

**SYNTAXONOMICAL SURVEY OF
GERANIO-CARDAMINETALIA *HIRSUTAE*:
SEMI-NATURAL THEROPHYTIC VEGETATION
OF THE MEDITERRANEAN REGION**

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ABSTRACT - A syntaxonomical scheme, including geographical range and synonymies of all the associations ascribed to *Geranio-Cardaminetalia hirsutae*, is presented. This order, framed into the class *Stellarietea mediae*, groups sciaphilo-subnitrophilous annual vegetation of natural and semi-natural habitats, commonly occurring on substrata rich in organic matter, accumulating on stone-walls, shaded rocks and initial soils, often under the canopy of shrubs and trees. Twelve new associations from Sardinia, Sicily, Egean islands and Israel are here described for the first time.

KEY WORDS - Syntaxonomy, *Geranio-Cardaminetalia hirsutae*, therophytic vegetation, Mediterranean region.

INTRODUCTION

Basing on literature and unpublished data, a syntaxonomical survey of the order *Geranio-Cardaminetalia* has been carried out. This syntaxon is grouping sciaphilo-subnitrophilous annual vegetation of natural and semi-natural habitats, commonly occurring on substrata rich in organic matter, accumulating on stone-walls, shaded rocks and initial soils, often under the canopy of shrubs and trees. In its typical aspect, this vegetation is dominated by microphytes and colonizes small niches and micro-ledges. The vegetation ascribed to this order ranges all over the Mediterranean basin and stretches northwards and westwards up to the southern temperate and Atlantic region, including Macaronesia. With reference to the Rivas-Martínez's bioclimatic classification (Rivas-Martínez *et al.*, 2004a-b), the dwelled sites are chiefly occurring within the thermo- and mesomediterranean thermotypes, with dry to humid ombrotypes.

This order was first described by Brullo (Brullo & Marcenò, 1985), and included in the *Stellarietea mediae* because of the occurrence of a rich pool of nitrophilous therophytes characterizing this class. Indeed, as it was first observed by its author,

Geranio-Cardaminetalia hirsutae is probably including the primary habitats of several species that became synanthropic after the development of the Mediterranean civilizations. Subsequently, Rivas-Martínez *et al.* (1999) put the order at issue at first in a new subclass of *Stellarietea mediae*, proposed as *Geranio purpurei-Cardaminea hirsutae*, that more recently has been turned into a new class, named *Cardamino hirsutae-Geranietea purpurei* (Rivas-Martínez *et al.* 2001, 2002).

The vegetation at issue is likely to be the forerunner of the Mediterranean weedy plant communities, that have been selected by the first agricultural practices. Actually, in the westward expansion of the Mediterranean agriculture, fields were obtained to the detriment of the woody vegetation, i.e. the so-called “maquis”, which was growing on the most productive soils. At the beginning of agriculture, the deforestation had probably a patchy pattern, resulting from the burn-beating practice, so that the annual plants occurring in the understorey of the vegetation around the fields were probably quite abundant also within the fields, at least those having enough “weedyness”, i.e. those having the most prolific seed set, the most durable seeds and the most effective dispersal strategies (Brullo & Guarino, 2007). Actually, most of the weedy species with a Mediterranean chorotype are frequently found in the natural and semi-natural vegetation linked to the extensive, agro-pastoral, land-use that shaped most of the Mediterranean landscape. For this reason, after screening the floristic composition and the ecological features of all the known associations belonging to *Geranio-Cardaminetalia hirsutae*, in this paper it is esteemed preferable to keep this order into the class *Stellarietea mediae*, at most in an own subclass, as postulated by Rivas-Martínez *et al.* (1999).

Within the order *Geranio-Cardaminetalia hirsutae*, three floristically and ecologically well defined alliances can be recognized: *Geranio purpurei-Torilidion neglectae*, restricted to the Macaronesian islands with an infra- thermomediterranean bioclimate; *Geranio pusilli-Anthriscion caucalidis*, spread over W-Mediterranean and Atlantic territories with a meso- supramediterranean or infra- to mesotemperate bioclimates; *Valantio-Galion muralis*, common all around the Mediterranean region, within infra- to mesomediterranean bioclimates. It must be noted, however, that a fourth alliance (*Parietaron lusitanico-mauritanicae*) have been proposed by Rivas-Martínez *et al.* (2002) for the “thermomediterranean and mesomediterranean hot biotopes in W-Mediterranean”. This alliance does not seem unambiguously characterized, since all the associations ascribed to *Parietaron lusitanico-mauritanicae* by its authors can be attributed, either, to *Valantio-Galion muralis* or *Geranio pusilli-Anthriscion caucalidis*, depending on their floristic settlement.

A syntaxonomical scheme, including geographical range and synonymies of all the associations ascribed to *Geranio-Cardaminetalia hirsutae*, is reported in the following paragraphs. In addition, twelve new associations from Sardinia, Sicily, Egean islands and Israel are here described for the first time.

SYNTAXONOMICAL SCHEME

STELLARIETEA MEDIAE R. TX., Lohmeyer & Preising ex von Rochow 1951, Pflanzensoziologie 8: 6.

Syn.: *Stellarietea mediae* R. Tx., Lohmeyer & Preising in R. Tx. 1950, nom. inval. (art. 8).

Chenopodietea Br.-Bl. in Br.-Bl., Roussine & Nègre 1952, nom. illeg. (art.22).

Sisymbrietea Gutte & Hilbig 1975, nom. illeg. (art.22).

Geranio purpurei-Cardaminetea hirsutae (Rivas-Martínez, Fernández González & Lloidi 1999) Rivas-Martínez, Fernández González, Lloidi, Lousa & Penas 2001, nom. inval. (art. 6).

Cardamino hirsutae-Geranietea purpurei Rivas-Martínez, Fernández González & Lloidi (1999) 2002, nom. illeg. (art. 22).

GERANIO PURPUREI-CARDAMINENEA HIRSUTAE Rivas-Martínez, Fernández González & Lloidi 1999, *Itinera Geobot.* 13: 384.

Holotypus: *Geranio-Anthriscion caucalidis* Rivas-Martínez 1978.

Character species: *Arabidopsis thaliana*, *Arenaria leptoclados*, *Campanula erinus*, *Cardamine hirsuta*, *Centranthus calcitrapa* ssp. *calcitrapa*, *Fumaria capreolata*, *Galium murale*, *Galium spurium*, *Geranium lucidum*, *Geranium purpureum*, *Geranium pusillum*, *Geranium rotundifolium*, *Myosotis ramosissima*, *Parietaria lusitanica*, *Parietaria mauritanica*, *Rhagadiolus edulis*, *Succowia balearica*, *Theligionum cynocrambe*, *Torilis arvensis* ssp. *neglecta*, *Torilis nodosa*, *Veronica cymbalaria*, *Veronica hederifolia*.

Distribution: Mediterranean area, Canarian islands, SW European atlantic coast.

GERANIO PURPUREI-CARDAMINETALIA HIRSUTAE Brullo in Brullo & Marcenò 1985, *Coll. Phytosoc.* 12: 73.

Holotypus: *Geranio-Anthriscion caucalidis* Rivas-Martínez (1978).

Character species and Distribution: see subclass.

GERANIO PURPUREI - TORILIDION NEGLECTAE Lohmeyer & Trautmann 1970 *Schriftenreihe Vegetationsk.* 5: 224, corr. Lohmeyer 1975.

Syn.: *Geranio-Torilion* Lohmeyer & Trautmann 1970, *Schriftenreihe Vegetationsk.* 5: 224.

Senecion tussilaginis Oberd. 1965, *Beitr. Naturk. Forsch. SW-Deutschl.*, 24: 87., nom. inval. (art. 8).

Galio-Geranium purpurei Lohmeyer 1975, *Schriftenreihe Vegetationsk.* 8: 125, nom. illeg. (art. 22).

Holotypus: *Galio aparines-Torilidetum neglectae* Lohmeyer & Trautmann, 1970.

Character species: *Bryonia verrucosa*, *Drusa glandulosa*, *Drusa oppositifolia*, *Erucastrum canariense*, *Parietaria debilis*, *Rumex bucephalophorus* ssp. *canariensis*

Distribution: Canary Islands.

Galio aparines-Torilidetum neglectae Lohmeyer & Trautmann, 1970, Schriftenreihe Vegetationsk. 5: 224.

Lectotypus: rel. 4, tab. 11, Lohmeyer (1975), hoc loco.

Distribution: La Palma, Canary Islands.

Galio aparines-Geranium purpurei Lohmeyer 1975, Schriftenreihe Vegetationsk. 8: 125.

Lectotypus: rel. 110, tab. 6, Lohmeyer (1975), hoc loco.

Distribution: Gran Canaria, Canary Islands.

Carduo clavulati-Urticetum stachyoidis Rivas-Martínez *et al.* 1993, Itinera Geobot. 7: 270.

Holotypus: ril 1, tab. 34, Rivas Martínez *et al.* (1993).

Distribution: Tenerife, Canary Islands.

Aggr. a Drusa glandulosa e Parietaria debilis Rivas-Martínez *et al.* 1993, Itinera Geobot. 7: 270.

Distribution: Tenerife, Canary Islands.

Geranio purpurei-Aichrysetum divaricati Foucault 1999, J. Bot. Soc. Bot. France 11: 24, nom inval. (art.5).

Distribution: Madeira.

Galium aparine-Senecio cruentus Gesell. Oberdorfer, 1965, Beitr. Naturk. Forsch. SW-Deutschl., 24: 87.

Distribution: Tenerife, Canary Islands.

Galium aparine-Senecio tussilaginis Gesell. Oberdorfer, 1965, Beitr. Naturk. Forsch. SW-Deutschl., 24: 87.

Distribution: Tenerife, Canary Islands.

GERANIO PUSILLI-ANTHRISCION CAUCALIDIS Rivas-Martínez 1978, Anal. Inst. Bot. Cavanilles, 34: 554.

