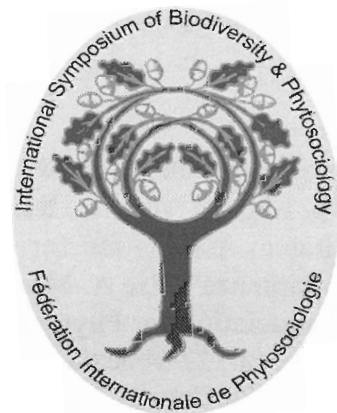


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## Guide to the Excursion of the "Fédération Internationale de Phytosociologie" to the Natural Parks of Conero, Gran Sasso and Monti della Laga, and Circeo

Edited by E. Biondi & C. Blasi

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## Excursion to the Conero regional natural park

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### The Regional Natural Park

The Regional Natural Park of Conero is situated in the central-eastern part of the Italian peninsula where it covers an area of about 6,000 ha (Fig. 1). The protected area extends in a north-south direction for a distance of about 20 Km, reaching a maximum width corresponding to Conero Mountain (about 7 Km) and narrowing towards its northern extremity.

The wide floristic and biocoenotic biodiversity which characterises the area is determined by its central position with respect to the basin of the Adriatic Sea, by the height of the Conero promontory, which with its height of 572 m greatly surpasses the average of the Italian Adriatic coast, and by the diversity of the geological, geomorphological and climatic conditions of the territory enclosed by the Natural Park (Brilli-Cattarini, 1967; Biondi, 1986).

The agricultural, timbering and shepherding activities that were very developed in the past have contributed in part to the increase in the biodiversity of the territory, determining a high diversification of the plant landscape and favouring the development of ecotonal areas. The abandonment of the agricultural activities in large areas that followed, and of the timbering and shepherding activities in almost all of the territory, has determined the development of the natural dynamic processes of the recovery of the vegetation.

### Geology and geomorphology

Structurally, the area is composed of a dome-shaped anticline, with numerous faults of Apennine-antiApennine orientation, attributable to different tectonic phases (the Pliocene, Pliopleistocene, Pleistocene phases). The outcrops belong to the Umbria/Marche series Formations from the Cretaceous to the Pliocene (Coltorti *et al.*, 1991).

In the Natural Park area, four main geomorphological zones can be individuated (Cello & Coppola, 1983) (Fig. 2).

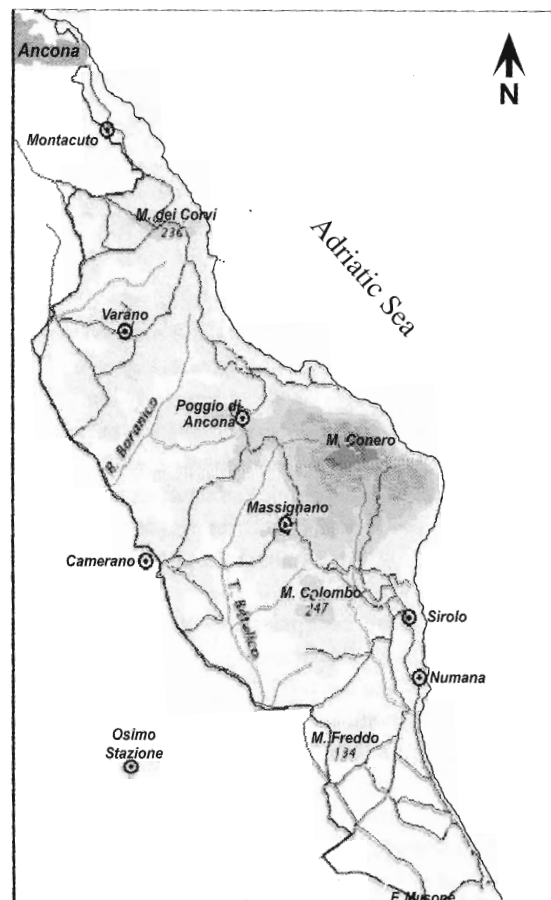


Fig. 1 – The Conero Regional Natural Park

The first of these is represented by the coastal belt that appears very indented with little bays, and is composed of various lithological and structural typologies. In particular, between Ancona and Portonovo and between Sirolo and Numana the coastal cliffs are of the marly-arenaceous type, of the formations of Schlier, while between Portonovo and the Sassi Neri locality they are calcareous with the lithotypes of Maiolica and of the White and Pink Scaglia. South of Numana, the coast is instead low-lying, of the sedimentary type.

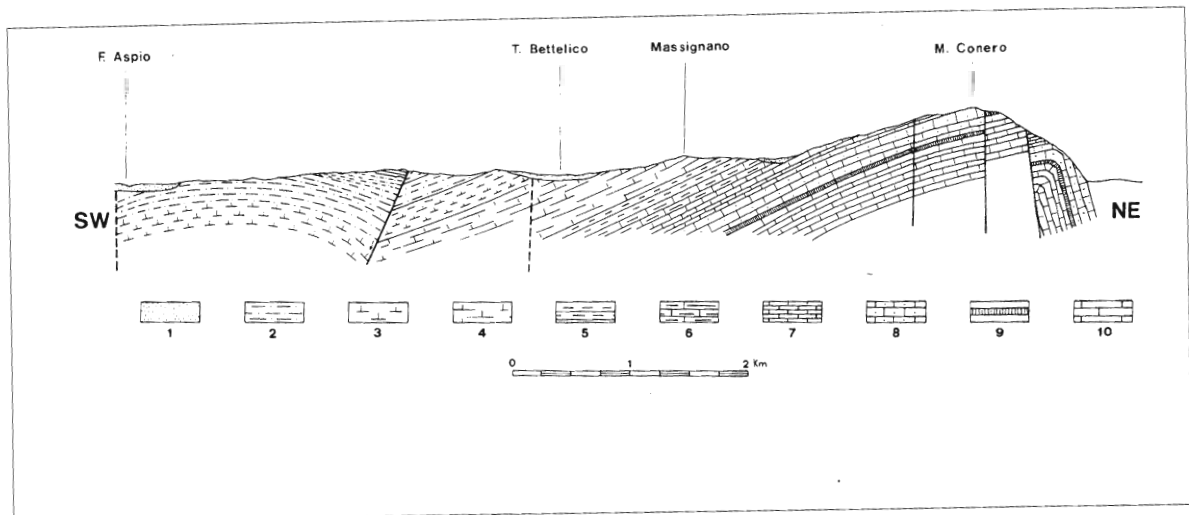


Fig. 2 – Geological cross-section of the Conero Mountain area: (redrawn from Cello and Coppola, 1983). 1: Alluvium, 2: Marl and sand, 3: Colombacci marl, 4: Schlier, 5: Bisciario, 6: Greyish Scaglia, 7: Pink Scaglia, 8: White Scaglia, 9: Fucoid marls, 10: Maiolica

The second zone consists of the hills of the inland area where the pelitic-arenaceous and marly deposits from the Miocene-Pliocene age are exposed. The lithological substratum of the hills mainly comprises very fine deposits: pelites of the plio-Pleistocene rich in argillaceous minerals interspersed with pelitic-arenaceous, arenaceous-pelitic and sandy-conglomerate bodies. The main peaks are: Massignano (268 m), Mount Zoia (262 m), Mount Larciano (236 m) and Mount Colombo (253 m).

The third zone comprises Conero Mountain, characterised by calcareous rocks with a complex pattern of folds and fractures. This massif is of a large ellipsoid shape, with an asymmetric structure: indeed, the sea aspects are very steep, almost vertical, while on the western side they are rounded.

Finally, the fourth zone comprises the plains constituted by pebble and pebble-sand alluvial deposits, and by lenticular formations of various extents of fine silt-sand and silt-clay deposits of a few metres in depth (Nanni, 1997).

In the Park territory there are few water courses, which are mainly seasonal in character. Other hydrographic elements of relevant environmental interest are the “Lago Grande” (Big Lake) and the “Lago Profondo” (Deep Lake), two small brackish waters in the Portonovo area.

### Bioclimatology

On the basis of the bioclimatic indices of Rivas-Martinez *et al.*, 1999, the Conero territory belongs to the Mediterranean macrobioclimate, with an oceanic

pluviseasonal bioclimate, upper mesoMediterranean thermotype, the low subhumid ombrotype (Fig. 3). It is anyway evident that the vegetation is influenced above all by the meso and micro climatic conditions, linked to the geomorphological characteristics of the locations.

### The Flora

On the basis of research that is still underway, the flora of the Natural Park includes about 1,200 entities. Considering the limited extent of the area, the index of the floral density is significantly high.

From the biological spectrum (Fig. 4), the affinity with regions with a Mediterranean bioclimate becomes clear. Indeed, there is a good presence of therophytes, which by themselves represent 39% of the species present in the area. Also, the hemicryptophytes have a high presence (31%), highlighting the particular bioclimatic condition, which is a transition between the Mediterranean and Temperate bioclimates.

The chorological spectrum (Fig. 4) highlights a clear dominance of the Mediterranean element. In particular, the steno-Mediterraneans are present at a much higher percentage than that relative to the entire region. This data confirms the peculiarity of the territory from the phytogeographic point of view. The low percentage of adventitious and cosmopolitan species indicates the good quality of the flora and of the environment.

Some of the species with a Mediterranean distribution find their northern limit of distribution along the western Adriatic coast specifically in the Conero Park (Paolucci, 1890-91; Paolucci & Cardinali, 1895;

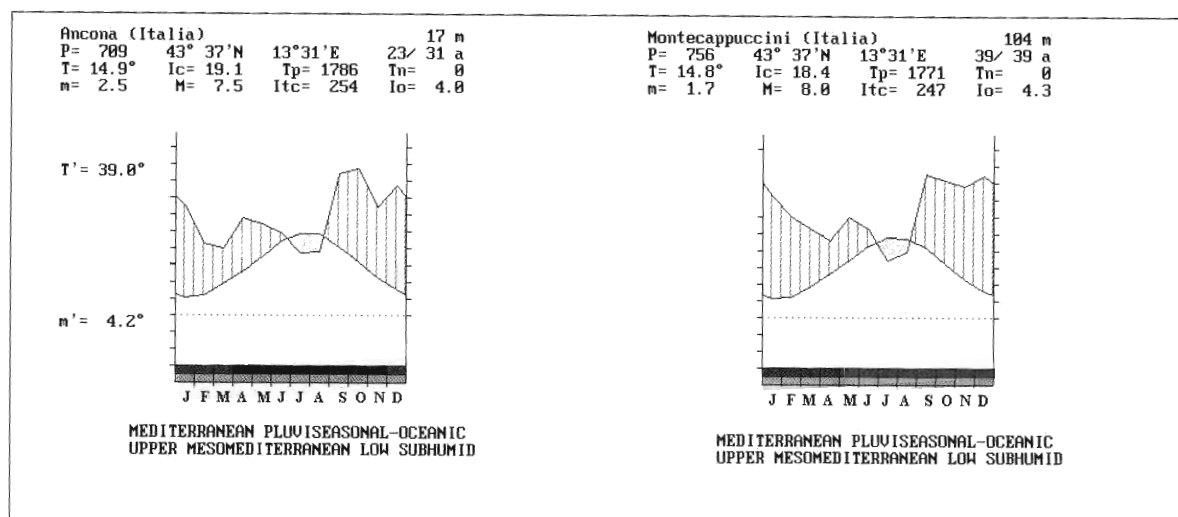


Fig. 3 – Bioclimatic diagram and classification

Béguinot, 1905; Brilli-Cattarini, 1965, 1967; Biondi, 1981, 1986): *Ampelodesmos mauritanicus*, *Melica minuta*, *Lolium rigidum* ssp. *lepturoides*, *Bellevalia dubia*, *Rapistrum rugosum* ssp. *linneanum*, *Hippocrepis ciliata*, *Coronilla valentina* ssp. *valentina* (Fig. 5), *Hedysarum spinosissimum* ssp. *capitatum*, *Euphorbia dendroides* ssp. *dendroides* (Fig. 6), *Plantago serraria*, *Fumana arabica*, *Brassica montana* (Fig. 7) and *Juniperus oxycedrus* subsp. *macrocarpa* (Fig. 8).

Other species that are found on Conero are instead not found along the length of the northern coast from Conero to Venezia Giulia: *Pinus halepensis*, *Stipa bromoides*, *Euphorbia veneta* (Fig. 9), *Asphodeline liburnica* (Fig. 10), *Hippocrepis emerus* ssp. *emeroides*, *Pistacia terebinthus* ssp. *terebinthus*, *Lonicera implexa*, *Medicago monspeliaca*, *Ruta chalepensis*, *Convolvulus elegantissimus* and *Crucianella latifolia*.

Species especially rare in the Park territory where they are in danger of extinction are the natural colonisers of the dune environment: *Echinophora spinosa*, *Otanthus maritimus*, *Euphorbia paralias*, *Eryngium maritimum*, *Calystegia soldanella*, *Polygonum maritimum*, *Medicago marina*, *Cuscuta scandens*

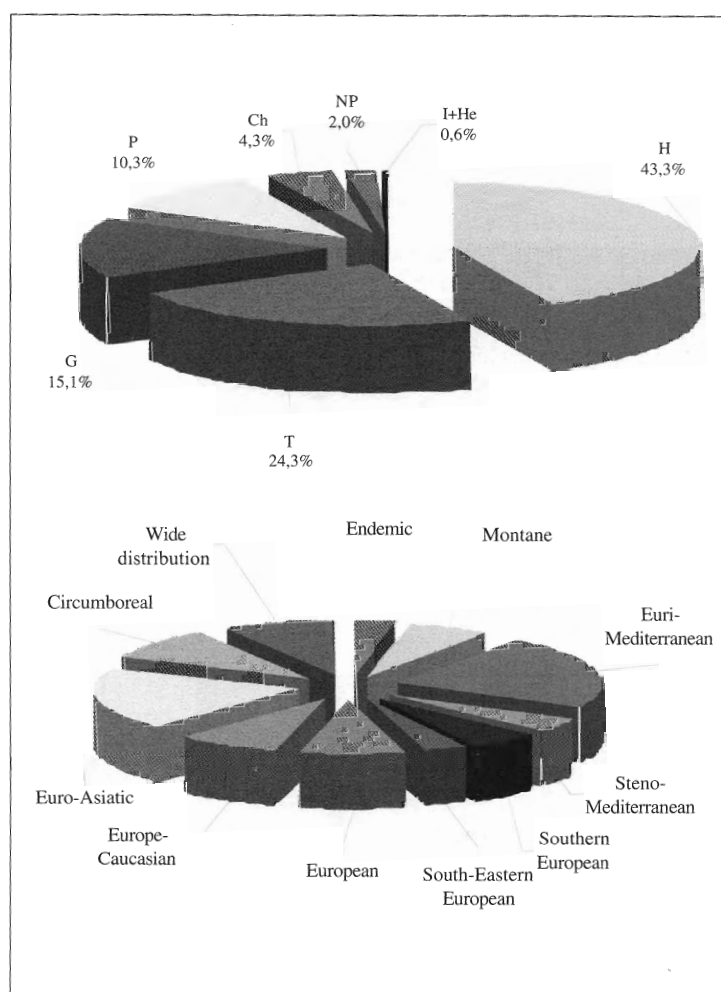


Fig. 4 – Biological and chorological spectra of the flora of the Conero Natural Park



