - Rocky cliffs (Scree slopes).

* *Festuca altissima* All.

H caesp - HGP - Eurosibiric - Woods (Megaforb).

? *Festuca circummediterranea* Patzke

Foggi & Rossi 1996.

Obs.: Reported by Foggi & Rossi (1996) on the basis of a specimen from the Levier

Herbarium for "Boscolungo, Sestaione"; this indication does not allow us to give this species as certain for the Upper Sestaione Valley.

Festuca gigantea (L.) Vill.

Caruel 1864 - H caesp - HGP - Eurosibiric-Tethydica - Megaforb.

Festuca heteromalla Pourret

Festuca rubra L. subsp. *fallax* (Thuill.) Nyman

Foggi & Rossi 1996 - H caesp - HGP - Medio-European - Fringe.

Festuca heterophylla Lam.

Caruel 1864 - H caesp - HGP - European - Woods.

? *Festuca laevigata* Gaudin subsp. *crassifolia* (Gaudin) Kerguélen & Plonka

Barbero & Bonin 1980 sub *Festuca duriuscula* L. var. *crassifolia* (Gaudin) Husnot.

Obs.: Reported by Barbero & Bonin (1980) on M. Gomito and on the Tre Potenze Alps (sub *Festuca duriuscula* L. var. *crassifolia*), but we could not find the reference specimen. In all probability it was confused with *Festuca riccerii* Foggi & Graz. Rossi.

* *Festuca microphylla* (St.-Yves) Patzke.

Festuca nigrescens Lam. subsp. *microphylla* (St.-Yves) Markgr.-Dann.

H caesp - HGP - European-Oro-Mediterranean - Grasslands.

Festuca paniculata (L.) Schinz & Thell. subsp. *paniculata*

Festuca spadicea L.

Parlatore 1848 sub *Festuca spadicea* L. - H caesp - HGP - Oro-hypsophilous - High altitude grasslands.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Festuca pratensis Hudson subsp. *apennina* (De Not.) Hegi

Caruel 1864 sub *Festuca elatior* L. - H caesp - HGP - Oro-hypsophilous-Oro-Mediterranean - Megaforb.

Festuca riccerii Foggi & Graz. Rossi

Vitman 1773 sub *Festuca vivipara* - H caesp - HGP - Tuscan-Emilian Apennines - High altitude grasslands.

Obs.: In our opinion, reports of *Festuca vivipara* for the Alps at Lago Nero (Vitman, 1773), *Festuca ovina* L. for Lago Nero (Caruel 1864; Archbald, 1874) and Campolino (De Philippis & al., 1973; Giannini & Screm, 1973; Ferrarini, 1977) and *Festuca duriuscula* L. for Boscolungo (Parlatore, 1848; Archbald, 1874; Gibelli & Pirota, 1882) should all be referred to this species.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

§ *Festuca rubra* L. *sensu lato*

Caruel 1864.

Festuca rubra L. subsp. *commutata* (Gaudin) Markgr.-Dann.

Festuca nigrescens Lam.

Parlatore 1848 sub *Festuca rubra* L. var. *alpina* Parl. - H caesp - HGP - Boreal - Grasslands (Bogs and temporary ponds).

Festuca rubra L. subsp. *juncea* (Hack.) K. Richt.

Foggi & Rossi 1996 - H caesp - HGP - European - High altitude grasslands.

Festuca violacea Gaudin subsp. *puccinellii* (Parl.) Foggi, Graz. Rossi & Signorini

Festuca puccinellii Parl.

Parlatore 1848 sub *Festuca puccinellii* Parl. - H caesp - HGP - Northern Apennines - Apuan Alps - High altitude grasslands (Scree slopes).

Obs.: The reports of *Festuca violacea* Gaudin for the Upper Sestaione Valley should be referred to this species. Taxonomic treatments follows Foggi & al. (1999).

Conservation: The species (sub *Festuca puccinellii* Parl.) is a plant of Regional interest (L. R. 56/2000, Annex A).