Syn.: *Parietaron lusitanico - mauritanicae* Rivas-Martínez, Fernández González, Lloidi, Lousa & Penas 2001, Itinera Geobot., 14: 96, p.p., nom. inval. (art. 8).

Parietaron lusitanico - mauritanicae Rivas-Martínez & Cantò in Rivas-Martínez *et al.* 2002, Itinera Geobot. 15: 154, p.p., nom. illeg.(art. 22).

Parietario-Galium murale Rivas-Martínez ex Rivas-Goday 1964 Veg. y Flor. Cuenca Extr. Guadiana: 106, p.p., nom. dubium (art. 38)

Lectotypus: *Anthriscus caucalidis-Geranium lucidi* O. Bolòs & Vigo in O. Bolòs 1967.

Character species: *Anthriscus caucalis*, *Erophila spatulata*, *Galium aparinella*, *Myosotis gracillima*, *Rhagadiolus stellatus*, *Viola kitaibeliana*.

Distribution: W-Mediterranean.

Notes: It must be noted that the alliance *Parietario-Galium murale*, which has been framed by many authors in the order *Parietarietalia judaicae* (see Braun-Blanquet 1966; Rivas-Martínez 1969; Oberdorfer 1969; Rivas-Martínez *et al.* 1993, 2001, 2002), has been validly published for the first time by Rivas-Goday (1964), to include the following two associations: *Parietarietum mauritanicae-bethuricum* and *Oryzopsis miliacea-Antirrhinum australe*-Ass. According to the Art. 3f of the Code (Weber *et al.*, 2000) the former association must be obligatorily chosen as lectotype for the alliance *Parietario-Galium murale*, since it is the only one having a *Parietaria*-species in its table. For the same reason, it is definitely wrong to consider the latter association the lectotype of the alliance *Parietario-Galium murale*, as proposed by Rivas-Martínez *et al.* (1993) and Rivas-Martínez (2003). Besides, in agreement with Rivas-Martínez (1978), the original relevés of *Parietarietum mauritanicae-bethuricum* are an heterogeneous mixture of perennial and annual elements, belonging respectively to *Oryzopsis-Antirrhinetum australis* and *Torili nodosae-Parietarietum mauritanicae*. Therefore, the name *Parietarietum mauritanicae-bethuricum* must be considered a *nomen dubium* (Art. 37) and, consequently, the *Parietario-Galium murale* is, on its turn, a *nomen dubium* that must be rejected (Art. 38).

Anthriscus caucalidis-Geranietum lucidi O. Bolòs & Vigo in O. Bolòs 1967, Mem. Real Acad. Cienc. Art. Barcelona 38 (1): 63.

Syn.: Group à *Urtica* et *Anthriscus scandicina* Braun-Blanquet & O. Bolòs, 1950, Collect. Bot. 2(3): 334.

Lectotypus: ril 1 tab. pg. 334, Braun-Blanquet & Bolòs, (1950).

Distribution: Catalonia, Spain.

Galio aparinellae-Anthriscetum caucalidis Rivas-Martínez 1978, Anal. Inst. Bot. Cavanilles, 34: 556.

Holotypus: rel. 9, tab. 1, Rivas-Martínez (1978).

Distribution: Madrid, Spain.

Geranio rotundifolii-Scandicetum microcarpae Rivas-Martínez 1978, Anal. Inst. Bot. Cavanilles, 34: 557.

Holotypus: rel. 4, tab. 2, Rivas-Martínez (1978).

Distribution: Madrid, Spain.

Anogrammo leptophyllae-Parietarietum lusitanicae Rivas-Martínez & Ladero in Rivas-Martínez, 1978, Anal. Inst. Bot. Cavanilles 34: 562.

Lectotypus: rel. 1, tab. 3, Rivas-Martínez (1978).

Distribution: Lusitania-Extremadura, Spain.

Torilidi nodosae-Parietarietum mauritanicae Rivas-Martínez 1978, Anal. Inst. Bot. Cavanilles 34(2): 564.

Syn.: *Parietarietum mauritanicae-bethuricum* Rivas-Goday 1964, Veg. y Flor. Cuenca Extr. Guadiana: 106, p.p., nom. dubium (art. 37)

Holotypus: rel. 1, tab. 4, Rivas-Martínez (1978).

Distribution: Lusitan-Extremadurean, Spain.

Claytonio perfoliatae-Anthriscetum caucalidis Izco, Gehù & Delelis 1978, Coll. Phytosoc. 6: 330.

Holotypus: rel. 12, tab. 1, Izco *et al.*(1978).

Distribution: north France, E-Manche.

Fumario boraei-Anthriscetum caucalidis Izco, Gehù & Delelis 1978, Coll. Phytosoc. 6: 332.

Holotypus: rel. 1, tab. 2, Izco *et al.*(1978).

Distribution: north France, Northarmorican.

Lamio bifidi-Anthriscetum caucalidis Ladero, Fuertes & Perez 1982, Ars Pharm. 21(2): 166.

Holotypus: rel. 6, tab. 1, Ladero *et al.* (1982).

Distribution: W-Spain.

Geranio purpurei-Galietum minutuli Rivas-Martínez, Costa, Castroviejo & Valdés 1980, Lazaroa 2: 74.

Holotypus: rel. 2, tab. 39, Rivas Martinez *et al.* (1980).

Distribution: Gaditano-Onubense coastal sector, Spain.

Urtico dubiae-Anthriscetum caucalidis Rivas-Martínez, Costa, Castroviejo & Valdés-Bermejo 1980, Lazaroa 2: 76.

Holotypus: rel. 4, tab. 40, Rivas Martinez *et al.* (1980).

Distribution: Gaditano-Onubense coastal sector, Spain.

Cardamino hirsutae-Erophiletum praecocis O. Bolòs 1981, Collect. Bot. 12(2): 68.

Holotypus: rel. 4, tab. 33, Bolòs (1981).

Distribution: Spain, Catalonia and Valencia.

Vicio pubescentis-Moehringietum pentandrae O. Bolòs 1981, Collect. Bot. 12(2): 73.

Holotypus: rel. 2, tab. 35, Bolòs (1981).

Distribution: Spain, Catalonia.

Parietario mauritanicae-Ceratocapnetum heterocarpae Martinez-Parras 1982, Anales Jard. Bot. Madrid 39(1): 187.

Syn: Group à *Succowia balearica* et *Corydalis heterocarpa* Daumas, Quezél e Santa, 1952, Bull. Soc. Hist. Nat. Afr. Nord, 43: 193.

Holotypus: rel. 2, tab.1, Martinez-Parras (1982).

Distribution: Spain, Betic in Almeriense territory (Martínez-Parras, 1982), N Morocco and Algeria (Daumas *et al.*, 1952; Deil & Galan De Mera, 2003).

Notes: in this association Martínez-Parras (1982) recognized two sub-associations: *ceratocapnetosum heterocarpae*, which represents the

typical aspect, and *succowietosum balearicae* (holotypus rel. 9, tab. 1), showing more thermophilous requirements.

Parietario lusitanicae-Geranium purpurei Alcaraz Ariza, Garre, Martínez Parras & Peinado 1986, Collect. Bot. 16(2): 416.

Holotypus: rel. 2, Tab. 1, Alcaraz Ariza *et al.* (1986).

Syn. *Soncho diana-Parietarium lusitanicae* Alcaraz *et al.* 1991, Datos Veg. Murcia: 98, non Esteve 1973, Veg. Fl. Prov. Murcia: 85.

Distribution: Spain, Murcian-Almeriense territory.

Notes: Alcaraz Ariza *et al.* (1991) considered this association as a synonym of *Soncho diana-Parietarium lusitanicae* Esteve 1973. It must be noted, however, that in the relevés published by Esteve Chueca (1973), the perennial species of *Parietaria judaicae* were prevailing and the floristic settlement of *Geranio-Cardaminetalia* was poorly represented, as already noticed by Pèrez Badia (1997). For this reason, according to Brullo & Guarino (1999), the *Soncho diana-Parietarium lusitanicae* should be preferably kept in the *Parietaria judaicae*, like it was in the original description. As concerns the relevés published by Alcaraz Ariza *et al.* (1986) and originally attributed to *Parietario lusitanicae-Geranium purpurei* they should be included in the *Geranio purpurei-Cardaminetalia hirsutae*. Moreover, in the *Parietario lusitanicae-Geranium purpurei* the *Sonchus* species is the typical *S. tenerrimus*, being *S. diana* more frequent in *Asplenietea trichomanis*- and *Chrythmo-Limonietea*-vegetation (Perez Badia, 1997).

Castellio tuberosae - Geranium rotundifolii Alcaraz Ariza, Garre, Martínez Parras & Peinado 1986, Collect. Bot. 16(2): 417.

Holotypus: rel. 1, tab. 2, Alcaraz Ariza *et al.* (1986).

Distribution: Spain, Almeria.

Fumario gaditanae-Geranium purpurei Peinado, Martínez-Parras & Bartolomé 1986, Stud. Bot. 5: 64, corr. .

Syn.: *Fumario sepii-Geranium purpurei* Peinado, Martínez-Parras & Bartolomé 1986, Stud. Bot. 5: 64.

Holotypus: rel. 3, tab. 4, Peinado *et al.* (1986).

Distribution: Spain, Gadicano sector.

Mercuriali ellipticae-Theligonietum cynocrambes Peinado, Martínez-Parras & Bartolomé 1986, Stud. Bot. 5: 64.

Syn.: *Stachydetum circinnatae* Fernandez-Casas, 1972, Trab. Dep. Bot. Univ. Granada, 1: 32, nom. dub. (art. 16, 37).

Holotypus: rel. 5, Tab. 5, Peinado *et al.* (1986).

Distribution: Andalusia, Rondean sector, Spain.

Fumario macrosepalae-Parietarietum mauritanicae Losa & Perez-Raya
in Losa 1988, Lazaroa 10: 24.

Holotypus: rel. 1, tab. 1, Losa (1988).