Fig. 5a

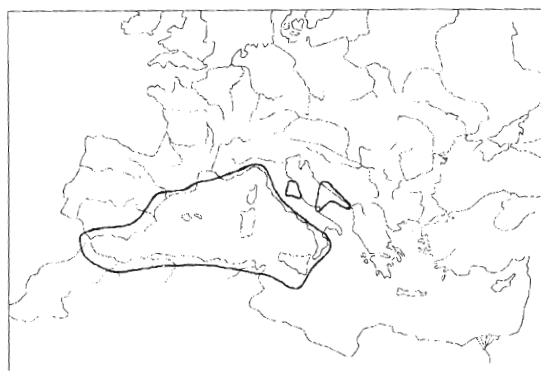


Fig. 5b



Fig. 6a

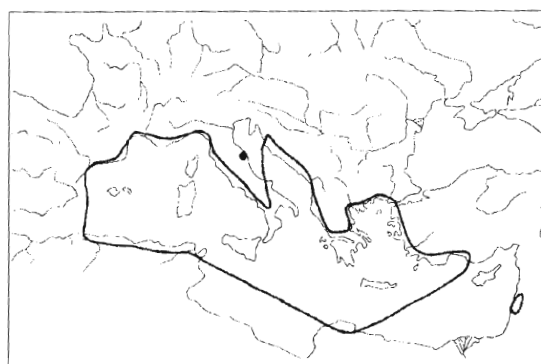


Fig. 6b



Fig. 7a

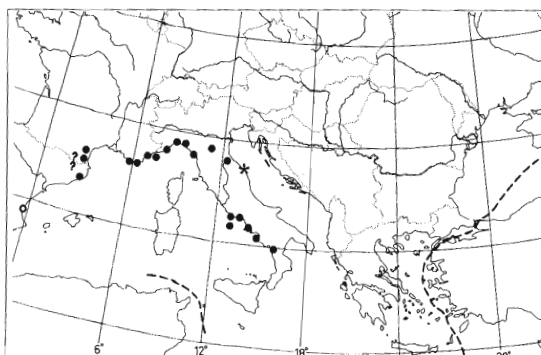


Fig. 7b



Fig. 8a

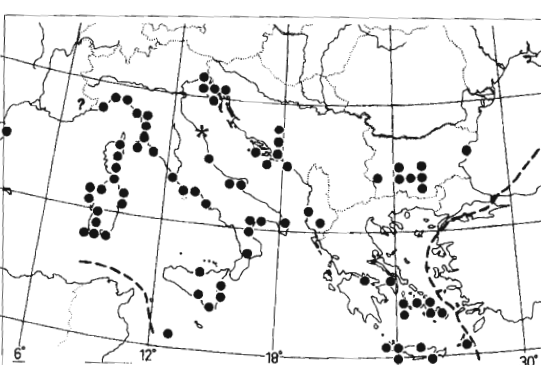


Fig. 8b



Fig. 9a

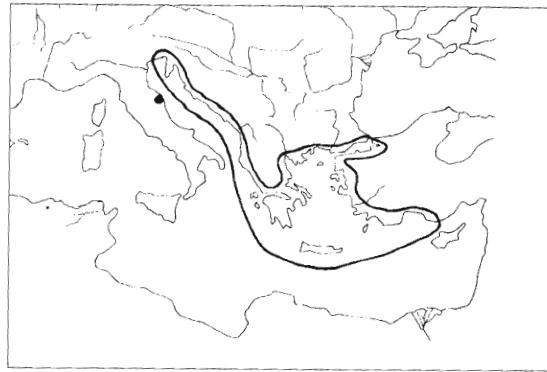


Fig. 9b



Fig. 10



Fig. 11

Fig. 5a – *Coronilla valentina* ssp. *valentina*

Fig. 5b – Distribution of *Coronilla valentina* ssp. *valentina* (from Biondi, 1986)

Fig. 6a – *Euphorbia dendroides* ssp. *dendroides*

Fig. 6b - Distribution of *Euphorbia dendroides* ssp. *dendroides* (from Biondi, 1986). The species, known for a long time for the area of Valle delle Vellare, was recently found in a western area of Conero, near Massignano Mountain

Fig. 7a – *Brassica montana*

Fig. 7b – Distribution of *Brassica montana* (modified from Jalas, Suominen & Lampinen, 1996) \* new area for Conero Mountain

Fig. 8a – *Juniperus oxycedrus* ssp. *macrocarpa*

Fig. 8b – Distribution of *Juniperus oxycedrus* ssp. *macrocarpa* (modified from Jalas & Souminen, 1988) \* new area for Conero Mountain

Fig. 9a – *Euphorbia veneta*

Fig. 9b – Distribution of *Euphorbia veneta* (modified from Biondi, 1986)

Fig. 10 – *Asphodeline liburnica* (indicated by Brilli-Cattarini 1967 for the calcareous sector of Conero Mountain, in the Valle delle Vellare, recently found in a rich area on the marly-arenaceous cliffs of Mezza Valle).

Fig. 11 – *Ranunculus peltatus* ssp. *baudotii*

subsp. *cesatiana* and *Glaucium flavum*. The sands beyond the dunes are host to some rare species, such as: *Trifolium suffocatum*, *Allium chamaemoly*, *Silene nocturna* ssp. *nocturna*, *Romulea ramiflora* and *R. columnae*.

At risk there are also the brackish waters species of the two lakes of Portonovo, *Cladium mariscus* and

*Sonchus maritimus* ssp. *maritimus* in particular.

Also very important is the presence in the Park flora of some hygrophilous species that are found in the wet plains area near the mouth of the Musone River: *Ranunculus peltatus* ssp. *baudotii* (Fig. 11), *Lythrum tribacteatum*, *Scutellaria hastifolia* and *Scrophularia auriculata*.

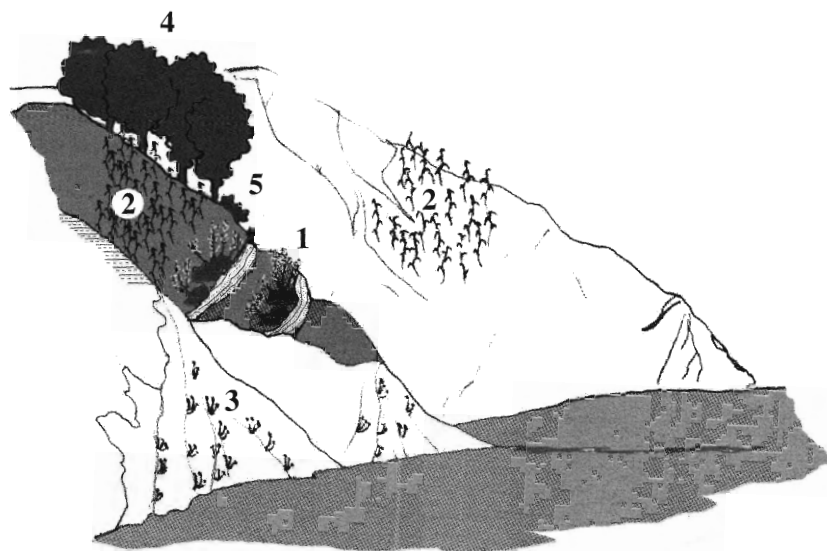
1<sup>st</sup> stop - The viewpoint above Portonovo

Fig. 12 - The marly-arenaceous cliffs geosyngnetum: 1 *Coronillo emeroidis-Rhamnetum alaterni*, 2 *Arundinetum plinianae*, 3 *Dauco carotae-Tussilaginetum farfarae*, 4 *Symphyto bulbosi-Ulmetum minoris*, 5 *Lonicero etruscae-Cornetum sanguineae* (from Biondi *et al.*, 2002)

From the Portonovo viewpoint it is possible to see the marly-arenaceous cliffs, and the north-facing calcareous cliffs.

#### The marly-arenaceous cliffs (Fig. 12)

The high marly-arenaceous cliffs of the Schlier formation extend from Ancona to Portonovo, and then, after the calcareous promontory, from the beach of Sassi Neri to the harbour of Numana, excluding the calcareous part where the small town of Sirolo has been built. Due to the looseness of the material of which they are composed, these formations, that date back to the Pliocene and the Pleistocene, are subjected to important erosive phenomena due to the actions of the sea and of atmospheric agents that cause landslides through the sliding of the layers along the fault lines. The sea at the base of the cliffs is punctuated by rocky outcrops, originating from the different erosive actions on their various layers, like the rock of Trave (The Beam) that is around 450 m in length.

The cliff vegetation can be differentiated into two series in relation to the morphology and nature of the

substratum, of which one, the *Symphyto bulbosi-Ulmetum minoris* syngnetum, colonises the calcareous marls, and the other, *Coronillo emeroidis-Rhamnetum alaterni* syngnetum develops on the arenaceous layers of the cliffs.

#### *SYMPHYTO BULBOSI-ULMETUM MINORIS* Biondi & Allegranza 1996 (Tab. 1)

This association is represented by the meso-hygrophilous woods of elm, of which the characteristic species are: *Ulmus minor*, *Symphytum bulbosum*, *Arum italicum* and *Ranunculus ficaria*. In particular, *Symphytum bulbosum*, a species found in south-eastern Europe, contributes to the differentiation between the Italian association and the Spanish one *Opopanax chironii-Ulmetum minoris* Bellot & Ron in Bellot, Ron & Carballal 1979. The presence of *Rubia peregrina* ssp. *longifolia*, *Laurus nobilis* and *Rhamnus alaternus* ssp. *alaternus* indicates the Mediterranean bioclimatic and biogeographic collocation of the phytocoenosis.

#### *LONICERO ETRUSCAE-CORNETUM SANGUINEAE* Biondi *et al.* 2002 (Tab. 2)

This association is represented by the dense shrubs

Tab. 1 - *SYMPHYTO BULBOSI-ULMETUM MINORIS* Biondi & Allegrezza 1996

|   |   |     |
|---|---|-----|
| Rel. n.   |   | 1   |
| Altitude (m)  |   | 170 |
| Exposure  |   | N   |
| Slope (°)   |   | 15  |
| Coverage (%)  |   | 100 |
| Area (m <sup>2</sup> )  |   | 30  |
| Charact. species of the ass. and of the <i>Alno-Ulmion minoris</i> all. |   |     |
| P caesp   | Ulmus minor Miller                          | 5.5 |
| G rhiz  | Petasites fragrans (Vill.) C. Presl         | 4.4 |
| G rhiz  | Symphytum bulbosum Schimper                 | 1.1 |
| Charact. species of the upper units                                     |   |     |
| P lian  | Hedera helix L.                             | 2.3 |
| P caesp   | Quercus pubescens Willd.                    | +2  |
| Other species   |   |     |
| P lian  | Clematis vitalba L.                         | 1.1 |
| G rhiz  | Arum italicum Miller subsp. italicum        | +2  |
| T scap  | Galium aparine L.                           | +2  |
| H scap  | Alliaria petiolata (Bieb.) Cavara et Grande | +2  |
| H scap  | Urtica dioica L.                            | +   |
| T scap  | Sinapis alba L.                             | +2  |
| P caesp   | Laurus nobilis L.                           | +   |
| G rhiz  | Convolvulus arvensis L. subsp. arvensis     | +   |
| H scap  | Parietaria judaica L.                       | +2  |
| T rept  | Stellaria media (L.) Vill.                  | +2  |
| G bulb  | Oxalis pes-caprae L.                        | +2  |

Tab. 2 - *Loniceri ETRUSCAE-CORNETUM SANGUINEAE* Biondi *et al.* 2002

| Rel. n.                             | 1  | 2    | 3    | 4    | P   |   |
|-------------------------------------|--|------|------|------|-----|---|
| Altitude (m)                        | 180  | 190  | 100  | 80   | r   |   |
| Exposure                            | E-SE   | E-SE | E-NE | N-NE | e   |   |
| Slope (°)                           | 15   | 15   | 30   | 30   | s.  |   |
| Coverage (%)                        | 100  | 100  | 100  | 100  |     |   |
| Area (m <sup>2</sup> )              | 15   | 15   | 20   | 15   |     |   |
| Charact. species                    |  |      |      |      |     |   |
| P caesp                             | Cornus sanguinea L.  | 5.5  | 5.5  | 4.4  | 4.4 | 4 |
| P lian                              | Lonicera etrusca Santi                                     | +2   | 1.2  | +    | 1.2 | 4 |
| Diff. species                       |  |      |      |      |     |   |
| G rhiz                              | Arundo plinii Turra  | 2.2  | 1.2  | 1.2  | 2.2 | 4 |
| P lian                              | Rubia peregrina L. ssp. longifolia (Poiret) Bolos          | 2.3  | .    | 2.3  | 1.2 | 3 |
| P lian                              | Clematis flammula L.                                       | +2   | .    | .    | 1.2 | 2 |
| P caesp                             | Spartium junceum L.  | .    | .    | +    | +2  | 2 |
| Charact. species of the upper units |  |      |      |      |     |   |
| NP                                  | Rubus ulmifolius Schott                                    | 2.2  | +2   | +    | 1.1 | 4 |
| G rhiz                              | Pteridium aquilinum (L.) Kuhn subsp. aquilinum             | 1.2  | .    | .    | .   | 1 |
| P caesp                             | Cytisophyllum sessilifolium (L.) O.F. Lang                 | +    | .    | .    | .   | 1 |
| Other species                       |  |      |      |      |     |   |
| G rhiz                              | Asparagus acutifolius L.                                   | 1.2  | 1.1  | +2   | +2  | 4 |
| P caesp                             | Rhamnus alaternus L. subsp. alaternus                      | 1.1  | .    | +    | .   | 2 |
| H scap                              | Ranunculus bulbosus L. subsp. aleae (Willk.) Rouy et Fouc. | .    | .    | +    | +   | 2 |
| H scap                              | Hedysarum coronarium L.                                    | .    | .    | +    | +   | 2 |
| Accidental species                  |  |      |      |      |     |   |
|                                     |  | 1    | -    | 1    | 2   |   |



that are found on the clay of the marly-arenaceous coastal cliffs, north of the Conero promontory, around the fall lines, often bordering the remnants of elm woods, at a height of between 50 and 200 m, on immature soils. The species characterising this association are: *Lonicera etrusca* and *Cornus sanguinea*, and differential geographic species are: *Arundo plinii*, *Clematis flammula* and *Spartium junceum*. From the syndynamic point of view, this coenosis forms the mantle of the elm woods.

**ARUNDINETUM PLINIANAE** Biondi, Brugiapaglia, Allegrezza & Ballelli 1992 (Tab. 3)

This consists of dense formations of *Arundo plinii* that develop on pelitic-arenaceous substratum and clay subjected to frequent landslides (Biondi *et al.*, 1992). These phytocoenosis are important for the control of superficial waters because *Arundo plinii* constitutes a thick network of roots and rhizomes that are able to bind the soil to a depth of 40-50 cm or more. Although this cannot directly prevent the development of the landslides, that originate from detachment of layers that are at a much greater depth, these formations decrease the main cause of hydrogeological deterioration by reducing the running off of the rainwater (Biondi, 1986).

The series of the Mediterranean buckthorn (*Coronillo emeroidis-Rhamneto alaterni* sygmetum) is the most xerophilous of this system as it develops on the sandstone, a rock of various compactness that through its breakdown liberates great quantities of sand and has a low water-retention capacity.

**CORONILLO EMEROIDIS-RHAMNETUM ALATERNI** Biondi *et al.* 2002 (Tab. 4)

**LONGICERETOSUM ETRUSCAE** Biondi *et al.* 2002

This consists of dense phytocoenosis of variable height that establish themselves on the sandstone layers of the marly-arenaceous cliffs north of the Conero promontory, on the east and north-east aspects at heights between 80 and 130 m. The species differentiating the subassociation are: *Lonicera etrusca*, *Arundo plinii*, *Cytisophyllum sessilifolium*, *Quercus pubescens* and *Lonicera xylosteum*.

From the syndynamic point of view, this association represents a restricted stage in the vegetation in that the continuous erosive phenomena that determine the hydrogeological instability prevent the evolution of the vegetation towards better structured communities.

The landscape of the marly-arenaceous cliffs is completed by the pioneer vegetation in the areas of detachment of recent landslides, belonging to the *Daucocrotae-Tussilaginetum farfarae* association Biondi,

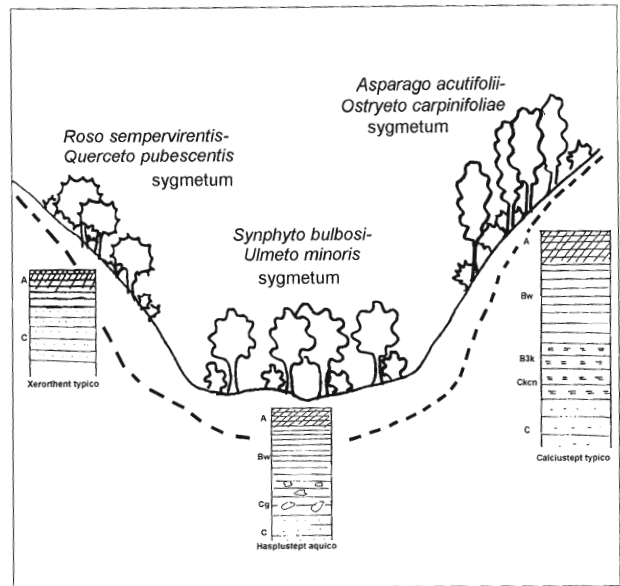


Fig. 13 - Distribution of sygmeta and types of soil in the small valleys that open out in the marly-arenaceous cliffs

Brugiapaglia, Allegrezza & Ballelli 1992 (Tab. 5), and by the halophilous vegetation that is found in the fissures of the rocky cliffs, belonging to *Reichardio maritimae-Brassicetum robertianae* association Biondi 1982 (Tab. 6).

