Abstract


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 Orohypsophyte 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 Apennines and Murbeckiella zanoni 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 & Pirotta 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, 1885, 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.
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 stretche 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 consortions 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 gaultheriodis* 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 gaulterioidis* 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 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*

**Ledge vegetation**


**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 crispa* (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 hygrophylic, 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 reforesting 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 delimiation 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 synonyms 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);
— 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 thos 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.

**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 Fée) 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).

*Aspidiaceae*

*Dryopteris affinis* (Lowe) Fraser- Jenkins subsp. *borrerii* (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
*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) Woynar 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

**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**

*Pinus mugo* Turra
P rept - WB - Cultivated.

*Abies alba* Miller
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.

*Ranunculus apenninus* (Chiov.) Pignatti
Baroni 1897 sub *Ranunculus montanus* Willd. var. gracilis (Schleich.) - H scap - HP - Apennine - High altitude grasslands.
Obs.: According to Chiovenda (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 Chiovenda 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. Sommier 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.

*Ranunculus platanifolius* L.
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.


*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 FL!: "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.

*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.
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.

§ *Anemone ranunculoides* L. subsp. *ranunculoides*
Ferrarini 1999.

§ *Hepatica nobilis* Miller

*Pulsatilla alpina* (L.) Delarbre subsp. *millefoliata* (Bertol.) D. M. Moser
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.
Obs.: First reported by Gibelli & Pirotta (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.
§ *Thalictrum minus* L.  
Caruel 1860.

**Fumariaceae**

* Corydalis solida (L.) Clairv.  
* Corydalis bulbosa (L.) DC.
  
G bulb - HP - Mid-European - Fringe.

**Urticaceae**

* Urtica dioica L.  

**Fagaceae**

* Fagus sylvatica L.  

**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.  

*Moehringia trinervia* (L.) Clairv.  

*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.
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.

Cerastium arvense L. subsp. suffruticosum (L.) Cesati
Baroni 1898 sub Cerastium arvense L. subsp. stricum (L.) Fiori - Ch suffr - WS - Western Alps-Apennines - Grasslands (Ledges).
Obs.: Reports of Cerastium stricum 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 & Pirotta (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

* 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).
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.

Silene rupestris L.
Caruel 1860 - H bienn - HB - Arctic-Oro-hyposphilous - Rocky cliffs.

Silene saxifraga L.
Caruel 1860 - H caesp - HP - Oro-hyposphilous - Rocky cliffs (Scree slopes).

Silene vulgaris (Moench) Garcke subsp. vulgaris
Caruel 1860 sub Silene inflata Sm. - H scap - HP - Cosmopolitan - Fringe.

* Saponaria ocyoides L.
H scap - HP - Oro-hyposphilous - Scree slopes.
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

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

POLYGONACEAE

Polygonum alpinum All.
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).
*Polygonum bistorta* L. subsp. *bistorta*

*Polygonum persicaria* L.
T scap - HA - Boreal-Tethydic - Bogs and temporary ponds.

*Rumex acetosa* L.

*Rumex acetosella* L.
Caruel 1863 - H scap - HP - Cosmopolitan - Scree Slopes.

*Rumex arifolius* All.
*Rumex montanus* Desf.
*Rumex alpestris* Jacq.

*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.

*Hypericum richeri* Vill. subsp. *richeri*

**MALVACEAE**

*Malva moschata* L.
Caruel 1860 - H scap - HP - European - Fringe.

**VIOLACEAE**

*Viola biflora* L.

*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

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.

Salix caprea L.
Caruel 1863 - P caesp - WB - Boreal - Megafurb.

* Salix eleagnos Scop.

§ Salix purpurea L. subsp. purpurea
Caruel 1863.

* Populus tremula L.

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

*Barbarea bracteosa* Guss.

*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

*Cardamine asarifolia* L.

*Cardamine bulbifera* (L.) Crantz

*Cardamine chelidonia* L.

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

*Cardamine heptaphylla* (Vill.) O. E. Schulz

*Cardamine hirsuta* L.
Caruel 1860 - T scap - HA - Cosmopolitan - Fringe.

*Cardamine impatiens* L. subsp. impatiens

*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.
*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 Parlalore (1893 sub *Draba aizoides* L.) for the Tre Potenze, by Levier & Sommier (1891) on alpine cliffs above Boscolunro 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 Boscolunro 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 Boscolunro 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 caerulescens* (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


*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. leuco-carpum 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.
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 fencings. 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

Pyrola minor L.