Lolium perenne L.

Caruel 1864 - H caesp - HGP - European-Tethydic - Fringe.

Dactylis glomerata L.

Caruel 1864 - H caesp - HGP - Cosmopolitan - Ubiquist.

Cynosurus cristatus L.

Caruel 1864 - H caesp - HGP - European - Grasslands.

Briza media L.

Caruel 1864 - H caesp - HGP - Eurosibiric-Mediterranean - Grasslands.

§ *Sesleria argentea* (Savi) Savi

Sesleria caerulea autumnalis (Scop.) F. Schultz

Ferrarini 1977 sub *Sesleria caerulea* Ard. var. *autumnalis* (F. Schultz) Fiori.

§ *Bromus arvensis* L. subsp. *arvensis*

Serrafalcus arvensis (L.) Godr.

Caruel 1864 sub *Serrafalcus arvensis* (L.) Godr.

Bromus erectus Hudson subsp. *erectus*

Caruel 1864 - H caesp - HGP - European-Mediterranean - Anthropic.

* *Bromus inermis* Leysser subsp. *inermis*

H caesp - HGP - Avventizia - Megaforb.

Bromus ramosus Hudson

Levier & Sommier 1891 - H caesp - HGP - Eurosibiric -Fringe.

Brachypodium genuense (DC.) Roemer & Schultes

Ferrarini 1977 sub *Brachypodium pinnatum* (L.) Beauv. - H caesp - HGP - Apennine - Grasslands (Ledges).

Obs.: In agreement with Lucchese (1991), reports such as *Brachypodium pinnatum* (L.) Beauv. must be referred to this species.

* *Brachypodium rupestre* (Host) Roemer & Schultes

H caesp - HGP - Eurosibiric-Oro-Mediterranean - Grasslands.

§ *Elytrigia repens* (L.) Desv. ex Nevski subsp. *repens*

Agropyron repens (L.) P. Beauv.

Ronchieri & Mazzei 1997 sub *Agropyron repens* (L.) P. Beauv.

§ *Roegneria canina* (L.) Nevski in Komarov subsp. *canina*

Agropyron caninum (L.) P. Beauv.

Triticum caninum L.

Caruel 1864 sub *Triticum caninum* L.

Avenula pratensis (L.) Dumort. subsp. *pratensis*

Caruel 1864 sub *Avena pratensis* L. - H caesp - HGP - European - Ledges.

Obs.: Reported by Caruel (1864) ed Archbald (1874) at Balzo near Boscolungo (sub *Avena pratensis* L.) and by Gibelli & Pirota (1882 *Avena pratensis* L.) at Boscolungo. The specimens examined in FI! (Verso le Tre Potenze. Appennini Pistoiese, 19/8/1898, Sommier; Balzo del Valloncello, 26 aug 86, Levier) exhibit 18-20 mm long spikes. The specimen we collected near La Fariola has new leaves with duplicates and spikes over 15 mm long. For this reason we can confirm the occurrence of this species in the Upper Sestaione Valley.

§ *Avenula versicolor* (Vuil.) Lainz subsp. *pretutiana* (Parl. ex Arcangeli) J. Holub

Avena praetutiana (Parl. ex Arcangeli) Pign.

Ferrarini 1999 sub *Avena praetutiana* Parl.

Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

Avenula versicolor (Vill.) Lainz subsp. *versicolor*

Foggi 1989 - H caesp - HGP - Oro-hypsophilous-Pontica - High altitude grasslands.

Deschampsia cespitosa (L.) P. Beauv. subsp. *cespitosa*

Caruel 1864 - H caesp - HGP - Cosmopolitan - Grasslands (Bogs and temporary ponds).

Deschampsia flexuosa (L.) Trin.

Avenella flexuosa (L.) Drejer

Caruel 1864 - H caesp - HGP - Cosmopolita - Heathland.