In the top and internal small valleys that open out in the cliffs, the distribution of the vegetational series is determined by the exposure and the geomorphological position (Fig. 13). On the northern aspects, the hop hornbeam (*Asparago acutifolii-Ostryeto carpinifoliae* sygmetum) series is found, while on those to the south, the downy oak (*Roso sempervirentis-Querceto pubescentis* sygmetum) series is found. Along the fall line the edapho-hygrophilous elm (*Synphyto bulbosi-Ulmeto minoris* sygmetum) series is found instead.

**ASPARAGO ACUTIFOLII-OSTRYETUM CARPINIFOLIAE** Biondi 1982 (Tab. 7)

The coenosis assigned to this association, described for Conero and found in various areas of the Adriatic and Tyrrhenian coasts of the peninsula, are physiognomically similar to the hop hornbeam woods of the calcareous mountains of the Apennines, from which they can be differentiated by the floristic composition that is enriched in Mediterranean species, such as *Smilax aspera*, *Rubia peregrina* ssp. *longifolia*, *Asparagus acutifolius*, *Ruscus aculeatus*, *Laurus nobilis*, *Quercus ilex* ssp. *ilex*, *Clematis flammula*, *Rosa sempervirens*, *Rhamnus alaternus* ssp. *alaternus*, *Viburnum tinus* ssp. *tinus*, while it is lacking in more mesophyllous species (*Helleborus bocconei*, *Scutellaria*

Tab. 3 - *ARUNDINETUM PLINIANAE* Biondi, Brugiapaglia, Allegrezza & Ballelli 1992

| Rel. n.  | 1   | 2   | 3     | P   |   |
|--|---|-----|-------|-----|---|
| Altitude (m)   | 100   | 100 | 180   | r   |   |
| Exposure   | SE  | SE  | SE    | e   |   |
| Slope (°)  | 40  | -   | 10-15 | s.  |   |
| Coverage (%)   | 100   | 100 | 100   |     |   |
| Area (m <sup>2</sup> )                               | 100   | 15  | 20    |     |   |
| Charact. and diff. species of the association        |   |     |       |     |   |
| G rhiz   | Arundo plinii Turra   | 5.5 | 5.5   | 5.5 | 3 |
| P caesp  | Cornus sanguinea L.   | 1.2 | .     | 1.2 | 2 |
| Charact. species of the <i>Inulo-Agropyrion</i> all. |   |     |       |     |   |
| T scap   | Pallenis spinosa (L.) Cass. subsp. spinosa                                | .   | +     | .   | 1 |
| Charact. species of the <i>Rhamno-Prunetea</i> class |   |     |       |     |   |
| P caesp  | Spartium junceum L.   | 1.2 | +2    | +2  | 3 |
| NP   | Hippocrepis emerus (L.) Lassen subsp. emeroides (Boiss. & Spruner) Lassen | +   | .     | .   | 1 |
| NP   | Rubus ulmifolius Schott   | .   | .     | 4.5 | 1 |
| Other species  |   |     |       |     |   |
| NP   | Asparagus acutifolius L.  | 1.2 | 1.1   | +   | 3 |
| H scap   | Bituminaria bituminosa (L.) L. Stirton                                    | +2  | 3.3   | .   | 2 |
| G rhiz   | Asphodeline liburnica (Scop.) Rchb.                                       | +   | 2.3   | .   | 2 |
| P lian   | Rubia peregrina L. ssp. longifolia (Poiret) Bolos                         | 2.3 | .     | 2.3 | 2 |
| P lian   | Lonicera etrusca Santi  | +   | .     | +2  | 2 |
| Accidental species                                   |   |     |       |     |   |
|  |   | 3   | 4     | 3   |   |

Tab. 4 - *CORONILLO EMEROIDIS-RHAMNETUM ALATERNI* Biondi et al. 2002  
*loniceretosum etruscae* Biondi et al. 2002  
*viburnetosum tini* Biondi et al. 2002

| Rel. n.  | 1   | 2   | 3   | 4    | 5   | 6   | 7   | 8   | P   |   |
|--|---|-----|-----|------|-----|-----|-----|-----|-----|---|
| Altitude (m)   | 100   | 80  | 130 | 110  | 80  | 50  | 50  | 200 | r   |   |
| Exposure   | NE  | E   | N   | E-NE | N   | E   | NE  | NNE | e   |   |
| Slope (°)  | 60  | 30  | 20  | 60   | 50  | 40  | 45  | 40  | s.  |   |
| Coverage (%)   | 100   | 100 | 100 | 100  | 100 | 100 | 100 | 100 |     |   |
| Area (m <sup>2</sup> )                                     | 50  | 40  | 20  | 25   | 100 | 100 | 120 | 100 |     |   |
| Charact. species of the association                        |   |     |     |      |     |     |     |     |     |   |
| P caesp  | Rhamnus alaternus L. subsp. alaternus                                     | 4.5 | 5.5 | 4.4  | 4.5 | 4.4 | 3.3 | 4.5 | 3.3 | 8 |
| P caesp  | Spartium junceum L.   | 2.3 | 1.2 | +    | +2  | 2.2 | 2.3 | 1.2 | +   | 8 |
| NP   | Hippocrepis emerus (L.) Lassen subsp. emeroides (Boiss. & Spruner) Lassen | 2.2 | 1.2 | 3.3  | .   | 2.2 | +   | 1.2 | 3.3 | 7 |
| Diff. species of the <i>loniceretosum etruscae</i> subass. |   |     |     |      |     |     |     |     |     |   |
| P lian   | Lonicera etrusca Santi  | 2.3 | 2.2 | 2.2  | 3.3 | .   | .   | .   | +   | 5 |
| G rhiz   | Arundo plinii Turra   | 1.2 | +   | .    | .   | .   | .   | .   | .   | 2 |
| P caesp  | Cytisophyllum sessilifolium (L.) O.F. Lang                                | +2  | +2  | .    | .   | .   | .   | .   | +   | 3 |
| P scap   | Quercus pubescens Willd.  | +   | +   | .    | .   | .   | .   | .   | .   | 2 |
| P caesp  | Lonicera xylosteum L.   | .   | +   | +    | .   | .   | .   | .   | .   | 2 |
| Diff. species of the <i>viburnetosum tini</i> subass.      |   |     |     |      |     |     |     |     |     |   |
| P caesp  | Viburnum tinus L. subsp. tinus  | .   | .   | .    | .   | 3.3 | 3.4 | 3.4 | 2.2 | 4 |
| H caesp  | Ampelodesmos mauritanicus (Poiret) Dur. et Sch.                           | .   | .   | .    | .   | 1.2 | +   | +2  | 1.2 | 4 |
| P lian   | Lonicera implexa Aiton  | .   | .   | .    | .   | 2.2 | 2.2 | 3.3 | .   | 3 |
| Diff. species of the <i>Fraxinus ornus</i> var.            |   |     |     |      |     |     |     |     |     |   |
| P scap   | Fraxinus ornus L. subsp. ornus  | .   | .   | .    | .   | .   | +   | 1.2 | 5.5 | 3 |
| Charact. species of the upper units                        |   |     |     |      |     |     |     |     |     |   |
| P lian   | Rubia peregrina L. ssp. longifolia (Poiret) Bolos                         | 1.2 | 2.1 | 1.2  | 2.2 | 2.3 | 1.2 | 2.3 | 2.2 | 8 |
| G rhiz   | Asparagus acutifolius L.  | 1.2 | 2.2 | 1.2  | 1.2 | 1.2 | 1.2 | 1.2 | 1.2 | 8 |
| NP   | Smilax aspera L.  | 4.5 | 2.2 | .    | .   | 1.2 | 1.2 | 2.2 | 1.2 | 6 |
| NP   | Osyris alba L.  | 1.2 | 2.2 | .    | .   | +2  | .   | .   | 1.2 | 4 |
| P scap   | Quercus ilex L. subsp. ilex   | .   | .   | +    | .   | 1.2 | 1.1 | .   | .   | 3 |
| NP   | Euphorbia dendroides L.   | .   | .   | .    | .   | +   | 1.2 | .   | .   | 2 |
| NP   | Pistacia x saportae Burnat  | .   | .   | .    | .   | +   | 1.1 | 1.2 | .   | 2 |
| P scap   | Pinus halepensis Miller   | .   | .   | .    | .   | +2  | .   | .   | .   | 1 |
| P caesp  | Pistacia terebinthus L. subsp. terebinthus                                | .   | .   | .    | .   | .   | 2.2 | .   | .   | 1 |
| Other species  |   |     |     |      |     |     |     |     |     |   |
| Ch frut  | Teucrium flavum L. subsp. flavum  | 1.2 | 1.1 | 1.2  | .   | .   | +   | +   | +   | 6 |
| H caesp  | Dactylis glomerata L.   | +   | +   | +    | +   | .   | .   | .   | .   | 4 |
| H caesp  | Bromus erectus Hudson subsp. erectus                                      | +   | +   | +    | +   | .   | .   | .   | .   | 4 |
| P lian   | Clematis vitalba L.   | .   | .   | +    | +   | .   | .   | 1.2 | .   | 3 |
| NP   | Rubus ulmifolius Schott   | .   | .   | .    | +   | .   | +   | .   | +   | 3 |
| H caesp  | Brachypodium rupestre (Host) R. et S.                                     | .   | .   | 1.2  | +   | .   | .   | .   | .   | 2 |
| H scap   | Dittrichia viscosa (L.) W. Greuter subsp. viscosa                         | .   | .   | +    | +   | .   | .   | .   | .   | 2 |
| H scap   | Cephalaria leucantha (L.) Schrader  | .   | .   | .    | .   | (+) | .   | +2  | .   | 2 |
| Ch suffr   | Brassica montana Pourret  | .   | .   | .    | .   | (+) | .   | .   | +   | 2 |
| Accidental species   |   |     |     |      |     |     |     |     |     |   |
|  |   | 3   | -   | 1    | 1   | 1   | 1   | -   | 3   |   |

Tab. 5 - *DAUCO-TUSSILAGINETUM FARFARAE* Biondi, Brugiapaglia, Allegrezza & Ballelli 1992

| Rel. n.                             | 1                                     | 2   | 3   | 4   | 5   | P   |   |
|-------------------------------------|---------------------------------------|-----|-----|-----|-----|-----|---|
| Slope (°)                           | 60                                    | 50  | 80  | 80  | 60  | r   |   |
| Coverage (%)                        | 60                                    | 60  | 50  | 60  | 20  | e   |   |
| Area (m <sup>2</sup> )              | 15                                    | 10  | 10  | 12  | 10  | s.  |   |
| Charact. species of the association |                                       |     |     |     |     |     |   |
| H bienne                            | Daucus carota L.                      | +   | +   | +   | +   | 5   |   |
| G rhiz                              | Tussilago farfara L.                  | 3.3 | 2.2 | .   | .   | 2   |   |
| Charact. species of the upper units |                                       |     |     |     |     |     |   |
| H caesp                             | Dactylis glomerata L.                 | +2  | +   | +   | +2  | 5   |   |
| Other species                       |                                       |     |     |     |     |     |   |
| H scap                              | Hedysarum coronarium L.               | +   | +   | 3.4 | 2.3 | 2.2 | 5 |
| H caesp                             | Brachypodium rupestre (Host) R. et S. | +   | .   | 1.2 | +   | +   | 4 |
| T scap                              | Sonchus asper (L.) Hill               | 1.1 | .   | +   | 1.2 | +   | 4 |
| H scap                              | Pulicaria dysenterica (L.) Bernh.     | +2  | +   | .   | .   | .   | 2 |
| G rhiz                              | Elymus athericus (Link) Kerguelén     | .   | 1.2 | .   | 1.2 | .   | 2 |
| H scap                              | Diptotaxis tenuifolia (L.) DC.        | .   | .   | 1.1 | 1.1 | .   | 2 |
| T scap                              | Rapistrum rugosum (L.) All.           | .   | .   | .   | 3.4 | +   | 2 |

Tab. 6 - *REICHARDIO MARITIMAE-BRASSICETUM ROBERTIANAE* Biondi 1982

| Rel. n.  | 1  | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | P   |    |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Altitude (m)   | 10   | 15  | 5   | 5   | 5   | 50  | 80  | 20  | 10  | 10  | r   |    |
| Exposure   | NNE  | W   | NE  | NE  | ENE | SE  | N   | ESE | SE  | NE  | e   |    |
| Slope (°)  | 65   | 90  | 85  | 90  | 90  | 70  | 90  | 90  | 85  | 80  | s.  |    |
| Coverage (%)   | 45   | 30  | 5   | 5   | 5   | 15  | 10  | 40  | 30  | 70  |     |    |
| Area (m <sup>2</sup> )   | 15   | 18  | 12  | 15  | 20  | 24  | 15  | 6   | 10  | 8   |     |    |
| Charact. species of the association  |  |     |     |     |     |     |     |     |     |     |     |    |
| Ch suffr   | Brassica montana Pourret                                 | 1.1 | 2.2 | 1.2 | 1.2 | 1.2 | +   | +   | 1.1 | 1.1 | 2.3 | 10 |
| H scap   | Reichardia picroides (L.) Roth var. maritima             | +2  | +   | +   | +   | 1.2 | +   | +   | +   | +   | +2  | 10 |
| Charact. species of the <i>Crithmo-Staticion</i> all. and of the <i>Crithmo-Staticetea</i> class |  |     |     |     |     |     |     |     |     |     |     |    |
| H bienne   | Daucus carota L. subsp. maritimus (Lam.) Batt.           | 1.1 | 1.1 | +   | +2  | +   | 1.1 | +   | +   | +   | +2  | 10 |
| T scap   | Sonchus asper (L.) Hill subsp. glaucescens (Jordan) Ball | 1.1 | +   | +   | 1.1 | +   | +   | +   | 1.1 | .   | .   | 9  |
| Ch suffr   | Crithmum maritimum L.                                    | 1.2 | 1.2 | +   | .   | +   | +   | +   | 2.3 | 2.3 | 1.2 | 9  |
| Other species  |  |     |     |     |     |     |     |     |     |     |     |    |
| Ch suffr   | Helichrysum italicum G. Don fil subsp. italicum          | 2.2 | +2  | +   | +   | +2  | +   | +   | +2  | .   | +2  | 9  |
| H caesp  | Dactylis hispanica Roth                                  | +2  | +2  | +   | +2  | +2  | +   | +   | +   | .   | +   | 9  |
| H scap   | Galium corrudifolium Vill.                               | .   | +2  | +   | .   | .   | +2  | 1.2 | .   | 1.1 | .   | 5  |
| Ch suffr   | Matthiola incana (L.) R. Br. subsp. incana               | .   | +   | .   | .   | +   | .   | .   | .   | +   | +   | 4  |
| G bulb   | Allium commutatum Guss.                                  | +   | 1.1 | .   | +   | .   | .   | .   | .   | .   | .   | 3  |
| H scap   | Cephalaria leucantha (L.) Roemer & Schultes              | .   | .   | +   | .   | .   | 1.2 | +2  | .   | .   | .   | 3  |
| Accidental species   |  |     |     |     |     |     |     |     |     |     |     |    |
|  |  | 2   | 2   | 5   | 4   | 2   | 7   | 4   | 1   | 1   | -   |    |