§ 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 & Pirotta (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 hypopytys 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*
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.

**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
Vitmann 1773 sub *Saxifraga aspera* L. - Ch suffr - WS - Apennine Tuscan-Emilian-Apuan Alps - Rocky cliffs (Scree slopes).
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.
Conservation: This plant is listed as a protected species in Tuscany (L. R. 56/2000, Annex C).

*Saxifraga stellaris* L. subsp. *robusta* (Engler) Greml
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.
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

**ROSACEAE**

*Rosa pendulina* L.
*Rosa alpina* L.

§ *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 & Pirotta, 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 agrimonioioides (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*


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 pondss.

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


? *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 corresponds to *Potentilla nitida* L. This is a calcicolous chasmophyte 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 corresponds 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.
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.

*Alchemilla glaucescens* Wallr.
H ros - HP - Oro-hypsophilous-Corsican - High altitude grasslands.

*Alchemilla hoppeana* (Rchb.) Della Torre
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).
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 ponds.

*Sorbus aria* (L.) Crantz

*Sorbus aucuparia* L.

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

* *Cotoneaster integerrimus* Medicus

*Prunus avium* L.

**FABACEAE**

*Cytisus scoparius* (L.) Link

§ *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

§ *Lathyrus occidentalis* (Fisher & C. A. Meyer) Fritsch
Vitman 1773 sub *Orobus luteus* L.

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

*Lathyrus pratensis* L.
Caruel 1862 - H scap - HP - Holarctic-Paleotropicale - Fringe.

*Lathyrus vernus* (L.) Bernh.

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

*Vicia sepium* L.

* *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

§ *Trifolium pallescens* Schreb. in Sturm
Gibelli & Pirotta 1882.
Obs.: Reported by Gibelli & Pirotta (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*

§ *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.

*Hippocrepis comosa* L.

* *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) wried that it is a "forma minuscola della *Peplis portula* L., piuttosto comune nei luoghi acquirinosi intorno a Boscolungo". Moreover, Levier described it as "apparsa in gran copia nel 1887 nella pozzanghera del Taglio Raso della Fornace a Boscolungo, scomparsa nel 1888 con il prosciugamento di quella", "presso il Lago del Greppo, sul Lago Baccioli, ecc. fino al Lago Nero dove diventa minuscola".
**THYMELAEACEAE**

*Daphne laureola* L.

*Daphne mezereum* L.
Caruel 1863 - NP - WF - Eurosibiric - Heathland (Megaforbs).

**ONAGRACEAE**

§ *Circaea alpina* L.
Vitman 1773.

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

*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*

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

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.

**OXALIDACEAE**

*Oxalis acetosella* L.

**GERANIACEAE**

*Geranium nodosum* L.

*Geranium pyrenaicum* Burm. fil. subsp. *pyrenaicum*
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

*Geranium robertianum* L. subsp. *robertianum*

*Geranium sylvaticum* L.

**APIACEAE**

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

§ *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-hypsophilous - Scree slopes (High altitude grasslands).

*Aegopodium podagraria* L.

§ *Anthriscus sylvestris* (L.) Hoffm.
Ferrarini 1977.

*Chaerophyllum aureum* L.
Chaerophyllum calabricum Guss.
1882a - H scap - HP - Apennine - Megaforb (Bogs and temporary pondss).
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 & Pirotta (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 & Pirotta (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.

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

Seseli libanotis (L.) Koch subsp. libanotis

§ 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

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 


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 comuniissimo 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. 


*Laserpitium siler* L. 

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

*Sanicula europaea* L. 


# Astrantia pauciflora Bertol. in Desv. 


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, correspondss 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.

\textit{Swertia perennis} L.
Caruel 1866 - H scap - HP - Boreal - Bogs and temporary pondss (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).

\textbf{ASCLEPIADACEAE}

§ \textit{Vincetoxicum hirundinaria} Medicus
\textit{Vincetoxicum officinale} Moench.
Caruel 1863 sub \textit{Vincetoxicum officinale} Moench.

\textbf{Solanaceae}

\textit{Atropa bella-donna} L.
Caruel 1863 - H scap - HP - European-Oro-Mediterranean - Megaforn (Fringe).
Conservation: This species is listed as a plant of Regional interest (L. R. 56/2000, Annex A).