Calamagrostis arundinacea (L.) Roth

Ferrarini 1977 - H caesp - HGP - Holarctic - Megaforb.

Calamagrostis varia (Schrader) Host subsp. *corsica* (Hackel) Rouy

Caruel 1864 sub *Calamagrostis sylvatica* Host var. *montana* (Host.) Caruel = *Calamagrostis montana* Host. = *Deyuxia varia montana* (Host.) Parl. - H caesp - HGP - Oro-hypsophilous-Corsa - Scree slopes (Megaforb).

Phleum alpinum L.

Caruel 1864 - H caesp - HGP - Boreal - High altitude grasslands.

Phleum pratense L.

Caruel 1864 - H caesp - HGP - Boreal-Tethydic - Grasslands.

* *Anthoxanthum odoratum* L. subsp. *nipponicum* (Honda) Tzelev

Anthoxanthum alpinum Löve & Löve

H caesp - HGP - Holarctic - High altitude grasslands.

Anthoxanthum odoratum L. subsp. *odoratum*

Caruel 1864 - H caesp - HGP - Eurosibiric-Oro-Mediterranean - Grasslands.

§ *Agrostis canina* L. subsp. *canina*

Caruel 1864.

Agrostis capillaris L. subsp. *capillaris*

Agrostis tenuis Sibth.

Agrostis vulgaris With.

Gibelli & Pirotta 1882 sub *Agrostis vulgaris* With. var. *floribus rubentibus* - H caesp - HGP - Boreal-Tethydic - Grasslands (Margine).

Agrostis rupestris All. subsp. *rupestris*

Parlatore 1848 - H caesp - HGP - Oro-hypsophilous-Corsican - High altitude grasslands (Scree slopes).

Agrostis stolonifera L.

Caruel 1864 sub *Agrostis alba* L. - H rept - HGP - Boreal-Tethydic - Bogs and temporary ponds.

* *Melica nutans* L.

H caesp - HGP - Eurosibiric-Sino-Japanese - Woods.

Melica uniflora Retz

Gibelli & Pirotta 1882 - H caesp - HGP - Holarctic - Woods.

§ *Milium effusum* L.

Levier & Sommier 1891.

? *Achnatherum calamagrostis* (L.) Beauv.

Vitman 1773 sub *Agrostis calamagrostis* Vitm.

Obs.: Reported by Vitman (1773 sub *Agrostis calamagrostis* Vitm.) on the Lago Nero Alps. We could not find any reference specimen for this species.

Nardus stricta L.

Caruel 1864 - H caesp - HGP - Holarctic - Grasslands (Bogs and temporary ponds).

§ *Danthonia decumbens* (L.) DC. in Lam. & DC.

Caruel 1864.

The list below gives the entities generally reported in literature for Boscolungo or for Abetone in alphabetical order but which we did not find in the Upper Sestaione Valley (any species reported for localities near the Upper Sestaione Valley but outside the study, such as "Pra di Lanna", "Macerino", etc., are not included).

Aceras anthropophorum (L.) R. Br.

Arctium lappa L.

Asperula purpurea (L.) Ehrend.

Asphodelus albus Miller

Barbarea verna (Miller) Ascherson
Bromus hordeaceus L. subsp. *hordeaceus*
Cardamine trifolia L.
Carduus nutans L.
Carex glauca Scop.
Carex hirta L.
Carex paniculata L. subsp. *paniculata*
Carum carvi L.
Cephalanthera rubra (L.) L. C. M. Richard
Cerastium campanulatum Viv.
Cervaria rivinii P. Gaertner
Chenopodium murale L.
Circaea x intermedia Ehrh.
Cirsium palustre (L.) Scop.
Colchicum autumnale L.
Convolvulus arvensis L.
Corylus avellana L.
Daucus carota L.
Dianthus seguieri Vill.
Echium vulgare L.
Epilobium lanceolatum Sebastiani & Mauri
Epilobium hirsutum L.
Epilobium roseum Schreber
Erigeron acris L.
Euphorbia flavicoma DC. subsp. *verrucosa* (Fiori) Pignatti
Festuca arundinacea Schreber
Gentiana cruciata L. subsp. *cruciata*
Glyceria plicata (Fries) Fries
Hieracium ageratoides Fries
Hieracium anchusaefolium Bert.
Hieracium auricula L.
Hieracium crinitum Sibth. & Sm.
Hieracium italicum Fries
Hieracium juranum Fries
Hypericum hirsutum L.
Impatiens noli-tangere L.
Juncus compressus Jacq.
Koeleria cristata Pers.
Leontodon autumnalis L.
Leontodon hirsutus L.
Lepidium campestre (L.) R. Br. in Aiton
Linum catharticum L.
Lithospermum officinale L.
Luzula pilosa (L.) Willd.
Luzula spadicea (All.) Lam. & DC.

