

THE COASTAL VEGETATION OF THE PORTUGUESE DIVISORY SECTOR: DUNES CLIFFS AND LOW-SCRUB COMMUNITIES

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Resumo – A VEGETAÇÃO COSTEIRA DO SECTOR DIVISÓRIO PORTUGUÊS: COMUNIDADES DAS DUNAS, ARRIBAS E MATOS. O Sector Divisório Português é uma unidade biogeográfica original, que está incluída na Província Gaditano-Onubo-Algarviense da Região Mediterrânica. Na sua área costeira reconhecem-se quatro Superdistritos distintos: Olissiponense, Sintrano, Costeiro Português e Berlenguense. O Costeiro Português é o maior dos territórios, cuja flora possui características mediterrânicas e atlânticas devido à sua paleo-história e às vias migratórias das plantas entre as Regiões Mediterrânica e Eurossiberiana. Devido a estas múltiplas influências, este território possui uma grande biodiversidade e tem uma riqueza original de táxones e sintáxones, sendo importante que lhe seja atribuído um estatuto de conservação. No presente trabalho, fazemos a caracterização breve de 27 associações de dunas e arribas que ocorrem neste Sector. As comunidades e os táxones que são endémicos ou possuem estatuto de conservação são citados. Também se propõem quatro novos sintáxones.

Palavras-chave: Biogeografia, Fitossociologia, Vegetação, Flora, Sector Divisório Português.

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Abstract – The Portuguese Divisory Sector is an original biogeographical unit within the Gaditano-Onubo-Algarvish Province of the Mediterranean chorological region. There are four superdistricts along its coastal area: «Olissiponense», «Sintrano», «Costeiro Português» (Portuguese Coastal) and «Berlenguense». The Portuguese Coastal superdistrict has not been sufficiently studied; it is the largest and its transitional biogeographical character lies between those of the Mediterranean and Eurosiberian regions due to its paleo-ecological history and joint position in relation to Atlantic and Mediterranean floristic migratory pathways. Due to these multiple influences a wealth of original taxa and syntaxa are found there which make large areas of the region suited for biodiversity conservation. In this work we characterise briefly 27 plant associations of dunes and sea-cliffs. Endemic or protect *taxa* and communities are cited. We also propose four new syntaxes.

Key words: Biogeography, Phytosociology, vegetation, flora, Portuguese Divisory Sector

I. INTRODUCTION

In terms of phytogeographical typology and following COSTA *et al.* (1998), the coastal area studied is included in «Divisório Português» (Portuguese Divisory) Sector (Gaditano-Onubo-Algarvish Province Mediterranean-Ibero-Atlantic Superprovince, Western Mediterranean Subregion, Mediterranean Region). It is formed by four Superdistricts: «Olissiponense» (Lisbon area), «Sintrano» (Sintra range), «Berlenguense» (Berlengas islands) and «Costeiro Português» (Portuguese Coastal, fig. 1). These units are characterized by coastal landscape systems (*geosigmatum*) including both dunes, cliffs, and low-shrub communities under more or less direct influence of maritime winds. It ranges approximately from Lisbon to Aveiro where it comes into contact with the Cantabro-Atlantic Province (Eurosiberian Region). Both climatic influence and paleo-historical nature of this unit are peculiar due to its transitional character and interface position in the main littoral plant migratory pathways (IZCO, 1983, 1992, 1993). In the «Olissiponense» Superdistrict the limestone cliffs are predominant, dunes can also be included in thermomediterranean thermotype and in dry ombrotype (COSTA *et al.*, 1993). In the «Sintrano» Superdistrict the granitic cliffs are dominant, in meso-Mediterranean thermotype and the sub-humid ombrotype. In the Portuguese Coastal Superdistrict between Sintra and Nazaré the lime or sandstone cliffs are sometimes interrupted by small beaches; north of Nazaré the coast is dominated by more or less altered dune systems, with a few calcareous outcrops (e.g. Cape Mondego). Most of the area belongs to the thermo-Mediterranean thermotype, except for a small area (Pinhal de Leiria, Mira and Quiaios coast). The former are of mesomediterranean type. The ombroclimate is of the subhumid ombrotype. Nevertheless, as expected in coastal areas, some physiological drought dominates the area due to somewhat persistent winds during winter and fall. The «Berlenguense» Superdistrict is formed by small granitic islands. There has been a strong human influence on this area

since the Middle Ages. Extensive plantations of maritime-pine (*Pinus pinaster*), dating mostly from the 19th century, also shape the landscape from Nazaré to Aveiro. These pine stands were planted for timber and to prevent the advance of dunes inland. Previous vegetation studies were those of BRAUN-BANQUET *et al.* (1964, 1972). The aim of this work is to extend some of the knowledge mostly on cliff and dune vegetation of the Portuguese Divisory Sector.