Distribution.: Granada, Spain.

Stellario pallidae-Chenopodietum exsuccii Molero Briones & Blanché
Verges 1990, Collect. Bot. 18: 161.

Lectotypus: rel. 2, tab. pag. 161, Molero Briones & Blanché Verges
(1990).

Distribution: Spain, Aragona.

Cerastio taurici-Myosidetum ramosissimae Roselló 1994, Cat. Fl. Veg.
Com. Nat. Alto Mijares: 405.

Holotypus: rel. 4, tab. 49, Roselló (1994).

Distribution: Spain, Valencia.

Parietario mauritanicae-Theligonetum cynocrambe Tamajón, Pinilla &
Muñoz, 2000, Studia Bot. 18: 12.

Holotypus: rel. 5, tab. 2, Tamajón *et al.* (2000).

Distribution: Andalusia, Spain.

Hymenolobo procumbentis-Anthriscetum caucalidis Laorga in Belmonte
& Laorga 2000, Acta Congr. Bot. Homen. Francisco Loscos: 684.

Holotypus: rel. 2, tab. 3, Belmonte & Laorga (2000).

Distribution: Spain, Bardeñas-Monegros sector.

VALANTIO MURALIS – GALION MURALIS Brullo & Marcenò 1985, Coll. Phy-
tosoc. 12: 73

Syn.: *Parietarion lusitanico – mauritanicae* Rivas-Martínez, Fernández González,
Lloidi, Lousa & Penas 2001, p.p., Itinera Geobot. 14: 96, nom. inval. (art. 8).

Parietarion lusitanico – mauritanicae Rivas-Martínez & Cantò in Rivas-Mar-
tínez *et al.* 2002, p.p., Itinera Geobot. 15: 154, nom. illeg.(art. 22).

Holotypus: *Torilido-Cerastietum pentandri* Brullo & Marcenò 1985

Character species: *Arabis verna*, *Campanula dichotoma*, *Draba muralis*, *Erophila*
verna ssp. verna, *Fumaria flabellata*, *Sedum litoreum*, *Sedum rubens*, *Sedum stellatum*, *Valantia muralis*.

Distribution: Circum-Mediterranean.

Geranio rotundifolii-Theligonetum cynocrambis Rivas-Martinez & Ma-
lato-Beliz in Rivas-Martinez 1978, Anal. Inst. Bot. Cavanilles 34: 568,
corr. Rivas-Martinez *et al.* 2002, Itinera Geobot. 15: 155.

Syn: *Geranio pusilli-Theligonetum cynocrambis* Rivas-Martinez & Malato-
Beliz in Rivas-Martinez 1978, Anal. Inst. Bot. Cavanilles 34: 568.

Holotypus: rel. 5, tab. 5, Rivas-Martinez (1978).

Distribution: Algarve, Iberian Peninsula.

Torilido nemoralis-Cerastietum pentandri Brullo & Marcenò 1985, Coll. Phytosoc. 12: 73.

Holotypus: rel. 6, Tab. 28, Brullo & Marcenò (1985).

Distribution: SE-Sicily.

Laguro vestiti-Erodiatum maritimi Brullo & Marcenò 1985, Coll. Phytosoc. 12: 81.

Holotypus: rel. 3, Tab. 33, Brullo & Marcenò (1985).

Distribution: Sicily, Marettimo island.

Cruciato pedemontanae-Buglossoidetum splitgerberi Brullo & Marcenò 1985, Coll. Phytosoc. 12: 79.

Holotypus: rel. 2, Tab. 30, Brullo & Marcenò (1985).

Distribution: Sicily, Etna.

Geranio purpurei-Saxifragetum bulbiferae Brullo & Marcenò 1985, Coll. Phytosoc. 12: 87.

Holotypus: rel. 6, Tab. 38, Brullo & Marcenò (1985).

Distribution: E-Sicily, Iblei and Peloritani mountains.

Valerianello eriocarpae-Cerastietum glomerati Brullo & Marcenò 1985, Coll. Phytosoc. 12: 84.

Holotypus: rel. 2, Tab. 36, Brullo & Marcenò (1985).

Distribution: S-Sicily.

Sedetum litoreo-stellati Brullo & Marcenò 1985, Coll. Phytosoc. 12: 81.

Holotypus: rel. 4, Tab. 32, Brullo & Marcenò (1985).

Distribution: Sicily, Marettimo island and Eolian islands.

Parietario lusitanicae-Veronicetum cymbalariae Brullo & Marcenò 1985, Coll. Phytosoc. 12: 79.

Syn.: aggr. a *Theligonum cynocrambe* e *Veronica cymbalaria* O. Bolòs, Molinier & P. Montserrat 1970, Acta Geobot. Barcinon. 5: 97.

Holotypus: rel. 1, Tab. 31, Brullo & Marcenò (1985).

Distribution: S-Italy (Aspromonte), Sicily and Spain (Catalonia).

Valantio muralis-Polycarpetum alsinifoliae Brullo & Marcenò 1985, Coll. Phytosoc. 12: 84.

Holotypus: rel. 4, Tab. 35, Brullo & Marcenò (1985).

Distribution: NW-Sicily.

Ranunculo parviflori-Senecionetum lividi Brullo & Marcenò 1985, Coll.

Phytosoc. 12: 84.

Holotypus: rel. 4, Tab. 34, Brullo & Marcenò (1985).

Distribution: Sicily, Pantelleria island.

Galio muralis-Sedetum cepaeae Brullo & Marcenò 1985, Coll. Phytosoc. 12: 76.

Holotypus: rel. 14, Tab. 29, Brullo & Marcenò (1985).

Distribution: S-Italy (Aspromonte), N-Sicily and Eolian islands (Brullo & Marcenò 1985, Guarino 1998, Brullo *et al.* 2001).

Valerianello carinatae-Cerastietum luridi Brullo & Marcenò 1985, Coll. Phytosoc. 12: 87.

Holotypus: rel. 2, Tab. 37, Brullo & Marcenò (1985).

Distribution: Sicily, Madonie.

Geranio rotundifolii-Silenetum latifoliae O. Bolòs, Folch & Vigo in O. Bolòs 1989, Folia Bot. Misc. 6: 126.

Holotypus: rel. 2, Tab. 6, Bolòs (1989).

Distribution: Spain, Columbretes islets (Bolòs, 1989).

Valantio muralis-Solenopsietum annuae Brullo, Scelsi & Siracusa 1994, Boll. Acc. Gioenia Sci. Nat. 27(346): 362.

Holotypus: rel. 3, Tab. 12, Brullo *et al.* (1994).

Distribution: W-Sicily.

Soncho tenerrimi-Parietarietum lusitanicae ass. nova

Holotypus: rel. 11, Tab. 78, Perez-Badìa (1997).

Syn. *Soncho -Parietarietum lusitanicae* Perez-Badìa 1997, Fl. Veg. Comarca Marina Alta: 410, non Esteve 1973, Veg. Fl. Prov. Murcia: 85

Notes: The relevés, published by Perez-Badìa (1997) and referred to *Soncho-Parietarietum lusitanicae* Esteve 1973, are different from those published by Esteve (1973) in the original description. In particular, the latter described an association of *Parietarietea judaicae*, where the perennial species were prevailing, while the therophytes of *Geranio-Cardaminetalia* were poorly represented, as already noticed by Pèrez Badìa (1997) and by Brullo & Guarino (1999) as well. Therefore, it is here proposed to ascribe the relevés 1-13 and 16-17 in the Table 78 of the Perez-Badìa's monography (*l.c.*) to a new association named *Soncho tenerrimi-Parietarietum lusitanicae*, that for its floristic settlement should be included in the *Valantio muralis-Galion muralis*.

Galio muralis-Catapodietum zwierleinii Bartolo, Brullo, Minissale & Spampinato 1990, Boll. Acc. Gioenia Sci. Nat. 21(334): 231.

Holotypus: rel. 4, Tab. 41, Bartolo *et al.* (1990).

Distribution: Sicily, Lampedusa island.

- Valerianello puberulae-Galietum calvescentis** Brullo & Siracusa 1996, Doc. Phytosoc. 16: 159.
 Holotypus: rel. 1, Tab. 26, Brullo & Siracusa (1996).
 Distribution: Sicily, Linosa island.
- Mercuriali ambiguae-Succowietum balearicae** O. Bolòs, Folch & Vigo in O. Bolòs 1989, Folia Bot. Misc. 6: 125, corr. Rivas-Martinez *et al.*, 2002, Itinera Geobot. 15: 155.
 Syn.: *Mercuriali annuae-Succowietum balearicae* O. Bolòs, Folch & Vigo in O. Bolòs 1989 (Tab. 5 - Pag. 126).
 Group à *Mercurialis ambigua et Theligionum cynocrambe* Deil e Hammoumi 1997, Acta Bot. Malac. 22: 140.
 Com. *Mercurialis annua* subsp. *ambigua* et *Theligionum cynocrambe* Deil & Galan De Mera, 2003, Bull. Inst. Sci. Rabat, 20: 108.
 Holotypus: rel. 4, Tab. 5, Bolòs (1989).
 Distribution: Spain (Deil, 1994), Columbretes islets (Bolòs, 1989; Juan & Crespo, 2001), N Morocco (Deil & Hammoumi, 1997; Deil & Galan De Mera, 2003).
- Cruciato pedemontanae-Violetum parvulae** Brullo, Scelsi & Spampinato 2001, Veg. Asprom.: 321.
 Holotypus: rel. 4, Tab. 208, Brullo *et al.* (2001).
 Distribution: S-Italy, Aspromonte.
- Campanulo erini-Valantietum hispidae** Brullo, Scelsi & Spampinato 2001, Veg. Asprom.: 322.
 Holotypus: rel. 4, Tab. 209, Brullo *et al.* (2001).
 Distribution: S-Italy, Aspromonte.
- Sedo cyrenaici-Saxifragetum hederifoliae** Brullo & Furnari 1996, Boll. Acc. Gioenia Sci. Nat. 27(347): 341.
 Holotypus: rel. 3, Tab. 41, Brullo & Furnari (1996).
 Distribution: Libya, N-Cyrenaica.
- Galio muralis-Valantietum columellae** Brullo & Furnari 1996, Boll. Acc. Gioenia Sci. Nat. 27(347): 343.
 Holotypus: rel. 8, Tab. 42, Brullo & Furnari (1996).
 Distribution: Libya, N-Cyrenaica.
- Erophilo vernaes-Sedetum hispanici** Brullo & Siracusa ass. nova (Tab. 2)
 Holotypus: Tab. 2, rel. 15, hoc loco
 Character species: *Sedum hispanicum*
 Physiognomy and ecology: Acidophilous vegetation dominated by *Sedum hispanicum*, quite a frequent species on shady ledges and small sags, on ancient lava flows, especially in the meso- and supramediterranean

subhumid bioclimatic belt. The vegetative optimum is in June.