Lysimachia punctata L. subsp. *punctata*
Muscari comosum (L.) Miller
Nepeta cataria L.
Orchis pallens L.
Picris hieracioides L.
Plantago media L.
Poa trivialis L.
Pulmonaria apennina Cristofolini & Puppi
Pyrola rotundifolia L.
Ranunculus acris L.
Ranunculus aduncus Gren. in Gren. & Godron
Rosa canina L.
Rosa coriifolia Fries
Rosa glutinosa Sibth. & Sm.
Rosa micrantha Borrer ex Sm. in Soweby
Rosa rubiginosa L.
Rosa tomentosa Sm.
Rubus discolor Weihe & Nees
Sagina subulata (Swartz) C. Presl
Salvia pratensis L.
Sambucus ebulus L.
Saponaria officinalis L.
Scleranthus annuus L.
Sedum acre L.
Senecio viscosus L.
Silene alba (Miller) E. H. L. Krause
Silene flos-cuculi (L.) Greuter & Burdet
Silene italica (L.) Pers.
Solanum dulcamara L.
Sonchus arvensis L.
Stachys alpina L.
Tanacetum vulgare L.
Tephrosieris longifolia (Jacq.) Griseb. ex Schenz
Trifolium badium Schreber in Sturm
Trifolium medium L. subsp. *medium*
Trifolium micranthum Viv.
Trifolium patens Schreber in Sturm
Trisetum flavescens (L.) P. Beauv.
Valeriana montana L. subsp. *montana*
Verbascum lychnitis L.
Verbascum phlomoides L.
Veronica montana L.
Vicia incana Gouan

Discussion

Some numerical data on the flora

The floristic list of vascular plants counts a total of 580 *taxa*. Of these 8 must be excluded from the flora of the Upper Sestaione Valley because incorrectly identified or because they have been re-evaluated after recent taxonomical revision; 27 must be considered doubtful because the specimens on which the record was based could not be found nor it was found during our last survey.

Consequently, the confirmed flora consists of 545 entities; of these 446 (81.83%) were found by us and are therefore representative of the current present flora; 61 are new for the upper Sestaione Valley.

The present flora for the Upper Sestaione Valley is distributed in 74 families and 226 genera; the ratio for no. species / no. genera is therefore 1.97. The families with the greatest number of representative are the *Asteraceae* (60 species, representing 13.45% of the present flora), *Poaceae* (40 species, 8.97%), *Rosaceae* (25 species, 5.61%) and *Fabaceae* (24 species, 5.38%) that together total 33.41%.