\textbf{Cuscutaceae}

* \textit{Cuscuta epithymum} (L.) L.
T par - O - Eurosibiric-Tethydica - Heathland.

\textbf{Menyanthaceae}

§ \textit{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).

\textbf{Boraginaceae}

? \textit{Pulmonaria officinalis} L.
Ferrarini 1977.
Obs.: Reported by Ferrarini (1977) for Campolino, unfortunately is 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  

* Symphytum officinale* L. subsp. officinale  
H scap - HP - Eurosibiric-Oro-Mediterranean - Fringe.

§ *Anchusa barrelieri* (All.) Vitman  
Levier & Sommier 1891.

*Myosotis alpestris* F.W. Schmidt  
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-Mediterranea -Fringe.

*Myosotis decumbens* Host subsp. *florentina* Grau  

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

*Myosotis sylvatica* Hoffm.  

*Cynoglossum officinale* L.  

*LAMIACEAE*

* Lamium maculatum* (L.) L.  
Caruel 1863 - H scap - HP - European - Fringe.

* Lamium galeobdolon* (L.) L.  
*Lamiastrium galeobdolon* (L.) Ehrend. & Polatschek  

*Ajuga reptans* L.  

* 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*


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

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

*Calamintha grandiflora* (L.) Moench


*Clinopodium vulgare* L.

H scap - HP - Holarctic - Fringe.

*Thymus pulegioides* A. Kerner ex Borbas

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

*Thymus serpyllum* 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.

*Salvia glutinosa* L.


**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 & Pirotta (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 & Pirotta 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.) Arcangели
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.

Scrophularia nodosa L.

§ Gratiola officinalis L.
Levier & Sommier 1891.

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

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

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


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


*Digitalis lutea* L. subsp. *lutea*


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.


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 Fl! 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 & Pirotta (1882) and Baroni (1901) must be attributed to *Veronica fruticans* Jacq. The two specimens of Levier examined in Fl! ("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.

Veronica urticifolia Jacq.
Caruel 1863 - H scap - HP - Oro-hypsophilous - Woods.

? Melampyrum sylvaticum L.
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
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).

Orobanchaceae

? Orobanche alba Stephan ex Willd.
Gibelli & Pirotta 1882 sub Orobanche epithymum DC.
Obs.: Reported for the Modenese Apennines by Gibelli & Pirotta (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.

**LENTIBURIACEAE**

? 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
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 pondss (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

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 ricevè 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 Honckeny 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 & Pirotta (1882) and Ferrarini (1977) for Asperula cynanchica L., by Caruel (1863), Archbald (1874), Gibelli & Pirotta (1882) and Baroni (1899) as Asperula longiflora Waldst. & Kit. should probably be referred to this species.

Asperula taurina L.

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

* Galium aparine L.

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 & Pirotta 1882 sub Galium aristatum L. var. laevigatum Vill. - H scap - HP -
European - Woods.

*Galium mollugo* L.

*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 did find it in the field. Very probably the species was confused with *Galium anisophyllum* Vill.

*Galium rotundifolium* L.

*? 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 corola, 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.

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

*Valeriana tripteris* L.  

**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 & Pirotta 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.) Greml
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 Setentrionale, 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.

Antennaria dioica (L.) Gaertner
Caruel 1863 - Ch rept - HP - Holarctic - Grasslands (Scree slopes).

Tussilago farfara L.

Petasites albus (L.) Gaertner
Caruel 1863 - G rhiz - HP - European - Megaforb.

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

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

**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 Fl!.

**Achillea millefolium** L.
Caruel 1863 - H scap - HP - Eurosibiric - Grasslands.

* *Achillea stricta* (Koch) Schleicher ex Greml
H scap - HP - Oro-hypsophilous - Grasslands.

* *Matricaria discoidea* DC.
T scap - HA - Avventizia - Anthropic.

**Leucanthemum heterophyllum** (Willd.) DC.
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.
* 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.

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

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

Centaurea nigrescens Willd.
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.
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.
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.

*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* 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.
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 qué 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.

*Mycelis muralis* (L.) Dumort.

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

* Taraxacum laevigatum* (Willd.) DC. (aggregate)
H ros - HP - Cosmopolitan - Scree slopes.

Taraxacum officinale Weber in Wiggers (aggregate)

*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.

*? 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 Fl! 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

§ _Hieracium humile_ Jacq.
Levier & Sommier 1891.

_Hieracium lactucella_ Wallr.
_Hieracium auricula_ Lam. & DC.