Distribution: Etna (Sicily), particularly on the East side, facing the Ionian sea.

Geranio purpurei-Cardaminetum graecae Brullo & Siracusa ass. nova (Tab. 2)

Holotypus: Tab. 2, rel. 8, hoc loco

Character species: *Cardamine graeca*

Physiognomy and ecology: Acidophilous vegetation dominated by *Cardamine graeca*, which colonizes moist and shaded ledges in small gorges, on lavic substrata. It is particularly abundant and frequent on mounds of partially undecomposed humus, within the mesomediterranean humid bioclimatic belt.

Distribution: NE-Etna (Sicily).

Cardamino hirsutae-Stachyetum arvensis Brullo & Siracusa ass. nova (Tab. 2)

Holotypus: Tab. 2, rel. 3, hoc loco

Character species: *Stachys arvensis*, *Sedum stellatum*

Physiognomy and ecology: Acidophilous vegetation dominated by *Stachys arvensis*, which colonizes initial soils and pyroclastic dregs on flat or gently sloping sites. It is found in the thermomediterranean subhumid bioclimatic belt.

Distribution: NE-Etna (Sicily).

Sedo stellati-Campanuletum dichotomae Brullo, Guarino & Siracusa ass. nova (Tab. 3)

Holotypus: Tab. 3, rel. 4, hoc loco

Character species: *Sedum stellatum*, *Campanula dichotoma*

Physiognomy and ecology: Acidophilous vegetation dominated by *Sedum stellatum* and *Campanula dichotoma*, commonly growing on detritus accumulated on small flat surfaces and stone-walls made of volcanic or metamorphic rocks. It is frequently found in fresh and moist places, preferably exposed to some hours of direct sunlight. This association is linked to the thermomediterranean subhumid bioclimatic belt, but it penetrates in the mesomediterranean one, especially on S-facing exposures.

Distribution: Etna and Peloritani mountains (NE-Sicily).

Saxifrago tridactylitis-Hornungietum petraeae Brullo & Guarino ass. nova - (Tab. 3)

Holotypus: Tab. 3, rel. 15, hoc loco

Character species: *Hornungia petraea*, *Saxifraga tridactylites*

Physiognomy and ecology: Litophilous vegetation dominated by *Hor-*

nungia petraea and *Saxifraga tridactylites*, colonizing small ledges and crevices on rocky outcrops (namely chalcosechists and phyllites), in shady places. It is found within the mesomediterranean humid bioclimatic belt.

Distribution: Peloritani mountains (NE-Sicily).

Note: In this association, the occurrence of *Saxifraga tridactylites* and *Hornungia petraea* reminds the *Saxifraga tridactylitis-Hornungietum petraeae* Izco 1974, recorded from the Atlantic coasts of the Iberian peninsula, chosen by Rivas-Martínez (1978) as the lectotype of the *Trachynion distachyae* (class *Tuberarietea guttatae* Br.-Bl. (1940) 1952), but the two mentioned species are among the few which are in common between the two associations, differing, as well, for the ecological requirements.

Minuartio mediterraneae-Arenarietum leptocladi ass. nova - (Tab. 4)

Holotypus: Tab. 4, rel. 1, hoc loco

Character species: *Arenaria leptoclados*, *Minuartia mediterranea*

Physiognomy and ecology: Acidophilous vegetation dominated by *Arenaria leptoclados*, growing beneath sparse shrubs, on stabilized sandy dunes at some km from the coast, within the thermomediterranean subhumid bioclimatic belt. The vegetative optimum is in May.

Distribution: SW-Sardinia.

Bupleuro semicompositi-Hornungietum procumbentis ass. nova (Tab. 4)

Holotypus: Tab. 4, rel. 7, hoc loco

Character species: *Hornungia procumbens*, *Bupleurum semicompositum*

Physiognomy and ecology: Basiphilous vegetation, growing on small rocky outcrops (calcic sandstones and limestones) in coastal sites, usually in the shadow of shrubberies. It is linked to the thermomediterranean subhumid bioclimatic belt. The vegetative optimum is in May.

Distribution: SW-Sardinia.

Rhodalsino geniculatae-Umbilicetum horizontalis ass. nova (Tab. 4)

Holotypus: Tab. 4, rel. 12, hoc loco

Character species: *Rhodalsine geniculata*, *Umbilicus horizontalis*, *Sedum rubens*, *Sedum stellatum*.

Physiognomy and ecology: Acidophilous vegetation dominated by *Rhodalsine geniculata* and small succulent therophytes, colonizing dune-slacks and flat sandy-slimy soils near the saltmarshes in coastal sites, usually in the shadow of shrubberies. It is linked to the thermomediterranean subhumid bioclimatic belt. The vegetative optimum is in May.

Distribution: SW-Sardinia.

Malcolmio flexuosae-Parietarium creticae ass. nova (Tab. 5)

Holotypus: Tab. 5, rel. 3, hoc loco

Character species: *Malcolmia flexuosa*, *Sedum litoreum*, *Parietaria cretica*.

Physiognomy and ecology: This association is found in shady niches on ancient stone-walls in urban areas, within the thermomediterranean dry bioclimatic belt.

Distribution: Rhodos island (Greece).

Crepido insularis-Cerastietum comati ass. nova (Tab. 5)

Holotypus: Tab. 5, rel. 10, hoc loco

Character species: *Crepis hellenica* ssp. *insularis*, *Cerastium comatum*.

Physiognomy and ecology: vegetation colonizing shady stone-walls and karstic niches on mesozoic limestones, within the mesomediterranean subhumid bioclimatic belt.

Distribution: Mt. Zeus, Naxos island. (Greece).

Sedo delici-Saxifragetum hederaceae ass. nova (Tab. 5)

Holotypus: Tab. 5, rel. 12, hoc loco

Character species: *Sedum delicum*, *Saxifraga hederacea*.

Physiognomy and ecology: vegetation substituting the previous one in the inner part of the karstic niches, in moister and shadier conditions, having a more mesic microclimate.

Distribution: Mt. Zeus, Naxos island. (Greece).

Sileno decipientis-Ceratocephaletum falcatae ass. nova (Tab. 6)

Holotypus: Tab. 6, rel. 5, hoc loco

Character species: *Sedum rubens*, *Ceratocephala falcata*, *Erophila minima*, *Silene decipiens*.

Physiognomy and ecology: vegetation colonizing shady rocky faces on limestones, in dry riverbeds (Wadi), in the Thermomediterranean dry bioclimatic belt.

Distribution: Naal Eloth, Negev Highlands (Israel).

Veronico politae-Galietum samuelsonii ass. nova (Tab. 6)

Holotypus: Tab. 6, rel. 8, hoc loco

Character species: *Galium samuelssonii*, *Veronica polita*, *Taraxacum cyprium*, *Arabis aucheri*.

Physiognomy and ecology: vegetation colonizing small outcrops of basaltic rocks, under the shadow of shrubberies, in the Mesomediterranean subhumid bioclimatic belt.

Distribution: Odem forest, near Masaada (Israel).