The Biological and growth forms spectrum

The biological spectrum of the present flora in the Upper Sestaione Valley was obtained by analysing the 446 entities that constitute the Flora (Fig. 3) The prevalence of hemicryptophytes (67.26%) and geophytes on the contrary is rather low considering the extent of

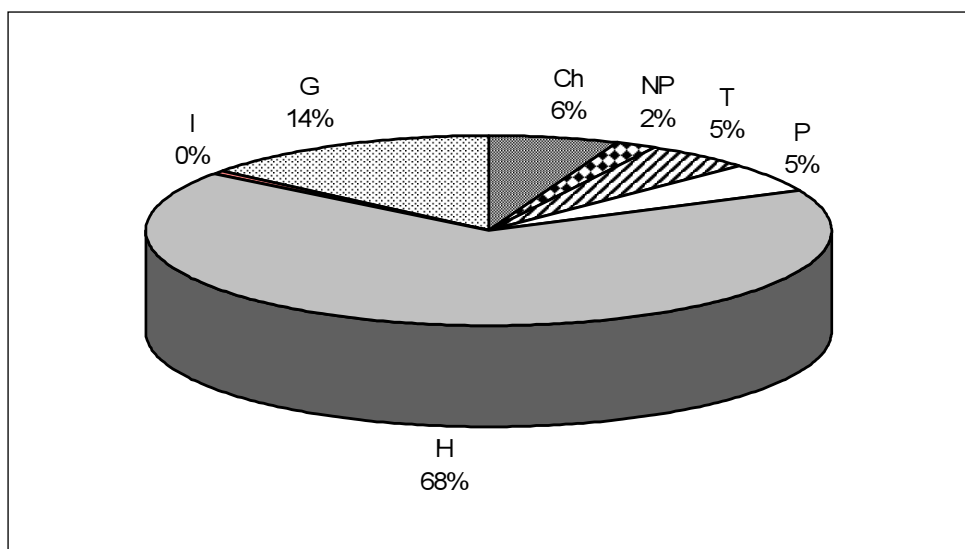


Fig. 3. Biological form spectrum of the present flora (446 entities) of the Upper Sestaione Valley.

woodland over the territory (14.13%) is obvious, but the chamephytes (6.28%) also hold a good percentage as, on the other hand, is to be expected considering the study area extends into higher altitudes where there are no woods which are dominated not only by meadows but also heathlands and rocky cliffs.

The Biological spectrum is very similar to that of high altitude flora (Lucchese & De Simone 2000). The only data that differs slightly are the percent of hemicryptophytes, just above that for the Upper Sestaione Valley and of therophytes and chamaephytes slightly that is just over that for the central. The H/T ratio (Sabato & Valenzano 1975) is 13.59, thus decidedly montane in type.

Table 1 gives the spectrum of growth forms according to Arrigoni (1986). The contribution of herbaceous species (368) is dominant, representing 82.51% of the entire confirmed flora: 63 species are woody (11.88%), dominated by shrub forms (17 entities). The pteridophytes confirmed for the Upper Sestaione Valley reach 22 species (4.93%).

The geographical element and phyto-geographical interpretation of the flora

Chorotype analysis (Fig. 4) underlines the striking dominance of species of Boreal distribution that reaches 57.84% of the total (258 species); among these, 212 species have a Euro-Siberian distribution, 103 of which represent the Oro-hypsophilous contingent of

Table 1. Growth forms of the present flora (446 entities) of the Upper Sestaione Valley. Abbreviations follow Arrigoni (1996).

Forms	n°	%
Woody (W)	53	11.88
W	10	
WB	17	
WF	10	
WS	10	
WS succ	6	
Herbaceous (H)	368	82,51
<i>Annual</i>	20	
HA	19	
HGA	1	
<i>Biennial</i>	9	
HB	9	
<i>Perennial</i>	339	
HP	255	
HGP	67	
H tu	7	
H bu	8	
Hy	2	
Pteridophytes (Pt)	22	4,93

species. There are 113, (25.33% of the total), species belonging to the Boreal-Tethydic link, whilst 43 species have an Olarctic distribution (9.64%); no species belong to the Tethydic and Mediterranean element.