Tab. 7 - *ASPARAGO ACUTIFOLII-OSTRYETUM CARPINIFOLIAE* Biondi 1982

| Rel. n.   | 1   | 2   | 3   | 4   | P   |   |
|---|---|-----|-----|-----|-----|---|
| Altitude (m)  | 230   | 250 | 400 | 380 | r   |   |
| Exposure  | NE  | N   | NNW | NNW | e   |   |
| Slope (°)   | 30  | 20  | 25  | 25  | s.  |   |
| Coverage (%)  | 100   | 98  | 95  | 100 |     |   |
| Area (m <sup>2</sup> )  | 250   | 150 | 250 | 200 |     |   |
| Charact. and diff. species of the association   |   |     |     |     |     |   |
| P lian  | Rubia peregrina L. ssp. longifolia (Poiret) O. Bolos                      | +   | 1.1 | 1.1 | 1.1 | 4 |
| G rhiz  | Asparagus acutifolius L.  | .   | +   | 1.1 | 1.1 | 3 |
| P scap  | Quercus ilex L. ssp. ilex   | 1.1 | .   | +   | +   | 3 |
| NP  | Smilax aspera L.  | +   | +   | +2  | .   | 3 |
| H scap  | Lithospermum purpurocaeruleum L.  | .   | .   | +2  | +   | 2 |
| NP  | Rosa sempervirens L.  | .   | .   | +   | +   | 2 |
| Ch frut   | Teucrium flavum L. subsp. flavum  | .   | .   | .   | .   | 1 |
| Charact. and diff. species of the <i>Lauro-Quercenion</i> suball.<br>and of the <i>Ostryo-Carpinion orientalis</i> all. |   |     |     |     |     |   |
| P caesp   | Ostrya carpinifolia Scop.   | 5.5 | 2.2 | 4.4 | 5.5 | 4 |
| NP  | Hippocrepis emerus (L.) Lassen subsp. emeroides (Boiss. & Spruner) Lassen | .   | +   | 1.1 | +   | 3 |
| G rhiz  | Ruscus aculeatus L.   | .   | 2.2 | 1.2 | +   | 3 |
| P scap  | Acer obtusatum Waldst. & Kit. ex Willd. subsp. obtusatum                  | .   | +   | 1.1 | +   | 3 |
| P caesp   | Laurus nobilis L.   | 1.2 | 3.3 | .   | .   | 2 |
| G bulb  | Cyclamen repandum S. et S.  | .   | .   | +   | 1.1 | 2 |
| G bulb  | Cyclamen hederifolium Aiton   | .   | .   | +   | +   | 2 |
| P caesp   | Viburnum tinus L. subsp. tinus  | +2  | .   | .   | .   | 1 |
| P caesp   | Cytisophyllum sessilifolium (L.) O.F. Lang                                | .   | .   | +   | .   | 1 |
| Charact. species of the <i>Quercetalia pubescentis</i> order and of the <i>Quercu-Fagetea</i> class                     |   |     |     |     |     |   |
| P scap  | Fraxinus ornus L. ssp. ornus  | 2.3 | 4.4 | 3.3 | 2.2 | 4 |
| P lian  | Hedera helix L. subsp. helix  | 5.5 | 4.4 | 1.2 | 4.4 | 4 |
| P caesp   | Quercus pubescens Willd.  | 1.1 | 1.1 | 2.2 | 2.2 | 4 |
| P caesp   | Daphne laureola L. subsp. laureola  | +   | .   | 1.2 | 1.1 | 3 |
| G rad   | Tamus communis L.   | 1.1 | +2  | .   | .   | 2 |
| P scap  | Acer campestre L. subsp. campestre  | 1.1 | 1.1 | .   | .   | 2 |
| P scap  | Acer pseudoplatanus L.  | +   | .   | +   | .   | 2 |
| G rhiz  | Cephalanthera damasonium (Miller) Druce                                   | .   | +2  | +   | .   | 2 |
| H scap  | Viola reichenbachiana Jordan ex Boreau                                    | .   | +2  | .   | 1.1 | 2 |
| G rhiz  | Hepatica nobilis Miller   | .   | .   | +   | 1.1 | 2 |
| H ros   | Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker                       | .   | .   | 1.2 | 1.1 | 2 |
| H scap  | Melittis melissophyllum L.  | .   | .   | 2.2 | 1.1 | 2 |
| H scap  | Solidago virgaurea L. subsp. virgaurea                                    | .   | .   | +2  | +   | 2 |
| G rhiz  | Cephalanthera longifolia (Hudson) Fritsch                                 | .   | .   | +   | +   | 2 |
| H ros   | Primula vulgaris Hudson   | .   | .   | .   | +2  | 1 |
| P scap  | Tilia platyphyllos Scop. subsp. platyphyllos                              | +2  | .   | .   | .   | 1 |
| P caesp   | Corylus avellana L.   | 1.2 | .   | .   | .   | 1 |
| P scap  | Prunus avium L.   | .   | +   | .   | .   | 1 |
| H rept  | Ajuga reptans L.  | .   | .   | +   | .   | 1 |
| P scap  | Sorbus domestica L.   | .   | .   | +   | .   | 1 |
| Other species   |   |     |     |     |     |   |
| H caesp   | Brachypodium rupestre (Host) R. et S.                                     | .   | +   | 2.2 | 1.1 | 3 |
| P caesp   | Cornus sanguinea L.   | .   | +   | +2  | 1.1 | 3 |
| P caesp   | Crataegus monogyna Jacq. ssp. monogyna                                    | .   | +   | +   | +   | 3 |
| G rhiz  | Carex flacca Schreber   | .   | +   | 4.4 | 2.2 | 3 |
| Accidental species  |   |     |     |     |     |   |
|   |   | 6   | 2   | 3   | 5   |   |

Tab. 8 - *ROSO SEMPERVIRENTIS-QUERCETUM PUBESCENTIS* Biondi 1986

| Rel. n.  | 1   | 2   | 3   | 4    | 5    | P   |   |
|--|---|-----|-----|------|------|-----|---|
| Altitude (m)   | 85  | 180 | 425 | 100  | 100  | r   |   |
| Exposure   | SE  | NW  | SSW | E-NE | E-NE | e   |   |
| Slope (°)  | 40  | 35  | 10  | 10   | 20   | s.  |   |
| Coverage (%)   | 90  | 95  | 100 | 100  | 100  |     |   |
| Area (m <sup>2</sup> )   | 200   | 100 | 100 | 100  | 100  |     |   |
| Charact. species of the association  |   |     |     |      |      |     |   |
| P lian   | Rubia peregrina L. ssp. longifolia (Poiret) Bolos                         | 2.2 | 2.2 | +2   | +    | 1.1 | 5 |
| NP   | Smilax aspera L.  | 1.1 | 1.1 | 1.2  | 1.1  | 1.1 | 5 |
| P lian   | Clematis flammula L.  | 2.2 | +2  | .    | +    | +   | 4 |
| NP   | Rosa sempervirens L.  | .   | .   | 1.2  | +    | +   | 3 |
| P lian   | Lonicera etrusca Santi  | 1.1 | 1.1 | .    | .    | .   | 2 |
| Charact. and diff. species of the <i>Lauro-Quercenion</i> suball. and of the <i>Ostryo-Carpinion orientalis</i> all. |   |     |     |      |      |     |   |
| P caesp  | Laurus nobilis L.   | +   | +   | 1.2  | .    | +   | 4 |
| NP   | Hippocrepis emerus (L.) Lassen subsp. emeroides (Boiss. & Spruner) Lassen | +2  | 2.2 | .    | 1.1  | 2.2 | 4 |
| P caesp  | Cytisophyllum sessilifolium (L.) O.F. Lang                                | 4.5 | +   | .    | +    | .   | 3 |
| NP   | Asparagus acutifolius L.  | .   | 1.1 | .    | 1.1  | +   | 3 |
| P caesp  | Ostrya carpinifolia Scop.   | .   | .   | .    | 2.2  | 1.1 | 2 |
| Ch frut  | Ruscus aculeatus L.   | +   | .   | 2.2  | .    | .   | 2 |
| P caesp  | Rhamnus alaternus L.  | +   | .   | .    | .    | .   | 1 |
| P caesp  | Viburnum tinus L.   | .   | .   | 1.1  | .    | .   | 1 |
| G bulb   | Cyclamen hederifolium Aiton   | .   | .   | 1.2  | .    | .   | 1 |
| G bulb   | Cyclamen repandum S. et S.  | .   | .   | +2   | .    | .   | 1 |
| Charact specie of the <i>Quercetalia pubescentis-petraeae</i> ord. and of the <i>Quercus-Fagetea</i> class           |   |     |     |      |      |     |   |
| P caesp  | Quercus pubescens Willd.  | 5.5 | 4.4 | 4.4  | 5.5  | 5.5 | 5 |
| P lian   | Hedera helix L. ssp. helix  | 3.3 | +2  | 4.4  | 4.4  | 4.4 | 5 |
| P scap   | Fraxinus ornus L. ssp. ornus  | .   | 3.3 | 3.3  | 1.1  | 1.1 | 4 |
| P scap   | Acer campestre L. ssp. campestre  | +   | .   | .    | .    | .   | 1 |
| Ch frut  | Ruscus hypoglossum L.   | .   | .   | 1.1  | .    | .   | 1 |
| P caesp  | Daphne laureola L. ssp. laureola  | .   | .   | +2   | .    | .   | 1 |
| P scap   | Acer pseudoplatanus L.  | .   | .   | +    | .    | .   | 1 |
| H ros  | Viola alba Besser ssp. dehnhardtii (Ten.) W. Becker                       | .   | .   | .    | +2   | .   | 1 |
| G rhiz   | Cephalanthera damasonium (Miller) Druce                                   | .   | .   | .    | .    | +   | 1 |
| Other species  |   |     |     |      |      |     |   |
| P caesp  | Cornus sanguinea L.   | 3.3 | 2.2 | .    | 2.2  | 1.1 | 4 |
| H caesp  | Brachypodium rupestre (Host) R. et S.                                     | 1.1 | 1.2 | .    | +    | +   | 4 |
| NP   | Rubus ulmifolius Schott   | +2  | +2  | .    | 1.1  | 1.1 | 4 |
| G rhiz   | Pteridium aquilinum (L.) Kuhn subsp. aquilinum                            | 1.1 | .   | .    | +    | +   | 3 |
| P caesp  | Arbutus unedo L.  | +   | .   | 2.2  | .    | .   | 2 |
| G rad  | Tamus communis L.   | 1.1 | +   | .    | .    | .   | 2 |
| NP   | Osyris alba L.  | +2  | .   | .    | +    | .   | 2 |
| P scap   | Prunus avium L.   | +2  | .   | .    | +    | .   | 2 |
| P caesp  | Crataegus monogyna Jacq. ssp. monogyna                                    | +   | .   | .    | +    | .   | 2 |
| H scap   | Stachys sylvatica L.  | +   | 1.1 | .    | .    | .   | 2 |
| P lian   | Clematis vitalba L.   | .   | .   | +    | .    | +   | 2 |
| P caesp  | Euonymus europaeus L.   | .   | .   | .    | 1.1  | +   | 2 |
| P lian   | Lonicera caprifolium L.   | .   | .   | .    | +    | +   | 2 |
| Accidental species   |   |     |     |      |      |     |   |
|  |   | 1   | 2   | 1    | 1    | -   |   |

*columnnae*, *Lathyrus venetus*).

The tree covering is mainly made up of *Ostrya carpinifolia*, together with *Fraxinus ornus* ssp. *ornus*, *Acer obtusatum* ssp. *obtusatum* and, sometimes, *Quercus ilex* ssp. *ilex*.

**ROSO SEMPERVIRENTIS-QUERCETUM PUBESCENS** Biondi 1986 (Tab. 8)

Within this association are put the thermophilous woods of *Quercus pubescens* of the subcoastal and coastal areas of Marche and Abruzzo and those of the internal areas of Umbria and Tuscany that are positioned on the best exposed aspects and on the substrata that favour the drainage of water.

The tree covering is mainly made up of *Quercus pubescens*, *Fraxinus ornus* ssp. *ornus*, *Quercus ilex* ssp. *ilex*, *Ostrya carpinifolia*. The undergrowth is rich in vine-like Mediterranean species, that are characteristic of the association: *Smilax aspera*, *Rubia peregrina* ssp. *longifolia*, *Rosa sempervirens*, *Clematis flammula*, *Lonicera implexa* and *Lonicera etrusca*. The presence of these species has allowed the differentiation of these phytocoenosis from those present on the Apennines.

**Calcareous formations with northern aspects** (Fig. 14)

**CEPHALANTHERO LONGIFOLIAE-QUERCETUM ILICIS** Biondi & Venanzoni ex Biondi, Gigante, Pignatelli & Venanzoni 2002 (Tab. 9)

To this association are assigned the mixed mesophilous formations of deciduous and evergreen sclerophyllous species, that make up thick woods of great environmental interest.

The characteristic and differential species are: *Cephalanthera longifolia*, *Hepatica nobilis*, *Melittis melissophyllum* ssp. *melissophyllum* and *Melica uniflora*.

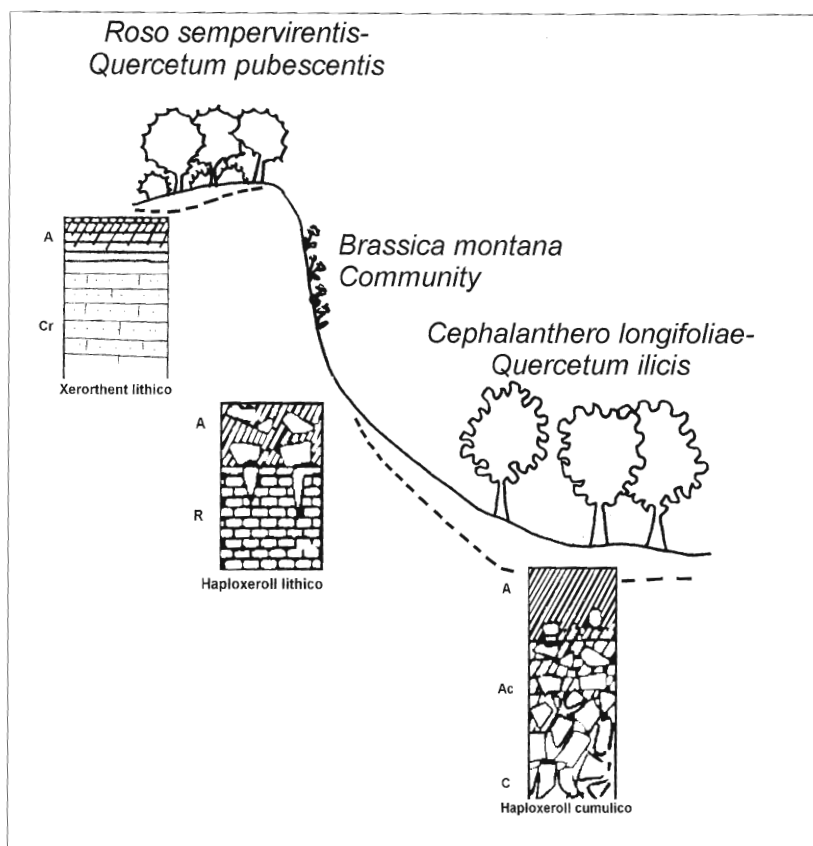


Fig. 14 – Vegetation and soil transect of the limestone with northern aspects

Among the sclerophyllous species, besides *Quercus ilex* ssp. *ilex*, there are: *Laurus nobilis*, *Arbutus unedo*, *Phillyrea media*, *Viburnum tinus* ssp. *tinus*. Among the deciduous the most abundant are: *Ostrya carpinifolia*, that competes with the holm oak for domination of the tree covering, *Acer obtusatum* ssp. *obtusatum* and *Quercus pubescens*.

At heights above 300 m the holm oak woods become rich in shrub and grass species, typically mesophilous, of the *Quercus-Fagetum* class: *Ilex aquifolium*, *Viola reichenbachiana*, *Ruscus hypoglossum*, *Mercurialis perennis*, *Euphorbia amygdaloides* ssp. *amygdaloides* and *Primula vulgaris* that contribute to the differentiation of a particularly mesophilous variant that represents a transition aspect between the formations made up of mainly evergreen sclerophyllous species and the deciduous woods.

The mesophilous holm oak woods cover the northern sea-aspects of Conero Mountain, up to the areas where there is a sudden change in aspect. Some outcrops of these woods also reach the southern aspect in the cooler locations, inside narrow gullies.