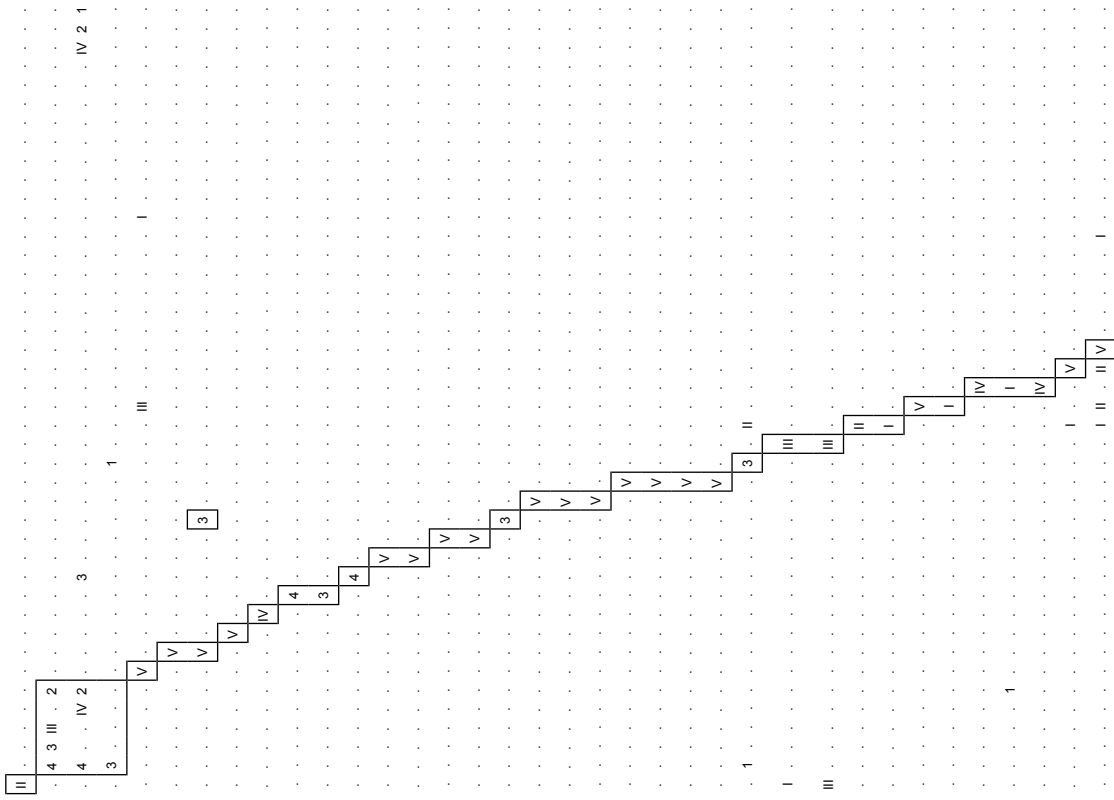
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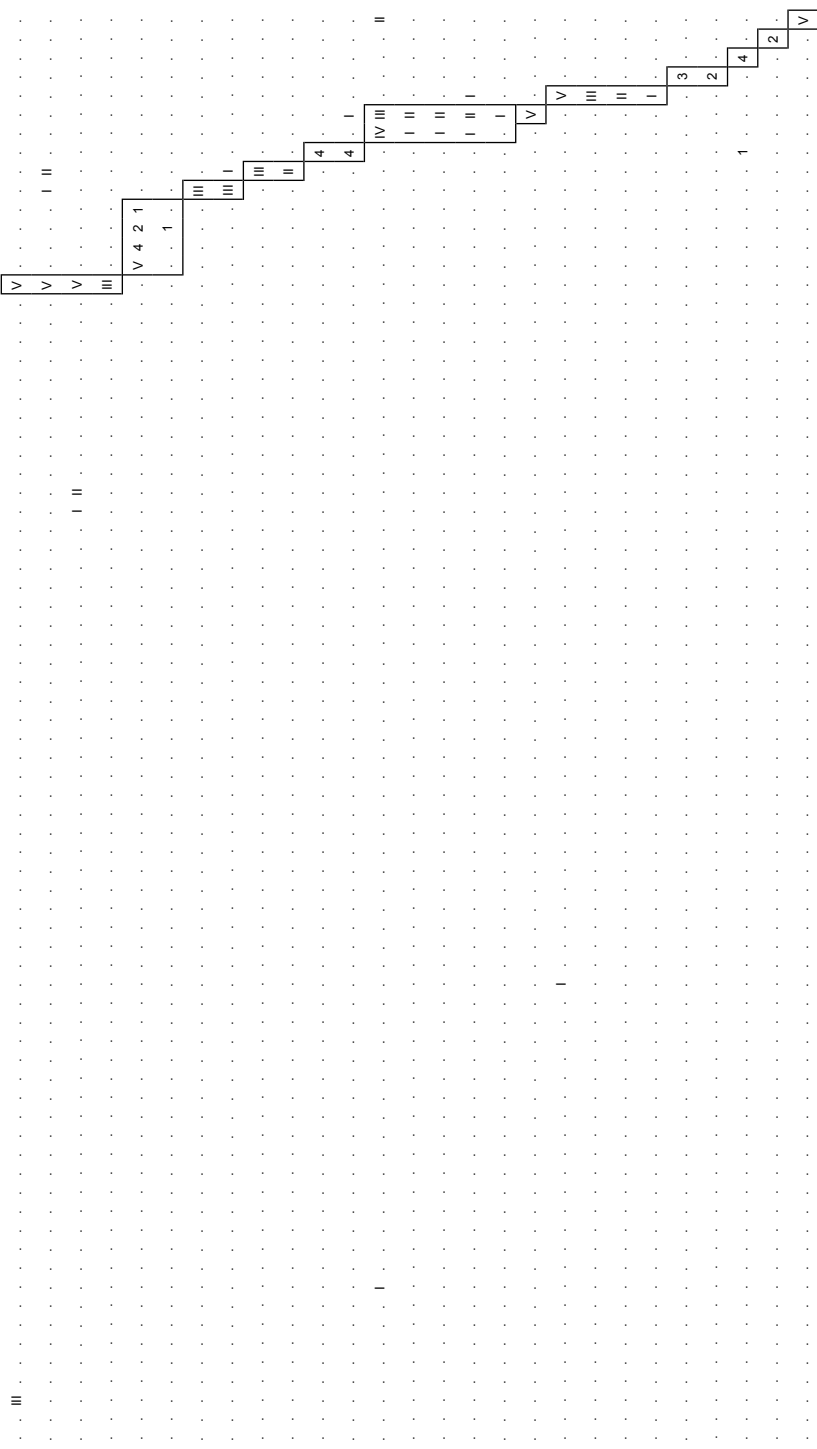
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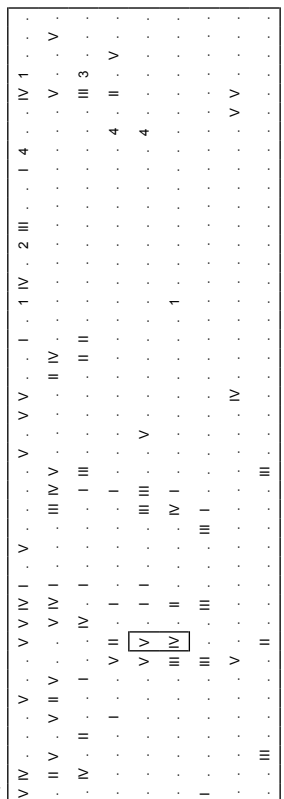
Cerastium brachypetalum Desp. ex Pers.
Mercurialis ambigua L. fil.
Succowia balearica (L.) Medicus
Sonchus oleraceus L.
Geranium pusillum L.
Sedum cyrenaticum Brullo & Furnari
Saxifraga hederacea L.
Valantia columnella (Ehneb. ex Boiss.) Baldacci
Minuartia medieterranea (Link) K. Maty
Homungia procumbens (L.) Hayek
Bupleurum semicompositum L.
Rhodalsine geniculata (Poir.) F. N. Williams
Palearctaria cretica L.
Malcolmia flexuosa (Sm.) Sm.
Cerastium comatum Desf.
Crepis helenica Kamari ssp. *insularis* Kamari
Sedum delicum (Vierh.) Carlstrom
Ceratocephala falcata (L.) Pers.
Erophila minima Meyer
Silene decipiens Barcelot
Gallium samuelsonii Ehrend.
Veronica pollia Fries
Taraxacum cyprium Lindb.
Arabis aucheri Boiss.
Silene latifolia Poiret
Centranthus calcitrapa (L.) DC. ssp. *trichocarpus*
 I.B.K.Richardson
Sonchus tenerimus L.
Anisrum simorithum Dur.
Campanula lusitanica L.
Scandix microcarpa Lange
Ziziphora adnoides L.
Stachys circinata L'Her.
Centranthus macrostiphon Boiss.
Mercurialis elliptica Lam.
Gallium minutulum Jordan
Ranunculus parviflorus L.





- Lanium bifidum Cyr. III
- Lanium purpureum L. V
- Lanium hybridum Vill. V
- Vicia lathyroides L. III
- Ceratocarpus heterocarpa Durieu
- Melilotus macrocarpa Coss. & Durieu
- Claytonia perfoliata Donn ex Willd.
- Myosotis anensis (L.) Hill
- Vicia nigra Steud.
- Valerianella olitoria Pollich
- Urtica stachyoides Webb & Berthel.
- Carduus clavulatus Link
- Achyranthes sicula (L.) All.
- Lathyrus tingitanus L.
- Tropaeolus majus L.
- Funaria bastardii Bor.
- Viola odorata L.
- Senecio webbii (Sch. Bip.) Christ
- Torilis neglecta R. et S.
- Senecio papyraceus DC.
- Senecio hillebrandii Christ
- Torilis leptophylla (L.) Rahn.
- Achyson divaricatum (Ait.) Praeger
- Achyson villosum Webb & Berthel.
- Anisarum subexertum Webb & Berthel.
- Senecio crenatus DC.
- Senecio tuasiliginis Less.

Char. All. (VALANTIO MURALIS-GALION MURALIS)



- Valantia muralis L.
- Erophila verna (L.) Chevall. ssp. verna
- Arabis verna (L.) R. Br.
- Sedum rubens L.
- Sedum stellatum L.
- Campanula dichotoma L.
- Funaria flabellata Caspar.
- Sedum libereum Guss.
- Draba muralis L.