The contingent of endemic species counts 1 endemism of the Tuscan-Emilian Apennines (*Festuca riccerii* and one of the Northern Apennine (*Murbeckiella zanonii*); 2 endemisms of the Tuscan-Emilian Apennines and Apuan Alps (*Saxifraga aspera* subsp. *etrusca* and *Globularia incanescens* Viv.) and 1 endemism of the northern Apennines and Apuan Alps (*Festuca violacea* subsp. *puccinellii*). However, there are 11 species that are endemic to the Apennine chain. Finally, mention should be made of a contingent of 13 species distributed on the Alps and on the Apennines: 2 *taxa* are found exclusively on the western Alps and northern Apennines (*Viola calcarata* L. subsp. *cavillieri* and *Phyteuma michelii*), 2 species occur on the western Alps and on the Apennines, 2 on the Alps and northern Apennines and 7 species are Alpine-Apennine.

Finally, many entities whose area covers the Alps and northern and central Europe find their southern limit of distribution in the Tuscan-Emilian Apennines. There are 13 *taxa* in the Upper Sestaione Valley that reach as far as M. Cimone and Libro Aperto (Ferrarini, 1977): (*Allium schoenoprasum*, *Carex divulsa*, *Cicerbita alpina*, *Empetrum hermaphroditum*, *Gentiana purpurea*, *Juncus filiformis*, *Lycopodium annotinum*, *Luzula lutea*, *Picea*

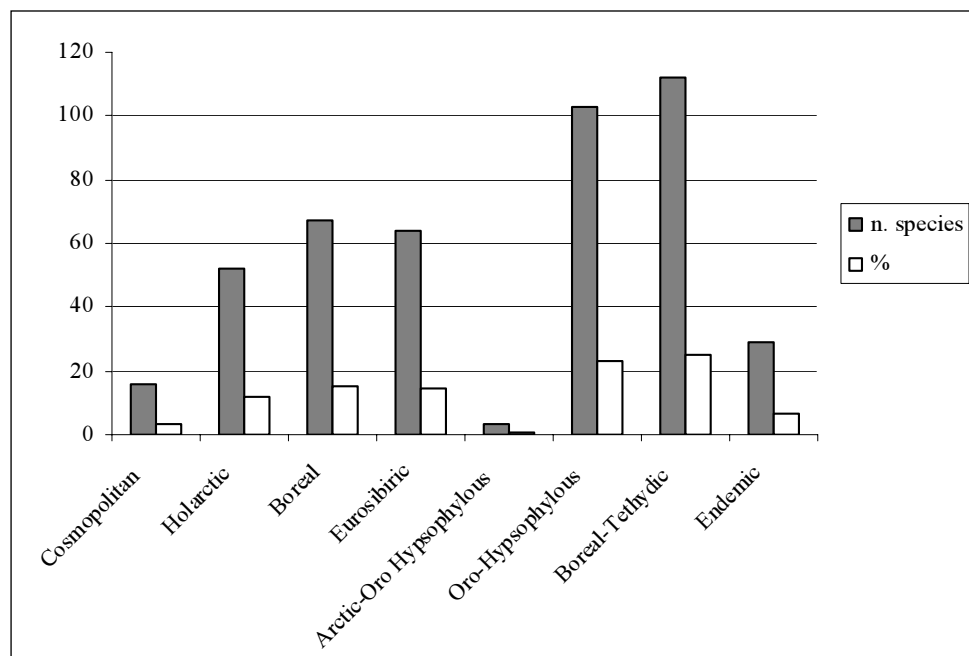


Fig. 4. Geographical element of the present flora (446 entities) of the Upper Sestaione Valley. Values refer to entities belonging to the principal choronomic unities.

abies, *Polygonum alpinum*, *Saxifraga stellaris* subsp. *robusta*, *Sparganium minimum*, *Swertia perennis*, *Veronica fruticans*); we found 13 species whose floristic distribution corresponds to Corno alle Scale and M. Uccelliera (*Aquilegia alpina*, *Cardamine asarifolia*, *Centaurea uniflora* subsp. *nervosa*, *Cryptogramma crista*, *Doronicum austriacum*, *Homogyne alpina*, *Pyrola media*, *Sedum anacampseros*, *Sempervivum montanum*, *Silene rupestris*, *Trifolium alpinum*, *Vaccinium gaultherioides*, *Viola biflora*); finally 5 species reach their southern limit of distribution at M. Falterona and M. Fumaiolo (*Imperatoria ostruthium*, *Phegopteris connectilis*, *Sambucus racemosa*, *Trochiscanthes nodiflora*, *Vaccinium vitis-idaea*).