Tab. 9 - *CEPHALANTHERA LONGIFOLIAE-QUERCETUM ILICIS* Biondi & Venanzoni ex Biondi  
Gigante Pignatelli & Venanzoni 2002

| Rel. n.                                       | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | P  |
|---|---|-----|-----|-----|-----|-----|-----|-----|----|
| Altitude (m)                                  | 495   | 450 | 400 | 350 | 40  | 420 | 410 | 350 | r  |
| Exposure                                      | N-NE  | NE  | NE  | NE  | N   | NNE | NNE | WSW | e  |
| Slope (°)                                     | 25  | 30  | 25  | 30  | 10  | 25  | 20  | 5   | s. |
| Coverage (%)                                  | 100   | 100 | 100 | 100 | 100 | 98  | 100 | 100 |    |
| Area (m <sup>2</sup> )                        | 200   | 200 | 200 | 100 | 150 | 150 | 150 | 150 |    |
| Charact. and diff. species of the ass.        |   |     |     |     |     |     |     |     |    |
| P caesp                                       | <i>Daphne laureola</i> L. ssp. <i>laureola</i>  | 2.2 | +   | 1.1 | +2  | +   | +2  | +   | 8  |
| P scap  | <i>Acer obtusatum</i> W. et K. ssp. <i>obtusatum</i>                                    | +   | 1.1 | +   | 1.1 | 1.1 | 2.2 | 2.2 | 7  |
| G rhiz  | <i>Ruscus hypoglossum</i> L.  | 1.2 | +   | +   | +   | .   | 1.1 | +   | 6  |
| G rhiz  | <i>Hepatica nobilis</i> Miller  | 2.2 | +2  | +2  | +   | .   | .   | +2  | 6  |
| G rhiz  | <i>Cephalanthera longifolia</i> (Hudson) Fritsch  | .   | +   | +   | +   | .   | +   | +2  | 6  |
| Charact. and diff. species of the upper units |   |     |     |     |     |     |     |     |    |
| P lian  | <i>Rubia peregrina</i> L. ssp. <i>longifolia</i> (Poiret) Bolos                         | 1.2 | 1.1 | 1.1 | +   | +   | +   | +   | 8  |
| G rhiz  | <i>Ruscus aculeatus</i> L.  | 3.4 | 1.2 | 2.2 | 1.1 | +   | 2.2 | 1.1 | 8  |
| NP  | <i>Smilax aspera</i> L.   | 2.2 | 2.3 | 3.3 | 1.1 | 2.2 | 2.2 | 3.3 | 8  |
| P scap  | <i>Quercus ilex</i> L. ssp. <i>ilex</i>   | 4.4 | 5.5 | 5.5 | 5.5 | 4.4 | 5.5 | 4.5 | 8  |
| P caesp                                       | <i>Viburnum tinus</i> L. subsp. <i>tinus</i>  | +   | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | .   | 7  |
| G bulb  | <i>Cyclamen repandum</i> S. et S.   | 2.3 | 1.1 | 1.2 | 1.1 | .   | 1.1 | 1.1 | 6  |
| H caesp                                       | <i>Carex hallerana</i> Asso   | +   | +   | +   | 1.1 | .   | .   | +2  | 6  |
| P   | <i>Arbutus unedo</i> L.   | .   | 2.2 | 1.1 | 1.2 | 1.1 | .   | +   | 6  |
| G rhiz  | <i>Asparagus acutifolius</i> L.   | .   | 1.1 | 1.1 | +   | .   | +   | +   | 6  |
| P caesp                                       | <i>Laurus nobilis</i> L.  | 1.2 | +   | .   | .   | .   | .   | .   | 2  |
| NP  | <i>Rosa sempervirens</i> L.   | .   | .   | +   | .   | .   | .   | +   | 2  |
| H ros   | <i>Asplenium onopteris</i> L.   | .   | .   | .   | +   | .   | .   | .   | 1  |
| P caesp                                       | <i>Pistacia lentiscus</i> L.  | .   | .   | .   | .   | .   | .   | (+) | 1  |
| Other species                                 |   |     |     |     |     |     |     |     |    |
| P scap  | <i>Fraxinus ornus</i> L. ssp. <i>ornus</i>  | 2.3 | 1.1 | 2.2 | 1.1 | 2.2 | 1.1 | 2.2 | 8  |
| P lian  | <i>Hedera helix</i> L. ssp. <i>helix</i>  | 3.3 | 2.2 | 1.1 | 1.1 | +   | 3.3 | 2.2 | 7  |
| P caesp                                       | <i>Ostrya carpinifolia</i> Scop.  | 3.3 | 1.1 | 1.1 | 1.1 | 2.2 | 1.1 | 2.2 | 7  |
| P caesp                                       | <i>Quercus pubescens</i> Willd.   | 1.1 | +   | +   | .   | .   | 1.1 | 1.1 | 6  |
| G bulb  | <i>Cyclamen hederifolium</i> Aiton  | 2.3 | 1.1 | 1.1 | 1.1 | .   | 2.2 | 1.1 | 6  |
| H ros   | <i>Viola alba</i> Besser ssp. <i>dehnhardtii</i> (Ten.) W. Becker                       | +   | +   | +   | +2  | .   | .   | +   | 5  |
| G rhiz  | <i>Mercurialis perennis</i> L.  | 2.3 | +2  | 1.1 | +   | .   | .   | .   | 4  |
| NP  | <i>Hippocrepis emerus</i> (L.) Lassen subsp. <i>emeroides</i> (Boiss. & Spruner) Lassen | .   | +   | +   | +   | .   | .   | +2  | 4  |
| NP  | <i>Oxyris alba</i> L.   | .   | 1.1 | +   | +   | .   | .   | .   | 4  |
| P caesp                                       | <i>Juniperus oxycedrus</i> L. ssp. <i>oxycedrus</i>                                     | .   | +   | +   | +   | .   | .   | +2  | 4  |
| H scap  | <i>Viola reichenbachiana</i> Jordan ex Boreau   | +   | .   | +   | .   | .   | .   | +   | 3  |
| Ch suffr                                      | <i>Euphorbia amygdaloides</i> L. subsp. <i>amygdaloides</i>                             | +   | .   | +   | +   | .   | .   | .   | 3  |
| P scap  | <i>Sorbus domestica</i> L.  | .   | +   | +   | .   | .   | +   | .   | 3  |
| P caesp                                       | <i>Sorbus torminalis</i> (L.) Crantz  | .   | +   | .   | +   | .   | +   | .   | 3  |
| Accidental species                            |   |     |     |     |     |     |     |     |    |
|   |   | 4   | 1   | 5   | 2   | -   | -   | -   | 1  |

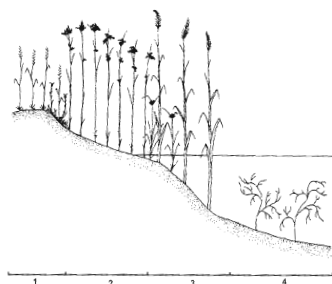
2<sup>nd</sup> stop - The Bay of Portonovo

Fig. 15 – Vegetation transect of Lago Profondo (from Biondi, 1986): 1- *Schoenus nigricans* and *Inula crithmoides* community 2- *Cladietum marisci* 3- *Scirpetum maritimi* 4- *Potamogeton pectinatus* community

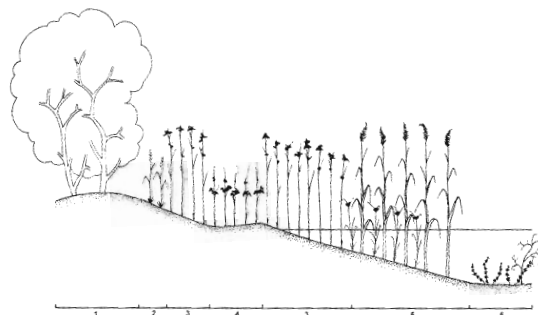


Fig. 16 – Vegetation transect of Lago Grande (from Biondi, 1986): 1- *Fraxino orni-Quercetum ilicis* 2- *Schoenus nigricans* and *Inula crithmoides* community 3- *Cladietum marisci* 4- *Junco-Caricetum extensae* 5- *Scirpetum maritimi* 6- *Chara hispida* and *Potamogeton pectinatus* communities

From the bay it is possible to see the marly-arenaceous and the calcareous cliff systems and the helophytic vegetation present in the two brackish waters (Fig. 15, 16).

The origin of the two brackish waters of Portonovo is thought to be linked to an avalanche of about three million cubic metres of calcareous rocks that, in prehistoric times, gave origin to the bay of Portonovo. These could then be the remains of two sea inlets isolated inside the avalanche material by the formation of dune lines by the sea currents. The two lakes are fed both by the rainwaters and by a high fresh-water table.

The phytocoenotic variability is extremely high in

relation to the small size of the lakes. Nowadays the floating phanerophyte associations are not present anymore, although they surely must have been present when *Lemna minor* and *L. gibba* could still be found. The shallow water vegetation is made up of groupings of *Chara hispida* and of *Potamogeton pectinatus*. Both lakes are surrounded by a belt of marshland vegetation of great consistency that is made up of different types of vegetation: *Cladietum marisci*, *Typhetum dominicensis*, *Scirpetum maritimi*, *Junco-Caricetum extensae*, *Juncetum maritimi-acuti*, formations of *Schoenus nigricans* and *Inula crithmoides* (Biondi, 1986).



### 3<sup>rd</sup> stop - Route from the coastal cliffs to Conero Mountain: the plant landscape of the hilly area and the Western aspect of Conero Mountain (Fig. 17)

Following the road that leads to Conero Mountain from the coast it is possible to see the marly-arenaceous hilly landscape of the Schlier in which the distribution of the vegetation can be assigned into geosygmata that vary in relation to the width of the valley. In this area, where the valleys have a limited width, the vegetation distributes according to the orientation and slope of the aspects (Fig. 18). On the southern aspects, the steepest part, characterised by shallow and primary soils, is colonised by formations belonging to the downy oak (*Rosa sempervirentis-Querceto pubescentis* sygmetum) series, while the same part of the aspect on the northern side, characterised by deeper and cooler soils, is occupied by the hop hornbeam (*Asparago acutifolii-Ostryeto carpinifoliae* sygmetum) series. In the lower part of the valley where the slope for both the aspects is less, and the soils are deeper and damp, there are the formations coming from the series of the elm (*Symphytobulbosi-Ulmeto minoris* sygmetum). In the bottom of the valley, now occupied by fields, the vegetational potentiality, in accordance with observations carried out in similar adjacent zones, is represented by woods of the *Lauro nobilis-Fraxinetum oxycarpae* association.

The hill area of the Park is the one which has the major agricultural use and within which it is possible to find weed and post-cultivation vegetation that can be assigned, respectively, to the associations: *Bifora testiculatae-Adonidetum cupaniana* Kropáč 1982 and *Senecio erucifolii-Inuletum viscosae* Biondi & Allegrezza 1996, sometimes present with the variant of *Brachypodium rupestre* that precedes the formation of the dense grassland of *Bromus erectus* with numerous chamaephytes of the association *Convolvulo elegantissimi-Brometum erecti* Biondi 1986. This stage, consequent to the abandonment of the agricultural activities, is followed by the spreading of the shrubbery that originates from the vegetation covering of the association *Spartium juncei-Cytisetum sessilifolii* Biondi, Allegrezza & Guitian 1988. In concordance with the microclimatic and edaphic characteristics, the shrubbery has different aspects, among which the most prevalent is that of *Spartium junceum* but not without aspects of *Juniperus oxycedrus* ssp. *oxycedrus*, linked to the holm oak woods and sometimes also to *Hippocrepis emerus*, for those in relation to the hop hornbeam woods.



Fig. 17 – The hilly landscape: a rich mosaic of vegetation typologies with strong dynamic aspects

Through its development the shrubbery favours in turn the starting conditions for the less demanding pre-forestal species, such as for example *Fraxinus ornus* ssp. *ornus*.

As already mentioned, the landscape of the hill areas has been deeply modified by agricultural activities, nevertheless there is still evidence of the original forest landscape in the limited growth along the banks, the rows, the hedges and the isolated trees, that make up, on the basis of the definition of the Regional Environmental Landscape Planning, the “scattered elements of the agricultural landscape”. From the ecological point of view, they constitute very important ecotonal spaces because as well as favouring the movement of many plant and animal species, they represent centres of biodiversity conservation and guarantee a certain ecological stability to the entire ecosystem. In the territory a floristic-structural characterisation has been performed based on the dominant species, which has allowed the individuation of ten main typologies which confer to the landscape a great environmental diversification. In particular, within a sampling area representative of the hill area, on the basis of a detailed assessment, 237 elements have been identified. The more common typology is represented by rows (43%), followed by hedges (41%), trees either isolated or in groups (8%), residual woods (5%), and finally bank formations (3%).

The western aspect of Conero Mountain is today covered by extensive woods dominated by *Pinus*

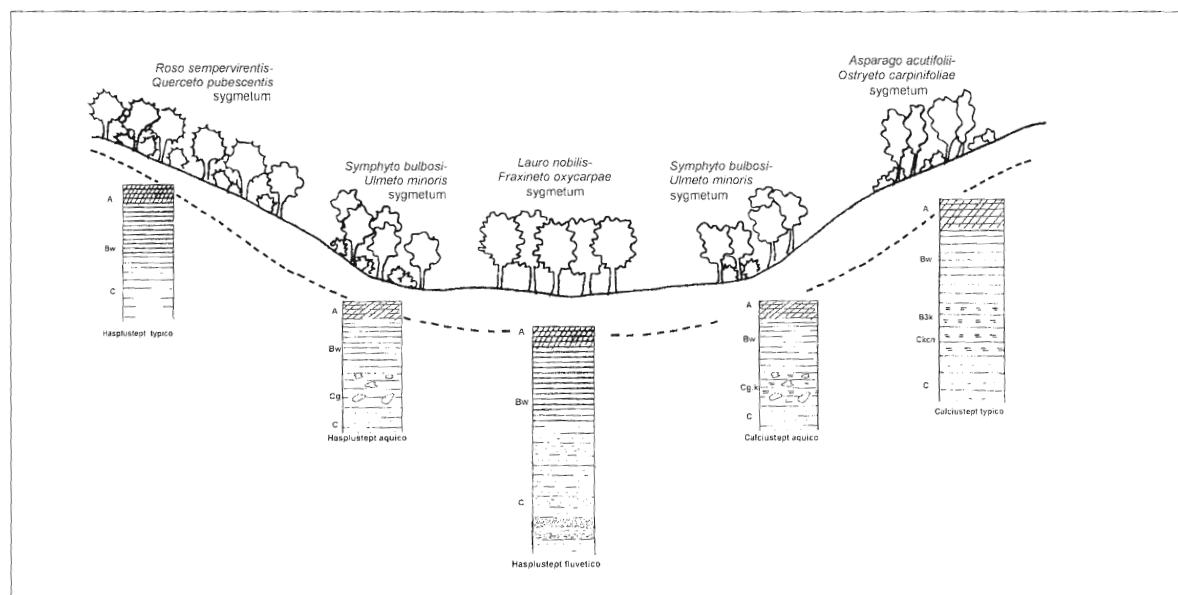


Fig. 18 – Distribution of vegetation series and soil chains in the wider valleys on marly-arenaceous substratum

*halepensis*, and this is a reforestation planted between 1931 and 1938 on soils with average slopes of 30-35% covered by xerophilous grassland. The unplanned exploitation of the woods that covered the inner aspects of Conero had produced considerable hydrogeological deterioration (Fig. 19). The reconstruction was done by means of seeding and planting a large variety of species, among which *Pinus halepensis* and *Quercus ilex* ssp. *ilex* were the most abundant, together with many other species, mainly exotics.

The few remnants of native wood vegetation that can be found on the western base of Conero give testimony to the potential for the formation of deciduous plants, with the dominance of hop hornbeam (*Ostrya carpinifolia*) in the cooler areas and downy oak (*Quercus pubescens*) in the warmer ones.



Fig. 19 – Historic view of the western aspects of Conero Mountain before the reforestation carried out in the 1930s. (from Reggiani, 1932)

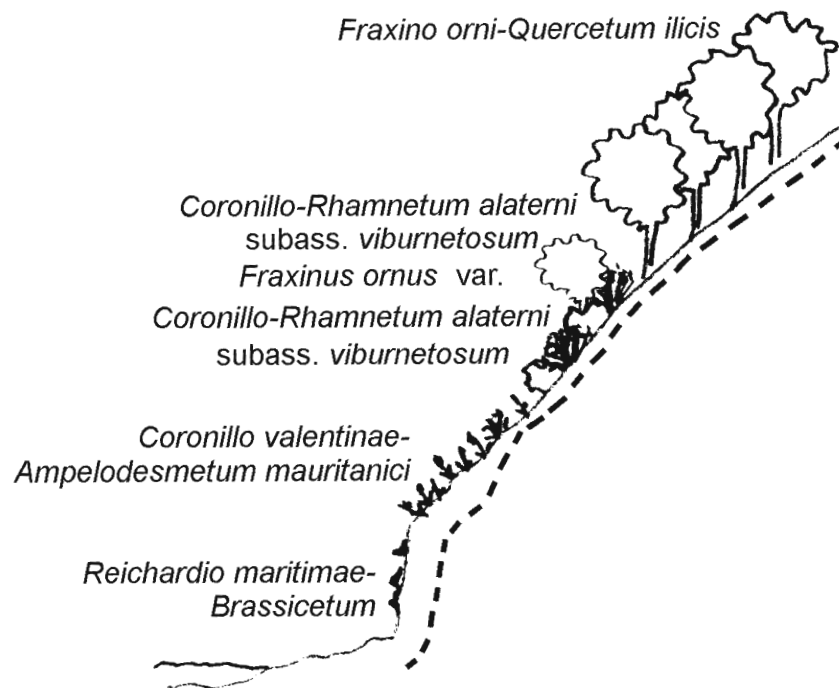
4<sup>th</sup> stop - Conero mountain and the ex-Monastery of the Camaldolite monks

Fig. 20 – Vegetation transect of the Valle delle Vellare

Following the path from the square in front of the ex-monastery of the Camaldolite monks that leads to the “Passo del Lupo” (Wolf Pass), one crosses a part of the northern aspect of Conero Mountain occupied by a mesophilous holm oak wood (*Cephalanthero longifoliae-Quercetum ilicis*), and then arrives at the south-eastern aspect occupied by thermophile holm oak wood (*Fraxino orni-Quercetum ilicis*). While descending along the path that leads to the “Passo del Lupo”, it is then possible to see the Valle delle Vellare (Vellare Valley), with its Thermo-Mediterranean vegetation (*Coronillo emeroidis-Euphorbietum dendroidis* subass. *ampelodesmetosum mauritanici*) and to see the “Due Sorelle” (Two Sisters) rocks (Fig. 20).