Umbilicus horizontalis (Guss.) DC.	IV	I	I	IV	1
Hypochaeris achrophorus L.	IV	II	V	IV	1
Lobularia maritima (L.) Desv.	III		III	I	1
Allium subhirsutum L.	I	IV	I	IV	2
Poa bulbosa L.	I	V	I	IV	1
Silene colorata Poir.	I	IV	I	V	3
Trifolium campestre Schreb.	II	II	I	II	1
Miscopates oronium (L.) Rafin.	II	I	I	II	1

- 1 - Torilido nemoralis-Cerastietum pentandri, Brullo & Marcenò (1985), Tab. 28.
- 2 - Laguro vestiti-Erodietum maritimi, Brullo & Marcenò (1985), Tab. 33.
- 3 - Cruciatu pedemontane-Buglossidetum spitterberi, Brullo & Marcenò (1985), Tab. 30.
- 4 - Geranio purpurei-Cardaminetum graecae, Sicily, Tab. 2b.
- 5 - Geranio purpurei-Saxifragetum bulbiferae, Brullo & Marcenò (1985), Tab. 38.
- 6 - Valerianello eriocarpae-Cerastietum glomerati, Brullo & Marcenò (1985), Tab. 36.
- 7 - Erophilo vernae-Sedetum hispanicum, Sicily, Tab. 2c.
- 8 - Sedetum litoreo-stellati, Brullo & Marcenò (1985), Tab. 32.
- 9 - Campanulo dichotomae-Sedetum stellati, Sicily, Tab. 3a.
- 10 - Saxifrago tridactylitis-Hornungietum petraeae, Sicily, Tab. 3b.
- 11 - Parietiano lusitanicae-Veronictetum cymbalariae, Brullo & Marcenò (1985), Tab. 31.
- 12 - " " " " " Brullo et al. (2001), Tab. 207.
- 13 - " " " " " Bolòs et al. (1970), Tab. 98.
- 14 - Valantio muralis-Polycarpetum alsinifoliae, Brullo & Marcenò (1985), Tab. 35.
- 15 - Ranunculo parviflori-Senecionetum lividi, Brullo & Marcenò (1985), Tab. 34.
- 16 - Galio muralis-Sedetum cepaeae, Brullo & Marcenò (1985), Tab. 29.
- 17 - " " " " " Brullo et al. (2001), Tab. 206.
- 18 - Valerianello carinatae-Cerastietum luridi, Brullo & Marcenò (1985), Tab. 37.
- 19 - Valantio muralis-Solenopsietum annuae, Brullo et al. (1994), Tab. 12.
- 20 - Cardamino hirsutae-Stachyetum avensis, Sicily, Tab. 2a.
- 21 - Galio muralis-Catapodietum zwierleinii, Bartolo et al. (1990), Tab. 41.
- 22 - Valerianello puberulae-Galietum calvescentis, Brullo & Siracusa (1996), Tab. 26.
- 23 - Cruciatu pedemontane-Violetum parvulae, Brullo et al. (2001), Tab. 208.
- 24 - Campanulo erini-Valantietum hispidulae, Brullo et al. (2001), Tab. 207.
- 25 - Soncho teneriflori-Parietietum lusitanicae, Perez Badia (1997), Tab. 78, rel. 1-13, 16-17.
- 26 - Mercuriali ambiguae-Succowietum balearicae, Juan & Crespo (2001) Tab. 2.
- 27 - " " " " " Deil & Hammoumi (1997), Tab. 1.
- 28 - " " " " " Deil (1994), Tab. 1.
- 29 - " " " " " Bolòs (1989), Tab. 5.
- 30 - " " " " " Deil & Galan De Mera (2003), Tab. 2.
- 31 - Geranio rotundifolii-Theilignonetum cynocrambis, Rivas-Martínez (1978), Tab. 5.
- 32 - Sello cyrenaici-Saxifragetum hederifoliae, Brullo & Furnari (1996), Tab. 41.
- 33 - Galio muralis-Valantietum columellae, Brullo & Furnari (1996), Tab. 42.
- 34 - Minuartio mediterraneae-Arenarietum leptocladii, Sardinia, Tab. 4a.
- 35 - Bupleuro semicompositi-Hornungietum procumbentis, Sardinia, Tab. 4b.
- 36 - Rhodolaisino genticulae-Umbelietum horizontalis, Sardinia, Tab. 4c.
- 37 - Malcolmio flexuosae-Parietietum creticae, Rhodos, Tab. 5a.
- 38 - Crepidio insularis-Cerastietum comati, Naxos, Tab. 5b.
- 39 - Sello delici-Saxifragetum hederaceae, Naxos, Tab. 5c.
- 40 - Sileno-ceratocephaletum falcatae, Israel, Tab. 6a.
- 41 - Veronica poliferae-Galietum samuelsonii, Israel, Tab. 6b.
- 42 - Geranio rotundifolii-Silinetum latifoliae, Bolòs (1989), Tab. 6.
- 43 - Parietiano lusitanicae-Geranietum purpurei, Alcaraz-Ariza et al. (1986), Tab. 1.
- 44 - Parietario mauritanicae-Theilignonetum cynocrambe, Tamajón et al. (2000), Tab. 2.
- 45 - Geranio rotundifolii-Scandicetum microcarpaee, Rivas-Martínez (1978), Tab. 2.
- 46 - Mercuriali ellipiticae-Theilignonetum cynocrambis, Peinado et al. (1986), Tab. 5.
- 47 - Geranio purpurei-Galietum minutilli, Rivas-Martínez et al. (1980), Tab. 39.
- 48 - Urtico dubiae-Anthriscetum caulicidis, Rivas-Martínez et al. (1980), Tab. 40.
- 49 - Cardamino hirsutae-Erophiletum praecoxis, Bolòs (1981), Tab. 33.
- 50 - " " " " " Rosello (1994), Tab. 32.
- 51 - Vicio pubescentis-Moehringietum pentandrae, Bolòs (1981), Tab. 35.
- 52 - Galio aparinnellae-Anthriscetum caulicidis, Rivas-Martínez (1978), Tab. 1.
- 53 - Funario macrosepalae-Parietietum mauritanicae, Losa-Quintana (1988), Tab. 1.
- 54 - Anogrammo-Parietietum lusitanicae, Rivas-Martínez (1978), Tab. 3.
- 55 - Torilidi nodosae-Parietietum mauritanicae, Rivas-Martínez (1978), Tab. 4.
- 56 - Stellario pallidae-Chenopodietum exsucco, Molero Briones & Blanché Verges (1990), Tab. pag. 161.
- 57 - Hymenobolo procumbentis-Anthriscetum caulicidis, Beimonte Lopez & Laorga Sanchez (2000), Tab. 3.
- 58 - Cerastio taurici-Myosidetum ramosissimae, Rosello (1994), Tab. 49.
- 59 - Funario gaditanae-Geranietum purpurei, Peinado et al. (1986), Tab. 4.
- 60 - Castello tuberculosa-Geranietum rotundifoliae, Alcaraz Ariza et al. (1986), Tab. 2.
- 61 - Anthriscio caulicidis-Geranietum lucidi, Braum-Blanquet & Bolòs (1950), Tab. pag 334.
- 62 - Lammio bifidi-Anthriscetum caulicidis, Ladero et al. (1982), Tab. 1.
- 63 - Parietario mauritanicae-Ceratocephaletum heterocarpaee, Martínez-Parras (1982), Tab. 1, rel. 1-5.
- 64 - " " " " " Martínez-Parras (1982), Tab. 1, rel. 6-9.
- 65 - " " " " " Daumas et al. (1952), Tab. pag. 193.
- 66 - " " " " " Deil & Galan De Mera (2003), Tab. 2, rel. 42.
- 67 - Claytonio perfoliatae-Anthriscetum caulicidis, Izco et al. (1978), Tab. 1.
- 68 - Funario boraei-Anthriscetum caulicidis, Izco et al. (1978), Tab. 2.
- 69 - Carduo clavulati-Urticetum stachyoidis, Rivas-Martínez et al. (1993), Tab. 34, rel. 1-4.
- 70 - Galio aparines-Geranietum purpurei, Lohmeyer (1975), Tab. 6A.
- 71 - " " " " " Lohmeyer (1975), Tab. 6B.
- 72 - Galio aparines-Torilidietum neglectae, Lohmeyer & Trautmann (1970), Tab. 11.
- 73 - Geranio purpurei-Alchyssetum divaricati, Foucault (1999), Tab. 3.
- 74 - Aggr. a Drusa glandulosa e Parietaria debilis, Rivas-Martínez et al. (1993), Tab. 34, rel. 5-8.
- 75 - Galium aparine-Senecio cruentus Gesell., Oberdorfer (1965), Tab. 12A.
- 76 - Galium aparine-Senecio tussilaginis Gesell., Oberdorfer (1965), Tab. 12B

TABLE 2 - a) *Cardamino hirsutae-Stachyetum arvensis* ass. nova; b) *Geranio purpurei-Cardaminetum graecae* ass. nova; c) *Erophilo vernaе-Sedetum hispanici* ass. nova. (continued)

Association	a	a	a	a	a	b	b	b	b	b	b	b	b	c	c	c	c	c	c
Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Height (dam)	25	25	25	25	25	90	90	90	90	90	90	90	90	120	120	145	110	110	140
Plot size (m ²)	2	2	3	2	3	1	1	1	1	2	1	2	1	1	1	1	1	1	1
Cover (%)	80	80	80	80	80	90	80	80	90	90	80	80	90	70	80	90	80	90	90
<i>Scrophularia peregrina</i> L.	1	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Bromus tectorum</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	2
<i>Galium aparine</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Other species																			
<i>Geranium dissectum</i> L.	.	.	.	.	.	2	1	2	2	2	1	1	+	.	.	.	.	.	.
<i>Rumex buchefalophorus</i> L.	3	2	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Poa bulbosa</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	.	1	2	1
<i>Vulpia myuros</i> (L.) Gmel.	.	.	.	.	.	+	1	1	.	.	.	+	.	.	.	.	.	.	.
<i>Galium divaricatum</i> Lam.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	+	1
<i>Trifolium cherleri</i> L.	1	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Trifolium stellatum</i> L.	2	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cerastium semidecandrum</i> L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1	.
<i>Herniaria glabra</i> L. ssp. <i>nebrodensis</i> Jan ex Nyman	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	+	+
<i>Sedum tenuifolium</i> DC.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	+	+
<i>Vulpia ciliata</i> (Danth.) Link	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	+	.	.	.