Habitat types

By analysing the types of habitat of the Upper Sestaione Valley, it can be seen that the most represented habitats are grasslands and high altitude grasslands with a total of 118 species (26.45%); woods (74 species, 16.59%) and ecotonal areas (megaforb: 50 species, 11.21%; fringe: 32 species, 6.95%). Table 2 gives the types of habitat of the present flora of the Upper Sestaione Valley, each accompanied by the number of occurring species. In the, each species refers only to its preferred habitat type. For example *Festuca violacea* subsp. *puccinellii* is a typical species of high altitude grasslands, but it also occurs also on scree slopes. Accordingly, in Table 2 it is only appears under its preferred habitat (high altitude grasslands).

Table 2. Habitat types of the present flora of the Upper Sestaione Valley.

Habitats	n. species	%
Woods	74	16,59
Riparian woods	4	0,90
Heathlands	23	5,16
Grasslands	71	15,92
High altitude grasslands	47	10,54
Ledges	23	5,16
Megaforbs	50	11,21
Fringe	32	7,17
Rocky cliffs	20	4,48
Scree slopes	27	6,05
Stony fields	6	1,35
Snow beds	4	0,90
Peat bogs and polls	28	6,28
Small lakes	6	1,35
Streams	3	0,67
Springs	8	1,79
Anthropic areas	18	4,04
Ubiquitous	2	0,45

Conservation Aspects

The Upper Sestaione Valley is almost untouched by human intervention; even the few ski lifts that existed until 1999 are no longer in use today. This situation is confirmed by the occurrence of only a few adventitious species that are cultivated or have been introduced for various reasons. However, it is not possible to compare the present situation with past conditions as no completed studies have ever been undertaken.

Several of the species in the Upper Sestaione valley come under the Regional Law 56 / 2000 (Region of Tuscany) "Rules for the conservation and safeguard of natural and semi-natural habitat and of wild flora and fauna". (Anonymus [Regione Toscana], 2000). Others are included in the EEC 92 / 42 Directive (La Posta & Tartaglini, 2001), yet others are considered under threat of extinction for Tuscany under the "Regional Red Lists of Italian Plants" (Conti & al. 1997). Annex A of the L.R. 56/2000 of Tuscany lists 135 entities: we found 104 of these species, 24 of which grow occur in high altitude meadows, 11 in peat bogs and temporary pools, 11 in meadows and 9 in heathlands. Annex C of L. R. 56/2000 for Tuscany lists 30 species (20 of which we found), whilst Annex C 1 of the above mentioned law lists 4 entities.

Species of the Upper Sestaione Valley included in the EEC 92 / 43 Directive aM. to 4: of these *Aquilegia alpina* L. (Annex IV) also appears in Annexes A and C of L. R. 56/2000 for Tuscany, but the other 3 (*Gentiana lutea*, *Lycopodium annotinum* and *Lycopodium clavatum*) are not considered under the above mentioned law.

Finally 38 (22 confirmed) entities are included in the "Regional Red Lists of the Plants of Italy" for Tuscany; of these one is reported as being under serious threat (IUCN category "CR"), 14 (7 of which we found) are considered vulnerable (IUCN category "VU"), 21 (14 of which we could confirm) should be considered at low risk (IUCN category "LR"), whilst there is insufficient data for the two species *Potentilla nitida* and *Potentilla nivea* (IUCN category "DD").