**Northern aspect**

The path crosses the mesophilous wood, a mixture of

evergreen sclerophyllous and deciduous trees, that covers the entire northern aspect of Conero more or less without interruption. This consists of a wood, periodically cut for timber, of *Cephalanthero longifoliae-Quercetum ilicis* association (Tab. 9) among which are well represented in the undergrowth *Hepatica nobilis*, *Melittis melissophyllum* ssp. *melissophyllum*, *Melica uniflora*, *Cyclamen repandum*, *C. hederifolium*, *Viola reichenbachiana*, *V. alba* subsp. *dehnhardtii*, *Mercurialis perennis*, *Euphorbia amygdaloides* ssp. *amygdaloides*, *Ruscus hypoglossum*, *Viburnum tinus* ssp. *tinus*, etc.

**South-eastern aspect**

The south-eastern aspect of Conero Mountain, mainly made up of the calcareous formations of the Pink Scaglia and the White Scaglia, has been colonised by the

Tab. 10 - *FRAXINO ORNI-QUERCETUM* H-ic (1956) 1958  
*arbutetosum unedi* Arrigoni & Di Tommaso 1997

| Rel. n.   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | P   |   |
|---|---|-----|-----|-----|-----|-----|-----|-----|-----|---|
| Altitude (m)  | 360   | 400 | 490 | 100 | 420 | 435 | 500 | 470 | r   |   |
| Exposure  | NNE   | SSW | SSE | WSW | SSE | SSE | SE  | SSE | e   |   |
| Slope (°)   | 40  | 20  | 10  | 20  | 10  | 10  | 10  | 20  | s.  |   |
| Coverage (%)  | 100   | 100 | 100 | 100 | 98  | 100 | 98  | 100 |     |   |
| Area (m <sup>2</sup> )                                | 60  | 100 | 120 | 500 | 150 | 150 | 150 | 100 |     |   |
| Charact. and diff. species of the ass.                |   |     |     |     |     |     |     |     |     |   |
| P caesp   | <i>Viburnum tinus</i> L. ssp. <i>tinus</i>  | 2.2 | 1.2 | 1.2 | 2.3 | 3.3 | 2.2 | 1.1 | 2.2 | 8 |
| P scap  | <i>Fraxinus ornus</i> L. ssp. <i>ornus</i>  | 2.2 | 2.3 | 2.2 | +   | 2.2 | 2.2 | 2.2 | .   | 7 |
| NP  | <i>Hippocrepis emerus</i> (L.) Lassen ssp. <i>emeroides</i> (Boiss. & Spruner) Lassen | +2  | 1.2 | 1.2 | .   | +   | .   | .   | +   | 5 |
| NP  | <i>Rosa sempervirens</i> L.   | .   | 1.2 | 1.2 | +2  | .   | .   | .   | .   | 3 |
| Diff. species of the <i>arbutetosum unedi</i> subass. |   |     |     |     |     |     |     |     |     |   |
| P caesp   | <i>Arbutus unedo</i> L.   | 2.2 | 4.5 | 2.2 | +   | 2.2 | 3.3 | 2.2 | 3.3 | 8 |
| Charact. species of the upper units                   |   |     |     |     |     |     |     |     |     |   |
| P scap  | <i>Quercus ilex</i> L. ssp. <i>ilex</i>   | 4.4 | 2.3 | 5.5 | 5.5 | 5.5 | 4.4 | 5.5 | 4.4 | 8 |
| P lian  | <i>Rubia peregrina</i> L. ssp. <i>longifolia</i> (Poiret) Bolos                       | 1.1 | 1.2 | 1.2 | +   | 1.2 | +   | +   | +   | 8 |
| NP  | <i>Asparagus acutifolius</i> L.   | +2  | 1.2 | 1.2 | 1.1 | +   | +   | +   | +   | 8 |
| NP  | <i>Smilax aspera</i> L.   | 3.3 | 2.3 | 2.3 | 2.3 | 3.3 | 2.2 | 2.2 | 3.4 | 8 |
| Ch frut   | <i>Ruscus aculeatus</i> L.  | 1.1 | +   | 3.3 | .   | +   | 2.2 | 1.1 | 2.2 | 7 |
| P lian  | <i>Clematis flammula</i> L.   | 1.1 | +2  | .   | +   | .   | .   | .   | +2  | 4 |
| NP  | <i>Osyris alba</i> L.   | 1.2 | 1.2 | 1.2 | +   | .   | .   | .   | .   | 4 |
| P caesp   | <i>Pistacia lentiscus</i> L.  | 1.2 | +2  | 1.2 | .   | +   | .   | .   | .   | 4 |
| P caesp   | <i>Phillyrea media</i> L.   | .   | 2.2 | 2.2 | +   | .   | .   | .   | .   | 3 |
| P caesp   | <i>Pistacia terebinthus</i> L. ssp. <i>terebinthus</i>                                | .   | 1.2 | .   | .   | .   | .   | .   | .   | 1 |
| G bulb  | <i>Cyclamen repandum</i> S. et S.   | .   | .   | .   | .   | .   | 1.1 | .   | .   | 1 |
| P caesp   | <i>Rhamnus alaternus</i> L. ssp. <i>alaternus</i>                                     | .   | .   | .   | +   | .   | .   | .   | .   | 1 |
| Other species   |   |     |     |     |     |     |     |     |     |   |
| P lian  | <i>Hedera helix</i> L. ssp. <i>helix</i>  | 2.2 | .   | .   | 1.1 | +2  | 2.2 | +2  | +   | 6 |
| G bulb  | <i>Cyclamen hederifolium</i> Aiton  | 1.2 | .   | 1.1 | .   | +2  | +2  | +   | +   | 6 |
| P caesp   | <i>Quercus pubescens</i> Willd.   | .   | +   | +   | .   | .   | 1.1 | 1.1 | 2.2 | 5 |
| P caesp   | <i>Juniperus oxycedrus</i> L. ssp. <i>oxycedrus</i>                                   | .   | +   | +2  | 1.1 | .   | .   | .   | .   | 3 |
| Accidental species                                    |   |     |     |     |     |     |     |     |     |   |
|   |   | 3   | -   | 1   | 1   | -   | -   | 3   | -   |   |

series of the thermophilous holm oak woods (*Fraxino orni-Querceto ilicis* sygmetum).

*FRAXINO ORNI-QUERCETUM ILICIS* H-ic (1956) 1958 (Tab. 10)

This consists of a mixed wood of evergreens and deciduous trees described for the Yugoslavian coast and found in Italy both in the internal areas of the Appenines and along the north Adriatic coast, in the "Bosco Nordio" (Pignatti, 1953) and in the woods of the Mesola (Corbetta and Pattener, 1976). The characteristic species of this association are: *Quercus ilex* ssp. *ilex*, *Arbutus unedo*, *Rhamnus alaternus* ssp. *alaternus*, *Lonicera implexa*, *Viburnum tinus* ssp. *tinus* and *Rosa sempervirens*.

The tree covering is dominated by *Quercus ilex* ssp.

*ilex*, *Fraxinus ornus* ssp. *ornus*, *Phillyrea media* and *Arbutus unedo*. In the undergrowth there are found *Rhamnus alaternus* ssp. *alaternus* and *Lonicera implexa* and numerous vines, such as: *Smilax aspera*, *Clematis flammula* and *Rubia peregrina* ssp. *longifolia*. Among the few herbaceous species present in the undergrowth *Stachys officinalis*, *Viola alba* ssp. *dehnhardtii* and *Carex flacca* can be mentioned.

*CORONILLO EMEROIDIS-RHAMNETUM ALATERNI* Biondi *et al.* 2002 (Tab. 4)

*VIBURNETOSUM TINI* Biondi *et al.* 2002 and variant of *FRAXINUS ORNUS*

This constitutes shrub-like formations that are found on the partially consolidated detritus at heights between

Tab. 11 - *ASPERULO ARISTATAE-FUMANETUM THYMIFOLIAE* Allegrezza, Biondi, Formica  
& Ballelli 1997  
*galietosum corrudifolii* Allegrezza, Biondi, Formica & Ballelli 1997

|          |  |     |
|----------|--|-----|
|          | Rel. n.  | 10  |
|          | Altitude (m)   | 220 |
|          | Exposure   | W   |
|          | Slope (°)  | 20  |
|          | Coverage (%)   | 90  |
|          | Area (m <sup>2</sup> )   | 30  |
| <hr/>    |  |     |
|          | Charact. and diff. species of the ass.   |     |
| Ch suffr | <i>Fumana thymifolia</i> (L.) Spach  | 2.3 |
| Ch suffr | <i>Micromeria graeca</i> (L.) Bentham ex Reichenb. subsp. <i>graeca</i>                                  | 1.1 |
| H scap   | <i>Bituminaria bituminosa</i> (L.) L. Stirton  | 1.2 |
|          | Diff. species of the subassociation  |     |
| H scap   | <i>Galium corrudifolium</i> Vill.  | 2.3 |
|          | Charact and diff. species of the upper units   |     |
| Ch suffr | <i>Artemisia alba</i> Turra  | 3.3 |
| Ch suffr | <i>Fumana ericoides</i> (Cav.) Gandog.   | 2.2 |
| Ch suffr | <i>Teucrium polium</i> L. ssp. <i>capitatum</i> (L.) Arcangeli   | 1.2 |
| Ch suffr | <i>Linum tenuifolium</i> L.  | 1.2 |
| Ch suffr | <i>Dorycnium hirsutum</i> (L.) Ser.  | +2  |
| NP       | <i>Cistus creticus</i> L. ssp. <i>eriocephalus</i> (Viv.) Greuter & Burdet                               | +   |
| H scap   | <i>Ononis pusilla</i> L.   | +   |
|          | Other species  |     |
| Ch suffr | <i>Helianthemum nummularium</i> (L.) Miller ssp. <i>obscurum</i> (Celak.) Holub                          | 2.2 |
| H scap   | <i>Hedysarum coronarium</i> L.   | 2.2 |
| Ch suffr | <i>Helichrysum italicum</i> (Roth) G. Don fil. ssp. <i>italicum</i>                                      | 1.2 |
| P caesp  | <i>Spartium junceum</i> L.   | 1.2 |
| Ch rept  | <i>Thymus longicaulis</i> Presl subsp. <i>longicaulis</i>  | 1.2 |
| H scap   | <i>Onobrychis viciifolia</i> Scop.   | 1.2 |
| H scap   | <i>Eryngium campestre</i> L.   | 1.1 |
| Ch suffr | <i>Teucrium chamaedrys</i> L. subsp. <i>chamaedrys</i>   | +2  |
| H caesp  | <i>Bromus erectus</i> Hudson   | +2  |
| H bienne | <i>Sixalix atropurpurea</i> (L.) Greuter & Burdet subsp. <i>maritima</i> (L.) Greuter & Burdet           | +2  |
| H caesp  | <i>Brachypodium rupestre</i> (Host) R. et S.   | +2  |
| H scap   | <i>Reichardia picroides</i> (L.) Roth  | +   |
| Ch suffr | <i>Satureja alpina</i> (L.) Scheele subsp. <i>alpina</i>   | +   |
| T scap   | <i>Bellardia trixago</i> (L.) All.   | +   |
| H bienne | <i>Centaurium erythraea</i> Rafn subsp. <i>erythraea</i>   | +   |
| H caesp  | <i>Dactylis glomerata</i> L.   | +   |
| H scap   | <i>Diplotaxis tenuifolia</i> (L.) DC.  | +   |
| T scap   | <i>Pallenis spinosa</i> (L.) Cass. ssp. <i>spinosa</i>   | +   |
| H scap   | <i>Sanguisorba minor</i> Scop. subsp. <i>balearica</i> (Bourgeaut ex Nyman) Muñoz Garmendia & C. Navarro | +   |
| H scap   | <i>Hypericum perforatum</i> L.   | +   |

Tab. 12 - *PISTACIO LENTISCI-JUNIPERETUM OXYCEDRI* Allegrezza, Biondi, Formica & Ballelli 1997

| Rel. n.   | 1  | 2   | P   |   |
|---|--|-----|-----|---|
| Altitude (m)  | 270  | 270 | r   |   |
| Exposure  | SE   | ESE | e   |   |
| Slope (°)   | 25   | 15  | s.  |   |
| Coverage (%)  | 100  | 100 |     |   |
| Area (m <sup>2</sup> )  | 30   | 20  |     |   |
| Charact. and diff. species of the ass. and of the all. and ord. |  |     |     |   |
| P caesp   | Juniperus oxycedrus L. ssp. oxycedrus                                      | 4.5 | 4.4 | 2 |
| P caesp   | Pistacia lentiscus L.  | 1.2 | 3.4 | 2 |
| P lian  | Rubia peregrina L. ssp. longifolia Poiret                                  | 1.2 | 2.3 | 2 |
| P caesp   | Rhamnus alaternus L.   | 1.2 | 1.2 | 2 |
| P lian  | Lonicera implexa Aiton   | +2  | +   | 2 |
| H caesp   | Ampelodesmos mauritanicus (Poiret) Durand et Schinz                        | 1.1 | 1.2 | 2 |
| NP  | Hippocrepis emerus (L.) Lassen subsp. emeroideus (Boiss. & Spruner) Lassen | 1.1 | 1.2 | 2 |
| P scap  | Pinus halepensis Miller  | +2  | .   | 1 |
| P caesp   | Pistacia terebinthus L. ssp. terebinthus                                   | 1.2 | .   | 1 |
| P lian  | Clematis flammula L.   | .   | 1.2 | 1 |
| Charact. species of the class                                   |  |     |     |   |
| P scap  | Quercus ilex L. ssp. ilex  | +2  | +2  | 2 |
| NP  | Smilax aspera L.   | 1.2 | 2.2 | 2 |
| P caesp   | Arbutus unedo L.   | 2.3 | 1.2 | 2 |
| NP  | Asparagus acutifolius L.   | +2  | .   | 1 |
| P caesp   | Phillyrea media L.   | 1.2 | .   | 1 |
| Other species   |  |     |     |   |
| NP  | Osyris alba L.   | 2.2 | +   | 2 |
| Ch frut   | Stachelina dubia L.  | +   | +   | 2 |
| P scap  | Fraxinus ornus L. ssp. ornus   | +2  | .   | 1 |
| NP  | Cistus creticus L. ssp. eriocephalus (Viv.) Greuter & Burdet               | +2  | .   | 1 |
| P caesp   | Spartium junceum L.  | +2  | .   | 1 |
| NP  | Coronilla valentina L. subsp. valentina                                    | 2.2 | .   | 1 |
| G rhiz  | Carex flacca Schreber ssp. flacca  | +2  | .   | 1 |
| P caesp   | Cytisophyllum sessilifolium (L.) O.F. Lang                                 | +   | .   | 1 |
| Ch suffr  | Dorycnium hirsutum (L.) Ser.   | .   | +   | 1 |

50 and 200 m. The differentiating species of the subassociation are: *Viburnum tinus* ssp. *tinus*, *Ampelodesmos mauritanicus* and *Lonicera implexa*.

The variant of *Fraxinus ornus* ssp. *ornus* has been interpreted as an evolutionary stage of these coenosis towards the constitution of the thermophilous ilex woods (*Fraxino orni-Quercetum ilicis*) with respect to which it represents the pre-forestal stage.

#### *PISTACIO LENTISCI-JUNIPERETUM OXYCEDRI* Allegrezza, Biondi, Formica & Ballelli, 1997 (Tab. 12)

At the top of the cliffs, on stabilized rocks with immature soil the formation of *Rhamnus alaternus* ssp. *alaternus* is replaced by the shrubs belonging to the association *Pistacio lentisci-Juniperetum oxycedri* that has a preference for the warmer and less steep aspects (Allegrezza *et al.*, 1997).

#### *CORONILLO VALENTINAE-AMPELODESMETUM MAURITANICI* Biondi 1986 (Tab. 13)

The coenosis belonging to this association have taken

over the partially consolidated detritus, on the steeper aspects, where the erosion causes frequent landslides that impede the settling of the forest vegetation. In these situations they represent a lasting stage, while under conditions of higher stability of the substratum it becomes enriched with elements of the Mediterranean scrublands that indicate its evolution towards the thermophilous holm oak woods.