_Hieracium pilosella_ L.

§ _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-hypsoophilous - Rocky cliffs (Scree slopes).

§ _Hieracium vulgatum_ Fries
_Hieracium lachenalii_ Gmelin
Gibelli & Pirotta 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.
Streptopus amplexifolius (L.) DC. in Lam. & DC.
Streptopus distortus Mich.

HYACINTHACEAE

Scilla bifolia L.
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

* 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.
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
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
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.

ORCHIDACEAE

§ *Orchis mascula* (L.) L.
Ferrarini 1977.

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

* 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 & Pirotta (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 in 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

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 & Pirotta 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.

*Juncus effusus* L.

*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.

*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.

*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 & Pirotta (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

**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
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.
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

? *Carex digitata* L.
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* Hudson

*Carex divulsa* Stokes in With. subsp. *divulsa*

*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* Bertoloni
Levier & 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'Appe.no 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.
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 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 viridula Michaux subsp. oedocarpa (N. J. Anderss.) B. Schmid
  Gerdl & Tomaselli 1993.

POACEAE

Poa alpina L. subsp. alpina

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 & Pirotta (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.

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.  

*Festuca heteromalla* Pourret  
*Festuca rubra* L. subsp. *fallax* (Thuill.) Nyman  

*Festuca heterophylla* Lam.  

*Festuca laevigata* Gaudin subsp. *crassifolia* (Gaudin) Kerguélen & Plonka  
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.  

*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  

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 & Pirotta, 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.

*Festuca rubra* L. subsp. *juncea* (Hack.) K. Richt.

*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.

*Dactylis glomerata* L.
Caruel 1864 - H caesp - HGP - Cosmopolitan - Ubiquist.

*Cynosurus cristatus* L.
Caruel 1864 - H caesp - HGP - European - Grasslands.

*Briza media* L.

§ *Sesleria argentea* (Savi) Savi
*Sesleria caerulea autumnalis* (Scop.) F. Schultz

§ *Bromus arvensis* L. subsp. *arvensis*
*Serrafalcus arvensis* (L.) Godr.
Caruel 1864 sub *Serrafalcus arvensis* (L.) Godr.

*Bromus erectus* Hudson subsp. *erectus*

* *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
Obs.: In agreement with Lucchese (1991), reports such as *Brachypodium pinnatum* (L.) Beauv. must be referred to this species.

* *Brachypodium rupestre* (Host) Roemer & Schultes
§ **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*
Obs.: Reported by Caruel (1864) ed Archbald (1874) at Balzo near Boscolungo (sub *Avena pratensis* L.) and by Gibelli & Pirotta (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** (Vill.) 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*

**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

**Calamagrostis varia** (Schrader) Host subsp. *corsica* (Hackel) Rouy
Caruel 1864 sub *Calamagrostis sylvatica* Host var. *montana* (Host.) Caruel = *Calamagrostis montana* Host. = *Deuyxia 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.

* **Anthoxanthum odoratum** L. subsp. *nipponicum* (Honda) Tzelev
*Anthoxanthum alpinum* Löve & Löve
H caesp - HGP - Holarctic - High altitude grasslands.

*Anthoxanthum odoratum* L. subsp. *odoratum*

§ *Agrostis canina* L. subsp. *canina*
Caruel 1864.

*Agrostis capillaris* L. subsp. *capillaris*
*Agrostis tenuis* Sibth.
*Agrostis vulgaris* With.

*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.

*Melica uniflora* Retz

§ *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.
Convulvulus 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.
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.
Tephroseris 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 hemicyryptophytes (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.](image)
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 hemicyryptophytes, just above that for the Upper Sestaione Valley and of therophytes and chamaephytes slighty 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>
<thead>
<tr>
<th>Forms</th>
<th>n°</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Woody (W)</strong></td>
<td>53</td>
<td>11.88</td>
</tr>
<tr>
<td>W</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>WF</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>WS</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>WS succ</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Herbaceous (H)</strong></td>
<td>368</td>
<td>82.51</td>
</tr>
<tr>
<td>Annual</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>HA</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>HGA</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Biennial</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>HB</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Perennial</td>
<td>339</td>
<td></td>
</tr>
<tr>
<td>HP</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>HGP</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>H tu</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>H bu</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Hy</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Pteridophytes (Pt)</strong></td>
<td>22</td>
<td>4.93</td>
</tr>
</tbody>
</table>