Table 3 shows the correlation between habitat type and species under threat of extinction in the "Regional Red Lists of the Plants of Italy": the left-hand column gives the data for species we did not find, the right hand column those for the present flora. The peat bogs and temporary ponds habitats accommodate the greatest number of species under threat of extinction; we could not find 4 of these 4 taxa (*Carex panicea*, *Epipactis palustris*, *Ophioglossum vulgatum* and *Pinguicula leptoceras*) during our study. Clearly, this type of habitat, that in the Apennines reaches the southern limit of its distribution, feels any changes in the climate most and is particularly important from the conservation point of view.

Therefore out of the total of the flora confirmed for the Upper Sestaione Valley, only 6 species out of 28 that grow in peat bogs and temporary ponds, are actually under threat of extinction. Rocky cliffs are the habitat that can be best conserved as only one species out of the 20 recorded is considered at risk.

Among those entities we were unable to confirm, *Potentilla nitida* and *Potentilla nivea* deserve special mention; both are reported for the Tre Potenze Alps on the basis of Herbarium specimens that date back to the first years of the 1800s. Both species grow on the Alps, the first on calcareous cliffs, the second in high altitude meadows. Their occurrence on the Tuscan-Emilian Apennines is difficult to explain. Probably there was a mis-

Table 3. Correlation between habitat type and species considered as under threat of extinction in Tuscany in the "Regional Red Lists of the Plants of Italy".

Habitats	species	threatened species	non-confirmed threatened species	confirmed threatened species
Woods	74	4	2	2
Heathlands	23	5	2	3
Grasslands	71	5	3	2
High altitude grasslands	47	3	2	1
Ledges	23	2	1	1
Megaforbs	50	2		2
Rocky cliffs	20	1		1
Scree slopes	27	3	1	2
Stony fields	6	1		1
Snow beds	4			
Peat bogs and polls	28	10	4	6
Small lakes	6	1		1
Springs	8	1	1	

take in writing the locality on the *Herbarium* label and consequently the two species should not really be considered as extinct.

Table 4 illustrates the biological spectrum of the species classified as under threat of extinction in Tuscany. Hemicryptophytes dominate in number (15, of which 6 are not confirmed) and the geophytes (13, of which 7 were not found). Of these 7 species that have not been confirmed in the present flora, 4 belong to the *Orchidaceae* (*Coeloglossum viride*, *Epipactis palustris*, *Listera cordata* and *Traunsteinera globosa*) families. Data for the hydrophytes is also important; in the present Upper Sestaione Valley flora, the hydrophytes

Table 4. Correlation between biological forms and species given as threatened by extinction for Tuscany in the "Regional Red Lists of the Plants of Italy".

Habitats	species	threatened species	non-confirmed threatened species	confirmed threatened species
Phanerophyte	22	2		2
Nanophanerophyte	9	2	1	1
Chamaephytes	28	4	2	2
Hemicryptophyte	300	15	6	9
Geophytes	63	13	7	6
Hidrophytes	2	2		2

are represented by only 2 species (*Callitriche palustris* and *Sparganium minimum*), both are considered under danger: therefore 100% of the hydrophytic flora is under risk of extinction.

Conclusions

The flora of the Upper Sestaione Valley is rich in species due in great measure to the high levels of habitat heterogeneity.

The area does not seem to exhibit evident signs of human intervention that could jeopardize the conservation of the existing floristic patrimony.

However, the wetlands should be treated separately as in the past they have suffered phenomena of drying up that has led to the extinction of several local population of hydrophytic and microthermal species such as those that grow in peat bogs and mountain streams. A conservational and, where possible, restoration programme (Anonymus [S.E.R.], 2002) is necessary for these habitat types, especially considering that they are extremely fragmented along the entire Tuscan-Emilian Apennine chain. In addition, human intervention linked to skiing and winter sports in the nearby Val di Luce, far more active than in the Upper Sestaione Valley, means that safeguard measures must be undertaken.

It should also be noted that these habitats accommodate isolated population of hydrophytic and microthermal species, species that could be the first to suffer further drying up because of the large scale phenomenon of climate warming and dehumidification.

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