#### *ASPERULO ARISTATAE-FUMANETUM THYMIFOLIAE* Allegrezza, Biondi, Formica & Ballelli 1997 subass. *GALIETOSUM CORRUDIFOLII* Allegrezza, Biondi, Formica & Ballelli, 1997 (Tab. 11)

This association is found in the rocky areas of Conero Mountain. The characteristic specific combination is exemplified by: *Micromeria graeca* ssp. *graeca*, *Fumana thymifolia*, *Pinus halepensis*, *Asperula aristata* ssp. *scabra* and *Bituminaria bituminosa*.

The subassociation *galietosum corrudifolii* is found exclusively on the calcareous screes of this aspect of the mountain on rock outcrops. The differentiating

Tab 13 - *CORONILLO VALENTINAE-AMPELODESMETUM MAURITANICI* Biondi 1986

| Rel. n.                                | 1  | 2   | 3   | 4   | 5   | 6   | 7   | P   |     |     |     |     |     |     |   |
|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|
| Altitude (m)                           | 110  | 180 | 200 | 250 | 230 | 80  | 200 | r   |     |     |     |     |     |     |   |
| Exposure                               | SE   | NE  | SE  | SSE | SSE | NNE | NE  | e   |     |     |     |     |     |     |   |
| Slope (°)                              | 60   | 50  | 50  | 50  | 40  | 60  | 30  | s.  |     |     |     |     |     |     |   |
| Coverage (%)                           | 90   | 100 | 80  | 80  | 85  | 100 | 100 |     |     |     |     |     |     |     |   |
| Area (m <sup>2</sup> )                 | 50   | 50  | 25  | 40  | 30  | 40  | 50  |     |     |     |     |     |     |     |   |
| Charact. and diff. species of the ass. |  |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| H caesp                                | Ampelodesmos mauritanicus (Poirlet) T. Durand & Schinz                     |     |     |     |     |     |     | 4.4 | 4.4 | 3.3 | 3.3 | 3.4 | 3.4 | 4.4 | 7 |
| P caesp                                | Spartium junceum L.  |     |     |     |     |     |     | .   | 3.3 | 1.2 | +   | 1.1 | 3.4 | 4.4 | 6 |
| NP                                     | Coronilla valentina L. ssp. valentina                                      |     |     |     |     |     |     | +   | .   | 1.1 | 2.1 | 1.2 | +2  | .   | 5 |
| Charact. species of the upper units    |  |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| NP                                     | Asparagus acutifolius L.   |     |     |     |     |     |     | .   | +2  | +   | +   | +2  | 1.2 | 1.2 | 6 |
| P lian                                 | Rubia peregrina L. ssp. longifolia Poirlet                                 |     |     |     |     |     |     | .   | 2.2 | .   | +   | +2  | 2.2 | +   | 5 |
| NP                                     | Smilax aspera L.   |     |     |     |     |     |     | +   | .   | .   | .   | +2  | 1.2 | +   | 4 |
| P lian                                 | Lonicera etrusca Santi   |     |     |     |     |     |     | .   | 1.2 | +   | .   | .   | 1.2 | +   | 4 |
| P lian                                 | Lonicera implexa Aiton   |     |     |     |     |     |     | .   | .   | .   | +   | +   | 2.2 | +   | 4 |
| P caesp                                | Rhamnus alaternus L. ssp. alaternus  |     |     |     |     |     |     | +   | .   | .   | .   | 1.1 | 1.2 | .   | 3 |
| P caesp                                | Viburnum tinus L. ssp. tinus   |     |     |     |     |     |     | .   | +   | .   | .   | .   | 1.1 | +   | 3 |
| P scap                                 | Quercus ilex L. ssp. ilex  |     |     |     |     |     |     | .   | .   | +   | +   | 1.1 | .   | .   | 3 |
| P caesp                                | Pistacia terebinthus L. ssp. terebinthus                                   |     |     |     |     |     |     | .   | +   | .   | .   | .   | .   | +2  | 2 |
| P lian                                 | Clematis flammula L.   |     |     |     |     |     |     | .   | +   | .   | .   | .   | +   | .   | 2 |
| P caesp                                | Arbutus unedo L.   |     |     |     |     |     |     | .   | .   | +   | .   | +   | .   | .   | 2 |
| NP                                     | Osyris alba L.   |     |     |     |     |     |     | .   | .   | .   | +   | +2  | .   | .   | 2 |
| P caesp                                | Pistacia lentiscus L.  |     |     |     |     |     |     | .   | .   | .   | +   | .   | .   | .   | 1 |
| P caesp                                | Juniperus oxycedrus L. ssp. macrocarpa (Sm.) P. W. Ball                    |     |     |     |     |     |     | .   | .   | .   | .   | .   | 1.1 | .   | 1 |
| Other species                          |  |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
| H scap                                 | Bituminaria bituminosa (L.) L. Stirton                                     |     |     |     |     |     |     | +   | +   | +   | +   | +   | +   | +   | 7 |
| H scap                                 | Cephalaria leucantha (L.) Roemer & Schultes                                |     |     |     |     |     |     | +2  | +   | +   | 1.1 | +   | +   | 1.2 | 7 |
| Ch frut                                | Teucrium flavum L. subsp. flavum   |     |     |     |     |     |     | .   | +2  | +2  | 1.1 | +   | +   | 1.2 | 6 |
| Ch suffr                               | Helichrysum italicum (Roth.) Don ssp. italicum                             |     |     |     |     |     |     | 2.2 | .   | +2  | +   | +   | +   | .   | 5 |
| Ch suffr                               | Dorycnium hirsutum (L.) Ser.   |     |     |     |     |     |     | +2  | .   | +   | 1.1 | .   | +   | +   | 5 |
| Ch frut                                | Stachelina dubia L.  |     |     |     |     |     |     | +   | .   | .   | 1.1 | +   | +   | .   | 4 |
| H scap                                 | Galium corrudifolium Vill.   |     |     |     |     |     |     | +   | .   | +2  | +2  | +2  | .   | .   | 4 |
| Ch frut                                | Antirrhinum majus L. subsp. tortuosum (Bosc) Rouy                          |     |     |     |     |     |     | +   | .   | +   | +   | +   | .   | .   | 4 |
| NP                                     | Cistus creticus L. ssp. eriocephalus (Viv.) Greuter & Burdet               |     |     |     |     |     |     | .   | .   | +   | 1.1 | +2  | +   | .   | 4 |
| P caesp                                | Cytisophyllum sessilifolium (L.) O.F. Lang                                 |     |     |     |     |     |     | .   | 1.2 | +   | +   | .   | .   | .   | 3 |
| P caesp                                | Juniperus oxycedrus L. ssp. oxycedrus                                      |     |     |     |     |     |     | .   | +   | .   | +   | +   | .   | .   | 3 |
| NP                                     | Hippocrepis emerus (L.) Lassen subsp. emeroideis (Boiss. & Spruner) Lassen |     |     |     |     |     |     | .   | 1.2 | .   | .   | +   | .   | 1.2 | 3 |
| Ch suffr                               | Fumana thymifolia (L.) Spach   |     |     |     |     |     |     | .   | .   | 1.1 | 1.2 | 1.2 | .   | .   | 3 |
| Ch suffr                               | Linum tenuifolium L.   |     |     |     |     |     |     | .   | .   | +   | +   | +   | .   | .   | 3 |
| H bienn                                | Daucus carota L.   |     |     |     |     |     |     | .   | .   | +   | +   | .   | .   | +   | 3 |
| Accidental species                     |  |     |     |     |     |     |     |     |     |     |     |     |     |     |   |
|  | 2  | 3   | 2   | 6   | 4   | -   | 3   |     |     |     |     |     |     |     |   |

species are: *Galium corrudifolium*, *Coronilla valentina* ssp. *valentina*, *Stachelina dubia* and *Teucrium flavum* ssp. *flavum*.

### Valle delle Vellare

On the south-eastern aspect of Conero the avalanches have resulted in the formation of a small inlet, the beach of the Due Sorelle and of the Valle delle Vellare above, where the particular microclimatic conditions favour the presence of thermo-Mediterranean formations which are part of the series of the tree spurge (*Coronillo emeroideis-Euphorbieto dendroidis* sygmetum *ampelodesmetosum mauritanici*). The Valle delle Vellare has a particular geomorphological structure: the substratum is, indeed, made up of layers of big solid limestone blocks, interspersed with layers of softer and

more fragmented marly limestone. The degradation of the latter has resulted in the formation of debris cones that are being undermined at their base by the sea. There is thus an alternation of remaining hard rock and fragmented rock with superficial debris, with a undulating micromorphology, that results in the formation of small rises that cut the valley lengthwise.

### *CORONILLO EMEROIDIS-EUPHORBIETUM DENDROIDIS* Géhu & Biondi 1997

*AMPELODESMETOSUM MAURITANICI* Biondi *et al.* 2002 (Tab. 14)

On the steep walls of the compact limestone from sea level up to a height of 140 m in the hottest areas of the south-east aspect of Conero Mountain (the Valle delle Vellare) the landscape is characterised by the presence of formations of *Euphorbia dendroides* ssp. *dendroides* that are representative of the

Tab. 14 - *CORONILLO EMEROIDIS-EUPHORBIETUM DENDROIDIS* Géhu & Biondi 1997  
*ampelodesmetosum mauritanici* Biondi, Bagella, Casavecchia & Pinzi, 2002

| Rel. n.                             | 1   | 2   | 3    | 4   | 5   | 6   | P   |   |
|-------------------------------------|---|-----|------|-----|-----|-----|-----|---|
| Altitude (m)                        | 30  | 140 | 50   | 70  | 6   | 3   | r   |   |
| Exposure                            | E   | E   | S-SE | NE  | SE  | SE  | e   |   |
| Slope (°)                           | 55  | 60  | 60   | 45  | 60  | 40  | s.  |   |
| Coverage (%)                        | 70  | 90  | 90   | 60  | 100 | 80  |     |   |
| Area (m <sup>2</sup> )              | 80  | 30  | 50   | 100 | 80  | 60  |     |   |
| Charact. species of the ass.        |   |     |      |     |     |     |     |   |
| NP                                  | Euphorbia dendroides L. ssp. dendroides                                   | 3.3 | 4.4  | 4.5 | 3.3 | 1.2 | +   | 6 |
| NP                                  | Hippocrepis emerus (L.) Lassen subsp. emeroides (Boiss. & Spruner) Lassen | 1.2 | .    | +   | +   | .   | .   | 3 |
| Diff. species of the subassociation |   |     |      |     |     |     |     |   |
| H caesp                             | Ampelodesmos mauritanicus (Poiret) Dur. et Sch.                           | 2.3 | 2.2  | 1.2 | 4.5 | +2  | +2  | 6 |
| Ch suffr                            | Brassica montana Pourret  | 1.1 | 1.2  | +   | +   | +   | +   | 6 |
| P caesp                             | Spartium junceum L.   | +   | 1.2  | .   | 2.3 | 1.2 | +   | 5 |
| NP                                  | Euphorbia veneta Willd.   | .   | .    | .   | .   | +2  | 2.2 | 2 |
| Charact. species of the upper units |   |     |      |     |     |     |     |   |
| G rhiz                              | Asparagus acutifolius L.  | 1.2 | +    | 1.2 | +2  | +   | +   | 6 |
| P caesp                             | Rhamnus alaternus L. ssp. alaternus                                       | 1.2 | 2.2  | 1.1 | 1.1 | .   | .   | 4 |
| P scap                              | Quercus ilex L. ssp. ilex   | .   | +    | .   | .   | +   | +   | 3 |
| P lian                              | Rubia peregrina L. ssp. longifolia (Poiret) Bolos                         | .   | .    | .   | +2  | +2  | +2  | 3 |
| P lian                              | Lonicera etrusca Santi  | .   | .    | .   | +   | +2  | +   | 3 |
| P caesp                             | Viburnum tinus L. ssp. tinus  | .   | .    | .   | 1.1 | +   | +   | 3 |
| Pcaesp                              | Pistacia x saportae Burnat  | .   | +    | 1.2 | .   | .   | .   | 2 |
| P lian                              | Lonicera implexa Aiton  | .   | 3.4  | .   | .   | .   | +   | 2 |
| NP                                  | Smilax aspera L.  | .   | +    | .   | 1.2 | .   | .   | 2 |
| NP                                  | Coronilla valentina L. ssp. valentina                                     | .   | .    | .   | +   | +   | .   | 2 |
| P lian                              | Clematis flammula L.  | .   | .    | .   | +   | +   | .   | 2 |
| P caesp                             | Pistacia lentiscus L.   | .   | +    | .   | .   | +   | .   | 1 |
| P caesp                             | Juniperus oxycedrus L. ssp. oxycedrus                                     | +   | .    | .   | .   | .   | .   | 1 |
| Other species                       |   |     |      |     |     |     |     |   |
| Ch frut                             | Teucrium flavum L. ssp. flavum  | +   | +    | +   | +   | +2  | +   | 6 |
| H scap                              | Cephalaria leucantha (L.) Roemer & Schultes                               | .   | +    | 1.2 | 2.2 | +2  | +2  | 5 |
| Ch frut                             | Antirrhinum majus L. subsp. tortuosum (Bosc) Rouy                         | +2  | .    | +   | +   | +   | +   | 5 |
| Ch succ                             | Sedum rupestre L.   | +   | .    | +   | .   | +2  | +2  | 4 |
| H scap                              | Galium corrudifolium Vill.  | .   | 1.2  | 1.2 | .   | +   | +   | 4 |
| H scap                              | Silene vulgaris (Moench) Garcke   | .   | .    | .   | +   | +   | +   | 3 |
| Ch suffr                            | Helichrysum italicum (Roth) Don ssp. italicum                             | .   | .    | 1.2 | .   | 1.2 | +2  | 3 |
| Ch suffr                            | Dorycnium hirsutum (L.) Ser.  | .   | .    | .   | +   | +   | +   | 3 |
| H caesp                             | Melica minuta L.  | .   | .    | .   | +   | +   | +   | 3 |
| H scap                              | Bituminaria bituminosa (L.) L. Stirton                                    | .   | .    | .   | .   | +   | +   | 2 |
| H scap                              | Picris hieracioides L. subsp. hieracioides                                | .   | .    | .   | .   | +   | +   | 2 |
| Ch suffr                            | Matthiola incana (L.) R. Br. subsp. incana                                | .   | +2   | .   | .   | +   | .   | 2 |
| H caesp                             | Dactylis glomerata L.   | .   | .    | .   | .   | +2  | +   | 2 |
| Accidental species                  |   |     |      |     |     |     |     |   |
|                                     |   | -   | 1    | 3   | 3   | -   | 3   |   |

subassociation *ampelodesmetosum mauritanici* of the *Coronillo emeroidis-Euphorbietum dendroidis* (Biondi *et al.*, 2002). This consists of more mesophilous phytocoenosis with respect to those present on the Dalmatian coast (Trinajstić, 1973) from which they differ by the absence of various thermoMediterranean species among which *Olea europaea* var. *sylvestris*, *Prasium majus*, *Myrtus communis*, *Ephedra fragilis* ssp. *campylopoda* (found in Italy in only one area in southern Puglia) and by the presence of more temperate species such

as *Ampelodesmos mauritanicus*, rare on the eastern Adriatic, *Spartium junceum* that is particularly abundant and *Euphorbia veneta*.

The substituting coenosis are represented by the shrubbery of the *Coronillo valentinae-Ampelodesmetum mauritanici* association, by the garigues of the *Asperulo aristatae-Fumanetum thymifoliae* association *galietosum corrudifolii* subass., and by the therophyte grasses of the *Trifolio scabri-Hypochoeridetum achyrophori* association.