II. VEGETATION

1. Dunes and low-scrub communities

South of Carvoeiro Cape the first dune community occurring close to the sea is the *Salsola kali-Cakiletum maritimae*. This Mediterranean therophytic vegetation occurs on a small strip of organic debris carried by tides. Dominant taxa are: *Cakile maritima* ssp. *maritima*, *Euphorbia peplis* and *Salsola kali*. It is often destroyed by bathers. *Honkenya peploides* is a scarce but more frequent north of Peniche. This species with *Cakile maritima* ssp. *integrifolia* forms the Atlantic community *Honkenyo-Euphorbietum peplis*.

In the second strip of mobile sand, embryonic dunes, a hemicriphophytic community appears: *Euphorbio paraliae-Agropyretum junceiformis* (syn. = *Eryngio-Honkenietum peploidis* J. & G. Br.-Bl., Rozeira & P. Silva 1972 = *Agropyro junceiformis-Otanthetum maritimi agropyro-crucianelletosum* J. & G. Br.-Bl., Rozeira & P. Silva 1972). The dominant taxa are: *Elymus farctus* ssp. *boreali-atlanticus*, *Euphorbia paralias*, *Eryngium maritimum*, *Calystegia soldanella* and *Pancratium maritimum* (table I). The subassociation *otanthetosum maritimae*, which is abundant, is a result of the destruction of the *Ammophila arenaria* ssp. *australis* communities by the sea storms during winter.

The mobile dune crests are occupied by two associations: *Otantho-Ammophiletum australis* (syn.= *Agropyro-Otanthetum maritimi ammophiletosum arenariae* J. & G. Br.-Bl., Rozeira & P. Silva 1972) and *Loto cretici-Ammophiletum australis*. The first community ranges from the coast of the Basque country to Peniche (approximately the midpoint of our study area). Chamaephytic and hemicriphophytic taxa such as *Ammophila arenaria* ssp. *australis*, *Otanthus maritimus*, *Eryngium maritimum*, *Medicago marina*, *Calystegia soldanella* are frequent. The subassociation *crucianellietosum maritimae* take place in the area where the sand begins to settle (table II). The *Otantho-Ammophiletum* sometimes is found far from the sea (up to 3 Km inland) due to strong winds (Leiria pinewoods). The second community (*Loto-Ammophiletum*) follows the west-Mediterranean coasts both in Morocco and the Iberian Peninsula (from Tarifa to Praia da Areia Branca). It differs from the former *Ammophila* community mostly by the strong abundance of *Lotus creticus* (table III). We propose the new subassociation *armerietosum welwitschii* specific