Table 1. Growth forms of the present flora (446 entities) of the Upper Sestaione Valley. Abbreviations follow Arrigoni (1996).
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 (\textit{Festuca riccerii} and one of the Northern Apennine (\textit{Murbeckiella zanonii}); 2 endemisms of the Tuscan-Emilian Apennines and Apuan Alps (\textit{Saxifraga aspera} subsp. \textit{etrusca} and \textit{Globularia incanescens} Viv.) and 1 endemism of the northern Apennines and Apuan Alps (\textit{Festuca violacea} subsp. \textit{puccinelli}). 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 (\textit{Viola calcarata} L. subsp. \textit{cavillieri} and \textit{Phyteuma micheli}), 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): \textit{(Allium schoenoprasum, Carex divulsa, Cicerbita alpina, Empetrum hermaphroditum, Gentiana purpurea, Juncus filiformis, Lycopodium annotinum, Luzula lutea, Picea...)}

![Graph showing geographical distribution of species](image_url)

**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 crispa, 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. Fumaïolo (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>
<thead>
<tr>
<th>Habitats</th>
<th>n. species</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woods</td>
<td>74</td>
<td>16.59</td>
</tr>
<tr>
<td>Riparian woods</td>
<td>4</td>
<td>0.90</td>
</tr>
<tr>
<td>Heathlands</td>
<td>23</td>
<td>5.16</td>
</tr>
<tr>
<td>Grasslands</td>
<td>71</td>
<td>15.92</td>
</tr>
<tr>
<td>High altitude grasslands</td>
<td>47</td>
<td>10.54</td>
</tr>
<tr>
<td>Ledges</td>
<td>23</td>
<td>5.16</td>
</tr>
<tr>
<td>Megaforbs</td>
<td>50</td>
<td>11.21</td>
</tr>
<tr>
<td>Fringe</td>
<td>32</td>
<td>7.17</td>
</tr>
<tr>
<td>Rocky cliffs</td>
<td>20</td>
<td>4.48</td>
</tr>
<tr>
<td>Scree slopes</td>
<td>27</td>
<td>6.05</td>
</tr>
<tr>
<td>Stony fields</td>
<td>6</td>
<td>1.35</td>
</tr>
<tr>
<td>Snow beds</td>
<td>4</td>
<td>0.90</td>
</tr>
<tr>
<td>Peat bogs and polls</td>
<td>28</td>
<td>6.28</td>
</tr>
<tr>
<td>Small lakes</td>
<td>6</td>
<td>1.35</td>
</tr>
<tr>
<td>Streams</td>
<td>3</td>
<td>0.67</td>
</tr>
<tr>
<td>Springs</td>
<td>8</td>
<td>1.79</td>
</tr>
<tr>
<td>Anthropic areas</td>
<td>18</td>
<td>4.04</td>
</tr>
<tr>
<td>Ubiquitous</td>
<td>2</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Table 2. Habitat types of the present flora of the Upper Sestaione Valley.
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 seminatural 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-
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 in the "Regional Red Lists of the Plants of Italy".

<table>
<thead>
<tr>
<th>Habitats</th>
<th>species</th>
<th>threatened species</th>
<th>non-confirmed threatened species</th>
<th>confirmed threatened species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woods</td>
<td>74</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Heathlands</td>
<td>23</td>
<td>5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Grasslands</td>
<td>71</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>High altitude grasslands</td>
<td>47</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ledges</td>
<td>23</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Megaforbs</td>
<td>50</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Rocky cliffs</td>
<td>20</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Scree slopes</td>
<td>27</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Stony fields</td>
<td>6</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Peat bogs and polls</td>
<td>28</td>
<td>10</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Small lakes</td>
<td>6</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Springs</td>
<td>8</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

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".

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".

<table>
<thead>
<tr>
<th>Habitats</th>
<th>species</th>
<th>threatened species</th>
<th>non-confirmed threatened species</th>
<th>confirmed threatened species</th>
</tr>
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<tbody>
<tr>
<td>Phanerophytes</td>
<td>22</td>
<td>2</td>
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<td>2</td>
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<tr>
<td>Nanophanerophytes</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chamaephytes</td>
<td>28</td>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Hemicryptophytes</td>
<td>300</td>
<td>15</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Geophytes</td>
<td>63</td>
<td>13</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Hydrophytes</td>
<td>2</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
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 hygrophytic 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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*= electronic publication.

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