**Syntaxonomical list**

CHARETEA FRAGILIS Fukarek ex Krausch 1964

+ Charetalia hispidae Sauer ex Krausch 1964

\* Charion fragilis Krausch 1964

*Chara hispida* community

POTAMETEA Klika in Klika & Novák 1941

+ Potametalia Koch 1926

\* Potamion (Koch 1926) Libbert 1931

*Potamogeton pectinatus* community

LEMNETEA TÜXEN EX O. BOLÒS & MASCLANS 1955

+ Lemnetalia minoris Tüxen ex O. Bolòs & Masclans 1955

\* Lemnion minoris Tüxen ex O. Bolòs & Masclans 1955

*Lemnetum minoris* Oberdorfer ex Müller & Görs 1960

PHRAGMITO-MAGNOCARICETEA Klika in Klika & Novák 1941

+ Phragmitetalia Koch 1926

\* Phragmition communis Koch 1926

*Phragmitenion communis*

*Typhetum domingensis* Brullo, Minissale & Spampinato 1994

+ Magnocaricetalia Pignatti 1954

\* Magnocaricion elatae Koch 1926

*Cladietum marisci* Zobrist 1935

+ Scirpetalia compacti Hejny in Holub, Hejny, Moravec & Neuhäusl 1967 corr. Rivas-Martínez, Costa, Castroviejo & E. Valdés 1980

\* Scirpion compacti Dahl & Hadac 1941 corr. Rivas-Martínez, Costa, Castroviejo & E. Valdés 1980

*Bolboschoenetum maritimi* Egger 1933

CRITHMO-STATICETEA Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

+ Crithmo-Staticetalia Molinier 1934

\* Crithmo-Staticion Molinier 1934

*Reichardio maritimae-Brassicetum robertianae* Biondi 1982

JUNCETEA MARITIMI Br.-Bl. in Br.-Bl., Roussine & Nègre 1952

+ Juncetalia maritimi Br.-Bl. ex Horvatic 1934

\* Juncion maritimi Br.-Bl. ex Horvatic 1934

*Junco-Caricetum extensae* Br.-Bl. & Del. 1936

*Juncetum maritimo-acuti* H-ic 1934

PARIETARIETEA Rivas-Martínez in Rivas Goday 1964

+ Parietarietalia Rivas-Martínez in Rivas Goday 1964

\* Brassicion oleraceae Rivas-Martínez, Fernández-González & Loidi 1999

*Brassica montana* community

ARTEMISIETEA VULGARIS Lohmeyer, Preising & Tüxen ex von Rochow 1951

+ Agropyretalia repentis Oberdorfer, Müller & Görs in Oberdorfer, Görs, Korneck, Lohmeyer, Müller, Philippi & Seibert 1967

\* Inulo viscosae-Agropyron repentis Biondi & Allegrezza 1996

*Senecio erucifolii-Inuletum viscosae* Biondi & Allegrezza 1996

*Dauco carotae-Tussilaginetum farfarae* Biondi, Brugiapaglia, Allegrezza & Ballelli 1992  
*Arundinetum plinianae* Biondi, Brugiapaglia, Allegrezza & Ballelli 1992  
 \* *Agropyron pungentis* Géhu 1968  
*Schoenus nigricans* and *Inula crithmoides* community

STELLARIETEA MEDIAE Tüxen, Lohmeyer & Preising ex von Rochow 1951  
 Stellarienea mediae  
 + *Centaureetalia cyani* Tüxen ex von Rochow 1951  
 \* *Caucalidion lappulae* Tüxen ex von Rochow 1951  
*Biforo testiculatae-Adonidetum cupaniana* Kropac 1982

ROSMARINETEA OFFICINALIS Rivas-Martínez *et al.* 2001  
 + *Rosmarinetalia officinalis* Br.-Bl. ex Molinier 1934  
 \* *Cisto eriocephali-Ericion multiflorae* Biondi 1999  
*Asperulo aristatae-Fumanetum thymifoliae* Allegrezza, Biondi, Formica & Ballelli 1997  
*galietosum corrudifolii* Allegrezza, Biondi, Formica & Ballelli 1997

RHAMNO-PRUNETEA Rivas Goday & Borja ex Tüxen 1962  
 + *Prunetalia spinosae* Tüxen 1952  
 \* *Cytision sessilifolii* Biondi 1988  
*Spartio juncei-Cytisetum sessilifolii* Biondi, Allegrezza & Guitian 1988  
*Asparago acutifolii-Osyridetum albae* Allegrezza, Biondi, Formica & Ballelli 1997  
 \* *Pruno-Rubion ulmifolii* O. Bolòs 1954  
*Lonicero etruscae-Cornetum sanguineae* Biondi, Bagella, Casavecchia & Pinzi 2002

QUERCETEA ILICIS Br.-Bl. ex A. & O. Bolòs 1950  
 + *Quercetalia ilicis* Br.-Bl. ex Molinier 1934 em. Rivas-Martínez 1975  
 \* *Quercion ilicis* Br.-Bl. ex Molinier 1934 em. Rivas-Martínez 1975  
*Fraxino orni-Quercetum ilicis* H.-ic (1956) 1958  
*arbutetosum unedi* Arrigoni & De Tommaso 1997  
*Cephalanthero longifoliae-Quercetum ilicis* Biondi & Venanzoni 1984 ex Biondi, Gigante, Pignattelli & Venanzoni 2002  
 + *Pistacio lentisci-Rhamnetalia alaterni* Rivas-Martínez 1975  
 \* *Oleo-Ceratonion siliquae* Br.-Bl. ex Guinochet & Drouineau 1944 em. Rivas-Martínez 1975  
*Coronillo valentinae-Ampelodesmetum mauritanici* Biondi 1986  
*Coronillo emeroidis-Euphorbietum dendroidis* Géhu & Biondi 1997  
*ampelodesmetosum mauritanici* Biondi, Bagella, Casavecchia, Pinzi 2002  
*Pistacio lentisci-Juniperetum oxycedri* Allegrezza, Biondi, Formica & Ballelli 1997  
*Coronillo emeroidis-Rhamnetum alaterni* Biondi, Bagella, Casavecchia & Pinzi 2002  
*loniceretosum etruscae* Biondi, Bagella, Casavecchia & Pinzi 2002  
*viburnetosum tini* Biondi, Bagella, Casavecchia & Pinzi 2002

QUERCO-FAGETEA Br.-Bl. & Vlieger in Vlieger 1937  
 + *Quercetalia pubescentis* Klika 1933  
 \* *Ostryo-Carpinion orientalis* (Horvat 1958 n.n.) 1959  
*Lauro-Quercenion* Ubaldi (1988) 1995  
*Roso sempervirentis-Quercetum pubescentis* Biondi 1986  
*Asparago acutifolii-Ostryetum carpinifoliae* Biondi 1982  
 + *Populeetalia albae* Br.-Bl. ex Tchou 1948  
 \* *Alnion incanae* Pawlowski in Pawlowski, Sokolowski & Wallisch 1928  
*Symphyto bulbosi-Ulmetum minoris* Biondi & Allegrezza 1996

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## Addenda

## Tab. 1

Locality and date of relevés:

rel. 1 - Pietralacroce from Biondi & Allegrezza 1996

## Tab. 2

Accidental species:

rel. 1 - *Pulicaria odora* (L.) Rchb. +; rel. 2 - *Ulmus minor* Miller +; rel. 3 - *Bituminaria bituminosa* (L.) L. Stirton L. +; rel. 4 - *Dorycnium herbaceum* Vill. subsp. *herbaceum* +, *Osyris alba* L. +.2.

Locality and date of relevés:

rel. 1 - Sardella path, 12.05.1998; rel. 2 - Sardella path 12.05.1998; rel. 3 - Trave path, 18.05.1999; rel. 4 - Trave path 18.05.1999.

## Tab. 3

Accidental species:

rel. 1 - *Teucrium flavum* L. ssp. *flavum* +, *Leopoldia comosa* (L.) Parl. +, *Rhamnus alaternus* L. ssp. *alaternus* 2.2; rel. 2 - *Dactylis glomerata* L. +, *Convolvulus cantabrica* L. +, *Micromeria graeca* (L.) Benth. ssp. *graeca* +, *Ulmus minor* Miller +; rel. 3 - *Clematis flammula* L. +.2, *Rosa sempervirens* L. +.2, *Pteridium aquilinum* (L.) Kuhn ssp. *aquilinum* 1.1.

Locality and date of relevés:

rel. 1, 2 - Above the rock of Trave, 17.06.1998; rel. 3 - Sardella path, 12.05.1998.

## Tab. 4

Accidental species:

rel. 1 - *Dorycnium hirsutum* (L.) Ser.+2, *Cistus creticus* L. ssp. *eriocephalus* (Viv.) Greuter & Burdet +.2, *Carex hallerana* Asso +.2; rel. 3 - *Acer campestre* L. ssp. *campestre* +; rel. 4 - *Hedera helix* L. ssp. *helix* 2.2; rel. 5 - *Melica minuta* L. +; rel. 6 - *Coronilla valentina* L. ssp. *valentina* +; rel. 8 - *Sorbus domestica* L. +, *Silene italica* (L.) Pers. +, *Inula conyza* DC. +.

## Locality and date of relevés:

rel. 1 - La Scalaccia path, 22.09.1998; rel. 2 - La Scalaccia path, 18.05.1999; rel. 3 - Valley between Passetto and Pietralacroce, 18.05.1999; rel. 4 - Valley between Passetto and Pietralacroce, 18.05.1999; rel. 5 - Valle delle Vellare 16.06.2000; rel. 6 - Valle delle Vellare, 16.06.2000; rel. 7 - Valle delle Vellare, 16.06.2000; rel. 8 - Valle delle Vellare, 16.06.2000.

## Tab. 5

## Locality and date of relevés:

rel. 1, 2, 3, 4, 5 - The cliff above Trave, from Biondi, 1986.

## Tab. 6

## Accidental species:

rel. 1 - *Ampelodesmos mauritanicus* (Poirot) Dur. et Sch. +2, *Parapholis incurva* (L.) Hubbard +; rel. 2 - *Melica minuta* L. +2, *Parietaria officinalis* L. +2; rel. 3 - *Bromus madritensis* L. +; rel. 4 - *Bromus madritensis* L. +2, *Silene vulgaris* (Moench) Garcke +, *Euphorbia dendroides* L. ssp. *dendroides* +, *Catapodium rigidum* (L.) Hubbard +, *Hypochoeris achyrophorus* L. +; rel. 5 - *Silene vulgaris* (Moench) Garcke +, *Dittrichia viscosa* (L.) W. Greuter subsp. *viscosa* +; rel. 6 - *Euphorbia dendroides* L. ssp. *dendroides* +, *Catapodium rigidum* (L.) Hubbard +, *Antirrhinum majus* L. 1.2, *Sedum reflexum* L. 1.2, *Sedum dasyphyllum* L. subsp. *dasyphyllum* +2, *Stachelina dubia* L.+, *Linum tenuifolium* L. (+); rel. 7 - *Antirrhinum majus* L. 1.1, *Blackstonia perfoliata* (L.) Hudson subsp. *perfoliata* +, *Dorycnium hirsutum* (L.) Ser. +, *Picris hieracioides* L. ssp. *hieracioides* +; rel. 8 - *Elymus athericus* (Link) Kerguelén 1.2; rel. 9 - *Parietaria judaica* L. +.

## Locality and date of relevés:

rel. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 - Conero Mountain from Biondi, 1986

## Tab. 7

## Accidental species:

rel. 1 - *Orobancha hederæ* Duby +, *Iris foetidissima* L. +, *Ligustrum vulgare* L. +, *Arum italicum* Miller 1.1, *Sambucus nigra* L. 2.3, *Euonymus europæus* L. 1.1; rel. 2 - *Rubus ulmifolius* Schott. +, *Prunus spinosa* L. +; rel. 3 - *Osyris alba* L. +2, *Prunus spinosa* L. +, *Stachys officinalis* (L.) Trevisan +; rel. 4 - *Stachys officinalis* (L.) Trevisan +, *Lonicera caprifolium* L. +, *Ornithogalum brevistylum* Wolfner +, *Epipactis helleborine* (L.) Crantz +, *Fragaria vesca* L. +2.

## Locality and date of relevés:

rel. 1 - Camerano wood, 17.06.1998; rel. 2 - Baldino Mount, 05.07.2001; rel. 3, 4 - Conero Mountain, path from Pian Grande to Fonte d'Olio, 22.05.2002.

## Tab. 8

## Accidental species:

rel. 1 - *Juniperus oxycedrus* L. ssp. *oxycedrus* +; rel. 2 - *Inula salicina* L. subsp. *salicina* +, *Leucanthemum vulgare* Lam. +; rel. 3 - *Quercus ilex* ssp. *ilex* 3.3; rel. 4 - *Arum italicum* Miller +.

## Locality and date of relevés:

rel. 1 - Poggio di Ancona, 23.06.98; rel. 2 - Larciano Mount, 30.06.98; rel. 3 - Conero Mountain, 15.04.1999; rel. 4, 5 - Along the road to San Germano, 22.05.2002.

## Tab. 9

## Accidental species:

rel. 1 - *Rubus ulmifolius* Schott +, *Primula vulgaris* Hudson +, *Melittis melissophyllum* L. 1.1, *Melica uniflora* Retz. +2; rel. 2 - *Teucrium flavum* L. ssp. *flavum* +; rel. 3 - *Solidago virgaurea* L. ssp. *virgaurea* +, *Brachypodium sylvaticum* (Hudson) Beauv. +, *Cytisophyllum sessilifolium* (L.) O.F. Lang +, *Epipactis helleborine* (L.) Crantz +, *Ilex aquifolium* L. +; rel. 4 - *Solidago virgaurea* L. ssp. *virgaurea* +, *Stachys officinalis* (L.) Trevisan +; rel. 8 - *Lonicera xylosteum* L. +.

## Locality and date of relevés:

rel. 1 - Conero Mountain, path under the ex-monastery, 23.03.2001; rel. 2, 3, 4 - Conero Mountain, northern aspect, 05.07.2001; rel. 5 - Conero Mountain, above Portonovo, 05.07.2001; rel. 6, 7 - Conero Mountain, northern aspect, 10.05.02; rel. 8 - Conero Mountain, Metà Monte, 10.05.02.

## Tab. 10

## Accidental species:

rel. 1 - *Carex flacca* Schreber +, *Daphne laureola* L. ssp. *laureola* +, *Ajuga reptans* L. +; rel. 3 - *Teucrium flavum* L. ssp. *flavum* +; rel. 4 - *Carex distachya* Desf. +; rel. 7 - *Laurus nobilis* L. +, *Ruscus hypoglossum* L. +, *Cephalanthera longifolia* (Hudson) Fritsch +;

## Locality and date of relevés:

rel. 1 - Conero Mountain, 15.04.1999; rel. 2 - Conero Mountain, under the ex-monastery of the Camaldolite monks, 04.08.1998; rel. 3 - Conero Mountain, southern aspect, 23.03.2001; rel. 4 - Conero Mountain, at the start of the route to the monastery, 29.03.02; rel. 5, 6 - Conero Mountain, path from the monastery to the viewpoint above Due Sorelle, 03.05.02 rel. 7, 8 - Conero Mountain, path from the monastery to the main route, 10.05.02.

## Tab. 11

## Locality and date of relevés:

rel. 1 - Conero Mountain, near the ex quarry of Massignano, 17.06.1998.

## Tab. 12

## Locality and date of relevés:

rel. 1, 2 - Conero Mountain from Allegrezza *et al.*, 1997.

Tab. 13

Accidental species:

rel. 1 - *Arabis collina* Ten. +, *Sedum reflexum* L. +.2; rel. 2 - *Lotus corniculatus* L. +, *Brachypodium rupestre* (Host) R. et S. +.2, *Fraxinus ornus* L. ssp. *ornus* 1.1; rel. 3 - *Dactylis glomerata* L. +, *Brachypodium rupestre* (Host) R. et S. +.2 ; rel. 4 - *Teucrium capitatum* L. subsp. *capitatum* (+), *Eryngium amethystinum* L. +, *Bromus erectus* Hudson +, *Silene vulgaris* (Moench) Garcke +, *Brassica montana* Pourret +, *Fumana ericoides* (Cav.) Gandog. +.2; rel. 5 - *Eryngium amethystinum* L. +, *Fumana ericoides* (Cav.) Gandog. +, *Micromeria graeca* (L.) Benth. ssp. *graeca* +, *Sedum rupestre* L. +.2; rel. 7 - *Dactylis glomerata* L. +, *Melica ciliata* +, *Fraxinus ornus* L. ssp. *ornus* 2.2.

Locality and date of relevés:

rel. 1, 2, 3, 4, 5, 6 - Conero Mountain from Biondi, 1986; rel. 7 - Valle delle Vellare, 16.06.2000.

Tab. 14

Accidental species:

rel. 2 - *Sonchus asper* (L.) Hill ssp. *glaucescens* Jordan (+); rel. 3 - *Dittrichia viscosa* (L.) W. Greuter subsp. *viscosa* (+), *Daucus carota* L. (+), *Crithmum maritimum* L. (+.2); rel. 4 - *Cytisophyllum sessilifolium* (L.) O.F. Lang (+), *Cistus creticus* L. ssp. *eriocephalus* (Viv.) Greuter & Burdet (+), *Foeniculum vulgare* Miller(+.2); rel. 6 - *Sanguisorba minor* Scop. subsp. *balearica* (Bourgeaut ex Nyman) Muñoz Garmendia & C. Navarro (+), *Inula conyza* DC. (+), *Centaurium erythraea* Rafn. (+).

Locality and date of relevés:

rel. 1 - Valle delle Vellare, 04.05.2000; rel. 2 - Valle delle Vellare, 16.10.2000; rel. 3 - Scoglio dei libri, 16.10.2000; rel. 4 - Conero Mountain, from Biondi 1986; rel. 5 - Conero Mountain, from Biondi 1986; rel. 6 - Conero Mountain, from Biondi 1986.