Sicilia

Rel. 1-5 Piano delle Immacolatelle (Etna), 27/2/1994

Rel. 6-13 Valle S. Giacomo (Etna), 7/5/1994

Rel. 14-15 Piano dei Grilli (Etna), 20/5/1995

Rel. 16 Monte Intraleo (Etna), 9/6/1992

Rel. 17-18 Monte Maletto (Etna) 16/6/1992

Rel. 19 Monte Spagnolo (Etna) 16/6/1992

TABLE 3 - a) *Sedo stellati-Campanuletum dichotomae* ass. nova; b) *Saxifrago tridactylitis-Hornungietum petraeae* ass. nova. (continued)

Association	a	a	a	a	a	a	a	a	a	a	a	a	b	b	b	b	b	b
Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Height (dam)	23	18	18	17	21	10	16	25	10	9	9	17	110	112	112	114	114	109
Plot size (m2)	20	15	5	5	10	10	5	5	15	10	10	5	0,5	0,5	0,5	0,5	1	0,5
0 Cover (%)	30	30	30	35	30	35	30	30	25	30	30	40	60	70	70	80	60	60
0 Slope (°)	90	90	90	90	90	90	90	90	90	90	90	90	-	-	-	-	-	-
0 Exposure	NE	NNE	NE	SSE	S	O	SO	SE	S	SE	E	N	-	-	-	-	-	-
0 Other species																		
6 Hypochaeris achyrophorus L.	+	1	1	1	+	+	1	1	+	+	1	+	.	.	.	.	.	.
8 Bituminaria bituminosa (L.) C.H. Stirt.	1	+	+	1	1	1	1	+	.	+	+	.	.	.	.	.	.	.
8 Lamarckia aurea (L.) Moench	+	1	+	.	1	+	1	+	.	1	1	2	.	.	.	.	.	.
10 Galium aparine L.	+	.	+	.	.	+	1	.	1	1	1	1	.	.	.	.	.	.
11 Sideritis romana L.	.	.	+	+	+	.	1	+	1	.	.	+	.	.	.	.	.	.
11 Sedum tenuifolium Sm.	.	.	.	+	+	.	.	.	.	.	.	.	1	.	1	1	1	1
13 Lobularia maritima (L.) Desv.	+	+	.	+	.	.	+	.	.	+	.	.	.	.	.	.	.	.
13 Sedum dasyphyllum L.	.	.	.	.	.	+	.	+	1	+	+	.	.	.	.	.	.	.
14 Rumex bucephalophorus L.	.	+	+	.	+	.	.	.	.	1	.	.	.	.	.	.	.	.
15 Hyoseris radiata L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	1
15 Trachynia distachya (L.) Link	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15 Misopates orontium (L.) Rafin.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
15 Parietaria judaica L.	.	.	.	.	.	+	.	+	1	.	.	.	.	.	.	.	.	.
15 Phagnalon saxatile (L.) Cass.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.
15 Bidens bipinnata L.	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.
16 Aira cupaniana Guss.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
16 Sherardia arvensis L.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
16 Achyranthes sicula (L.) All.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
16 Catapodium rigidum (L.) Hubbard	.	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.
16 Ceterach officinarum DC.	.	.	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.

Rel.1-3: Taormina (NE-Sicily), 2/6/1996

Rel.4-5: Fiumedinisi (NE-Sicily), 3/6/1996

Rel..6-7: Stone-wall near Mongiuffi-Melia (NE-Sicily), 14/4/1996

Rel.8: Tipoldo, (NE-Sicily) 17/9/1995.

Rel. 9: Grotte (NE-Sicily) 3/5/1996.

Rel.10-11: Sparagona, near S. Teresa di Riva (NE-Sicily), 14/4/1996.

Rel.12: Stone-wall near Scifi (NE-Sicily), 14/4/1996.

Rel.13-18: Rupestrian ledges above Mandanici (NE-Sicily), 17/4/1996.

TABLE 4 - a) *Minuartia mediterraneae-Arenarietum leptocladii* ass. nova; b) *Bupleuro semicompositi - Hornungietum procumbentis* ass. nova; c) *Rhodalsino geniculatae-Umbilicetum horizontalis* ass. nova.

Association	a	a	a	a	a	b	b	b	b	c	c	c	c
Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13
Height (dam)	20	20	15	15	15	25	25	25	25	10	10	10	10
Plot size (m2)	1	1	1	0,6	1	1	1	0,8	0,5	1	1	2	1
Cover (%)	70	80	70	60	60	60	50	60	60	50	60	60	50
Char. Association													
Arenaria leptocladus Guss.	2	1	2	2	1	.	.	.	.	.	.	.	.
Minuartia mediterranea (Link) K. Maly	1	+	.	+	+	.	.	.	.	.	.	.	.
Hornungia procumbens (L.) Hayek	.	.	.	.	.	3	2	2	3	.	.	.	.
Bupleurum semicompositum L.	.	.	.	.	.	+	+	+	.	.	.	.	.
Umbilicus horizontalis (Guss.) DC.	.	.	.	.	.	.	.	.	.	3	2	2	1
Sedum stellatum L.	.	.	.	.	.	.	.	.	.	2	2	2	3
Sedum rubens L.	.	.	.	.	.	.	.	.	.	2	1	1	2
Rhodalsine geniculata (Poirot) Williams	.	.	.	.	.	.	.	.	.	1	3	2	1
Char. Valantio muralis-Galion muralis and Geranio-Cardaminetalia hirsutae													
Theligonum cynocrambe L.	+	1	1	.	+	.	.	+	1	.	+	+	1
Geranium purpureum Vill.	3	3	3	2	2	1	+	1	2	1	+	1	.
Galium murale (L.) All.	.	+	.	+	+	1	+	1	1	.	.	+	+
Parietaria lusitanica L.	+	3	1	2	+	+	+	.	+	.	.	.	.
Centranthus calcitrapa (L.) DC.	+	.	2	2	2	.	+	1	.	.	.	+	.
Valantia muralis L.	.	.	.	.	+	2	1	2	2	.	.	.	.
Cardamine hirsuta L.	.	.	.	.	.	+	1	.	1	+	+	.	.
Torilis nodosa (L.) Gaertn.	.	.	.	.	.	1	2	2	.	.	.	.	.
Campanula erinus L.	.	.	.	+	+	.	.	.	.	.	.	.	.
Char. Stellarietea mediae													
Stellaria media (L.) Vill.	3	2	+	+	1	.	2	+	1	+	+	2	1
Geranium molle L.	.	.	+	+	+	.	.	1	.	1	2	1	+
Fumaria officinalis L.	.	.	1	+	1	.	+	+	.	1	+	1	.
Euphorbia peplus L.	.	+	+	.	+	.	+	.	1	.	+	+	.
Chenopodium murale L.	.	.	.	.	.	.	.	.	.	1	+	2	1
Senecio vulgaris L.	.	.	+	.	.	.	+	+	.	.	.	.	+
Urospermum picroides (L.) Scop.	+	2	.	.	.	1	+	.	.	.	.	.	.
Urtica membranacea Poirot	.	.	+	+	1	.	.	+	.	.	.	.	.
Succowia balearica (L.) Medicus	.	.	.	.	.	.	.	.	.	1	1	1	.
Lamium amplexicaule L.	.	.	+	.	+	.	.	.	.	.	.	.	.
Lolium rigidum Gaudin	.	.	1	.	+	.	.	.	.	.	.	.	.
Solanum nigrum L.	.	.	.	.	.	.	.	.	.	.	1	+	.
Bromus madritensis L.	.	+	.	.	.	.	.	.	.	.	.	.	.
Other species													
Senecio leucanthemifolius Poirot	1	1	1	2	1	+	1	2	1	1	2	1	2
Silene colorata Poirot	1	1	2	2	+	+	1	.	1	.	.	.	.
Rumex bucephalophorus L.	.	.	2	1	2	+	+	.	+	.	.	.	.

TABLE 4 - a) *Minuartio mediterraneae-Arenarietum leptocladi* ass. nova; b) *Bupleuro semicompositi - Hornungietum procumbentis* ass. nova; c) *Rhodalsino geniculatae- Umbilicetum horizontalis* ass. nova. (continued)

Association	a	a	a	a	a	b	b	b	b	c	c	c	c
Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13
Height (dam)	20	20	15	15	15	25	25	25	25	10	10	10	10
Plot size (m2)	1	1	1	0,6	1	1	1	0,8	0,5	1	1	2	1
Cover (%)	70	80	70	60	60	60	50	60	60	50	60	60	50

Other species (Continued)

<i>Lobularia maritima</i> (L.) Desv.	1	1	.	+	+	.	.	+	.	.	.	.	.
<i>Polycarpon tetraphyllum</i> L.	+	.	+	.	.	.	.	.	.	.	.	.	.
<i>Hypochoeris achyrophorus</i> L.	.	.	+	.	+	.	.	.	.	.	.	.	.
<i>Lagurus ovatus</i> L.	.	+	.	.	.	.	.	.	+	.	.	.	.
<i>Vulpia fasciculata</i> (Forssk.) Fritsch	.	.	1	1	.	.	.	.	.	.	.	.	.

Sardegna

Rel. 1-2: Dune di Bugerru (SW-Sardinia), 24/04/1989

Rel. 3-5: Portixeddu (SW-Sardinia), 24/04/1989

Rel. 6-9: Porto Pino (SW-Sardinia), 26/04/1989

Rel. 10-13: Baia di Chia (SW-Sardinia), 26/04/1989

TABLE 5 - a) *Malcolmio flexuosae-Parietarietum creticae* ass. nova; b) *Crepido insularis-Cerastietum comati* ass. nova; c) *Sedo delici-Saxifragetum hederaceae* ass. nova.

Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Height (dam)	1	1	1	1	1	60	60	70	70	70	72	65	65	65
Plot size (m2)	1	1	1	1	1	1	0,5	0,5	0,5	1	1	2	2	1
Cover (%)	80	70	70	50	70	100	100	80	90	100	100	60	50	60

Char. Association

<i>Malcolmia flexuosa</i> (Sm.) Sm.	3	3	2	+	2	.	.	.	.	.	.	.	.	.
<i>Sedum litoreum</i> Guss.	3	3	2	1	2	.	.	.	.	.	.	.	.	.
<i>Parietaria cretica</i> L.	2	1	2	2	3	.	.	.	.	.	.	.	.	.
<i>Cerastium comatum</i> Desf.	.	.	.	.	.	2	3	2	2	3	2	.	.	.
<i>Crepis hellenica</i> Kamari ssp. <i>insularis</i> Kamari	.	.	.	.	.	3	.	1	1	2	2	.	.	.
<i>Saxifraga hederacea</i> L.	.	.	.	.	.	.	.	.	.	.	.	3	3	2
<i>Sedum delicum</i> (Vierh.) Carlström	.	.	.	.	.	.	.	.	.	.	.	2	1	2

Char. Valantio muralis-Galium muralis and Geranio-Cardaminetalia hirsutae

<i>Galium murale</i> (L.) All.	+	+	1	+	+	3	2	1	3	2	2	+	+	.
<i>Erophila praecox</i> (Steven) DC.	.	.	.	.	.	+	2	1	1	2	2	2	+	+
<i>Parietaria lusitanica</i> L.	.	.	.	.	.	1	2	2	2	2	+	1	2	2
<i>Campanula erinus</i> L.	.	.	1	+	+	1	+	.	+	2	+	.	.	.
<i>Geranium purpureum</i> Vill.	.	.	.	.	.	1	1	2	1	1	+	+	.	+

TABLE 5 - a) *Malcolmio flexuosae-Parietarium creticae* ass. nova; b) *Crepido insularis-Cerastietum comati* ass. nova; c) *Sedo delici-Saxifragetum hederaceae* ass. nova. (continued)

Number of relevés	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Height (dam)	1	1	1	1	1	60	60	70	70	70	72	65	65	65
Plot size (m2)	1	1	1	1	1	1	0,5	0,5	0,5	1	1	2	2	1
Cover (%)	80	70	70	50	70	100	100	80	90	100	100	60	50	60
Char. Valantio muralis-Galion muralis and Geranio-Cardaminetalia hirsutae (Continued)														
<i>Theligonum cynocrambe</i> L.	.	.	.	.	.	.	+	2	+	1	.	1	1	1
<i>Arabis verna</i> (L.) R. Br.	.	.	.	.	.	+	.	.	+	+	.	2	+	2
<i>Cardamine hirsuta</i> L.	.	.	.	.	.	.	.	1	+	.	1	+	+	1
<i>Arabidopsis thaliana</i> (L.) Heynh.	.	.	.	.	.	.	1	1	+	.	+	+	.	1
<i>Geranium lucidum</i> L.	.	.	.	.	.	.	.	+	.	+	1	+	1	+
<i>Valantia hispida</i> L.	1	2	2	2	1	.	.	.	.	.	.	.	.	.
<i>Valantia muralis</i> L.	.	.	.	.	.	+	.	.	+	+	+	.	1	.
<i>Arenaria leptoclados</i> Guss.	.	.	.	.	.	.	.	.	.	.	.	1	2	1
Char. Stellarietea mediae														
<i>Stellaria media</i> (L.) Vill.	.	.	.	.	.	2	2	1	1	1	+	.	+	+
<i>Senecio vulgaris</i> L.	.	.	.	.	.	1	1	+	+	.	1	+	1	+
<i>Lophochloa cristata</i> (L.) Hyl.	.	.	.	.	+	+	1	.	+	+	.	.	.	.
<i>Papaver dubium</i> L.	.	.	.	.	.	+	+	+	.	.	.	.	.	.
<i>Capsella bursa-pastoris</i> (L.) Medicus	.	.	.	.	.	+	+	.	+	.	1	.	.	.
<i>Urospermum picroides</i> (L.) Scop.	.	.	.	.	.	+	.	.	+	.	+	.	.	.
<i>Sonchus oleraceus</i> L.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
<i>Bromus madritensis</i> L.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
<i>Euphorbia peplus</i> L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Other species														
<i>Sedum litoreum</i> Guss.	3	3	2	1	2	3	3	2	2	2	3	.	.	.
<i>Ceterach officinarum</i> DC.	.	.	.	.	.	+	+	+	.	+	+	+	.	+
<i>Leontodon hispidus</i> L.	.	.	.	.	.	2	+	1	+	.	1	.	.	.
<i>Filago eriocephala</i> Guss.	.	.	.	.	.	2	+	.	1	+	1	.	.	.
<i>Umbilicus horizontalis</i> (Guss.) DC.	.	.	.	.	.	+	.	.	1	1	+	.	.	.
<i>Galium setaceum</i> Lam.	.	.	.	.	.	.	.	.	.	.	.	1	2	1
<i>Crepis capillaris</i> (L.) Wallr.	.	.	.	.	.	+	.	.	.	+	+	.	.	.
<i>Poa bulbosa</i> L.	.	.	.	.	.	+	.	+	1	.	.	.	.	.
<i>Papaver hybridum</i> L.	.	.	.	.	.	1	+	+	.	.	.	.	.	.
<i>Anthemis chia</i> L.	.	.	.	.	.	1	.	.	+	.	.	.	.	.
<i>Linaria pelisseriana</i> (L.) Miller	.	.	.	.	.	+	.	.	+	.	.	.	.	.
<i>Sedum rubens</i> L.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
<i>Anogramma leptophylla</i> (L.) Link	.	+	1	.	.	.	.	.	.	.	.	.	.	.
<i>Cheilantes acrostica</i> (Balbis) Todaro	.	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Plantago coronopus</i> L.	.	.	.	+	.	.	.	.	.	.	.	.	.	.

REL. 1-5: Greece, shady walls in Rhodos town (Rhodos), 26/08/1989

REL. 6-14: Greece, Mt. Zeus (Naxos), Mesozoic limestones, 11/06/1995

TABLE 6 - a) *Sileno decipiens-Ceratocephalum falcatae* ass. nova; b) *Veronico politae-Galietum samuelsonii* ass. nova.

Association	a	a	a	a	a	a	b	b	b	b	b
Number of relevés	1	2	3	4	5	6	7	8	9	10	11
Height (dam)	94	94	94	94	94	94	101	101	101	101	101
Plot size (m2)	1	1	2	1	1	1	1	1	1	1	1
Cover (%)	40	60	50	50	50	60	80	70	60	70	60
Char. Association											
Sedum rubens L.	3	4	2	3	3	1	.	.	.	.	.
Ceratocephala falcata (L.) Pers.	1	+	+	+	1	2	.	.	.	.	.
Erophila minima Meyer	1	.	2	1	+	1	.	.	.	.	.
Silene decipiens Barcelot	+	1	2	+	+	2	.	.	.	.	.
Galium samuelssonii Ehrend.	.	.	.	.	.	.	2	3	1	2	3
Veronica polita Fries	.	.	.	.	.	.	2	1	2	2	2
Taraxacum cyprium Lindb.	.	.	.	.	.	.	2	1	+	+	1
Arabis aucheri Boiss.	.	.	.	.	.	.	+	1	+	1	+
Char. Valantio muralis-Galium muralis and Geranio-Cardaminetalia hirsutae											
Arabis auriculata Lam.	1	2	1	1	+	2	.	.	.	.	.
Myosotis ramosissima Rochel	+	.	.	.	+	.	1	.	+	1	+
Galium murale (L.) All.	.	+	1	.	.	1	+	+	.	.	+
Erophila verna (L.) Chevall.	.	.	.	.	.	.	+	2	2	2	1
Cardamine hirsuta L.	.	.	.	.	.	.	1	+	.	+	+
Theligonum cynocrambe L.	.	.	.	.	.	.	1	+	.	+	1
Rhagadiolus edulis Gaertner	.	.	.	.	.	.	+	1	2	+	.
Geranium purpureum Vill.	.	.	+	.	+	.	.	.	.	.	.
Arabidopsis thaliana (L.) Heynh.	.	.	.	.	.	.	.	+	.	+	.
Char. Stellarietea mediae											
Biscutella didyma L.	.	.	+	1	1	.	+	1	+	.	+
Geranium molle L.	.	+	+	.	.	+	.	+	+	+	+
Carduus getulus Pomel	.	+	1	1	+	+	.	.	.	.	.
Senecio vulgaris L.	.	.	.	.	.	.	+	+	.	1	+
Lamium amplexicaule L.	.	.	.	.	.	.	+	.	+	+	+
Sisymbrium erysimoides Desf.	.	+	+	.	1	+	.	.	.	.	.
Calepina irregularis (Asso) Thel.	.	.	.	.	.	.	+	.	+	+	.
Capsella bursa-pastoris (L.) Medicus	.	.	.	.	.	.	+	.	+	+	.
Avena wiestii Steudel	+	+	.	1	.	.	.	.	.	.	.
Stellaria cupaniana (Jordan & Fourr.) Begunot	.	.	.	.	.	.	+	.	+	.	.
Other species											
Alyssum strigosum Banks & Solander	+	1	1	.	+	1	.	.	.	.	.
Clypeola jonthlaspi L.	+	1	.	1	+	.	.	.	.	.	.
Lamarckia aurea (L.) Moench	+	.	+	1	1	.	.	.	.	.	.
Senecio vernalis Waldst. & Kit.	+	+	.	1	1	.	.	.	.	.	.
Romulea columnae Sebast. & Mauri	.	.	.	.	.	.	1	+	.	+	+

TABLE 6 - a) *Sileno decipiens-Ceratocephaletum falcatae* ass. nova; b) *Veronico politae-Galietum samuelsonii* ass. nova. (continued)

Association	a	a	a	a	a	a	b	b	b	b	b
Number of relevés	1	2	3	4	5	6	7	8	9	10	11
Height (dam)	94	94	94	94	94	94	101	101	101	101	101
Plot size (m2)	1	1	2	1	1	1	1	1	1	1	1
Cover (%)	40	60	50	50	50	60	80	70	60	70	60
Other species											
<i>Carrichtera annua</i> (L.) DC.	.	+	.	.	1	+	.	.	.	.	.
<i>Astragalus sanctus</i> Boiss.	+	.	+	+	.	.	.	.	.	.	.
<i>Ranunculus ficaria</i> L.	.	.	.	.	.	.	1	+	.	+	.
<i>Silene colorata</i> Poiret	.	.	+	+	.	.	.	.	.	.	.
<i>Cynosurus callitrichus</i> Barbey	.	+	+	.	.	.	.	.	.	.	.

Rel. 1-5: Israel, Negev Highlands (Naal Eloth), limestones, 27/03/1989

Rel. 6-11: Israel, Odem forest (near Masaada), basaltic rocks, 04/04/1989