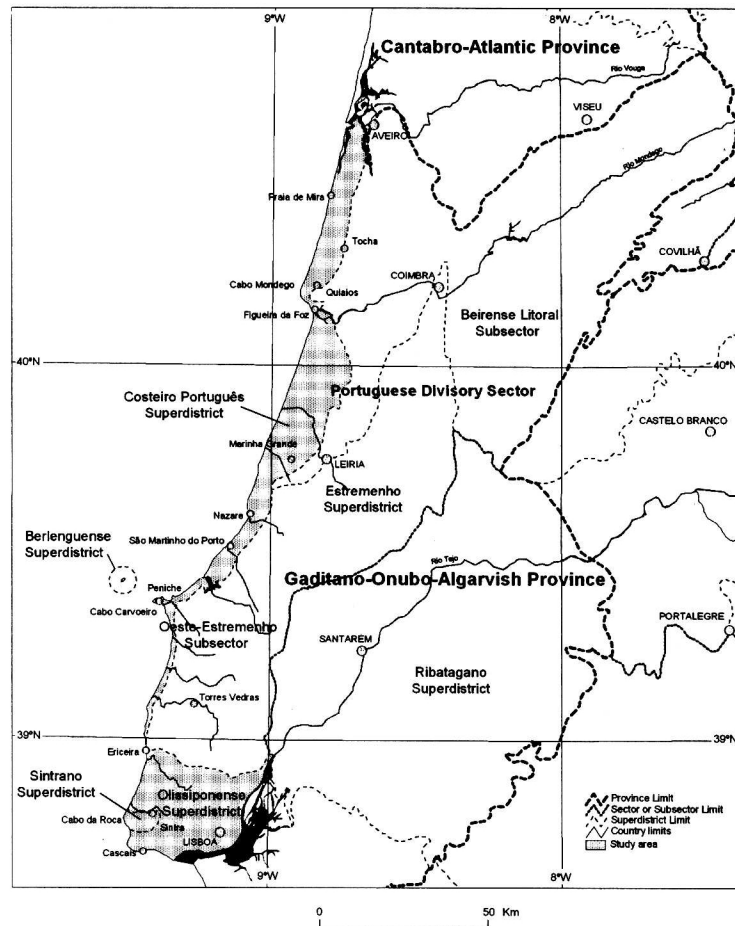


Fig.1 - Biogeographic map of the study area

Fig.1 - Mapa biogeográfico da área de estudo

of Portuguese Divisory Sector, where the contact with moving sands and stable sands occurs and *Armeria welwitschii* ssp. *welwitschii*, *Artemisia crithmifolia*, *Helichrysum picardi*, *Ononis natrx* ssp. *ramosissima*, *Crucianella maritima* are the differential species (*syntypus* releve 7, table III).

The grey dunes, where chamaephytes dominate and the sands are fixed, two associations are present. The first is endemic to the study area *Armerio welwitschii-Crucianelletum maritimae*. Its floristic composition includes: *Crucianella maritima*, *Helichrysum picardi*, *Armeria welwitschii* ssp. *welwitschii*, *Artemisia crithmifolia*, *Pancratium maritimum*, *Lotus creticus*, *Ononis natrx* ssp. *ramosissima*, *Malcolmia littorea*, *Carpobrotus edulis*, *Sedum sediforme*, *Aetheorhiza*

bulbosa, *Scrophularia frutescens*, *Euphorbia portlandica*, *Iberis procumbens* ssp. *procumbens*, *Verbascum litigiosum*, *Cyperus capitatus*, *Seseli tortuosum*, *Linaria caesia* ssp. *decumbens*, *Vulpia alopecurus*, *Corynephorus canescens* var. *maritimus* and *Calendula suffruticosa* ssp. *algarbiense* (table IV). The community ranges from Cascais to Quiaios where it is replaced by the second community: the Atlantic association *Scrophulario-Vulpietum alopecuris* (syn. *Iberidetum procumbentis* Bellot 1966, pp.). It differs from the former by a great abundance of *Vulpia alopecurus*, *Seseli tortuosum*, *Herniaria ciliolata* ssp. *robusta*, *Leontodon arenarius* and the absence of *Armeria welwitschii*, *Lotus creticus* and *Herniaria maritima* (table V). In the study area the characteristic species *Jasione lusitanica* and *Coincya johnstonii* are absent. It is endemic of the NW of the Iberian Peninsula. During springtime, the clearings of both these low-shrub formations are filled with an endemic therophitic community: *Viola henriquesii-Silenetum littoreae* (*Silene littorea*, *Senecio gallicus*, *Polycarpon alsinifolium*, *Erodium aethiopicum* ssp. *pilosum*, *Medicago littoralis*, *Pseudor-laya minuscula*, etc., table VI). It is also endemic and ranges from Cascais to Galiza (NW Spain).

The mature vegetation of stable dunes is the thermomediterranean *Juniperus turbinata* community: *Osyrio quadripartitae-Juniperetum turbinatae*. It is an endemic syntaxon of the sand dunes from Cadiz to Mondego Cape (Gaditano-Onubo-Algarvish Province). It appears in fossil dunes in sea-cliffs. Its composition includes: *Juniperus turbinata* ssp. *turbinata*, *Rubia peregrina* var. *longifolia*, *Asparagus aphyllus*, *Daphne gnidium*, *Pistacia lentiscus*, *Phillyrea angustifolia*, *Smilax aspera* var. *mauritanica*, *Corema album*, *Antirrhinum majus* ssp. *cirrhigerum*, etc. (table VII). The fringe and the first stage of degradation is *Rubio longifoliae-Coremetum albi* association (table VIII). It follows the geographical distribution of the *Juniperus* community and reaches northern sites near Aveiro. Its floristic character comes from the combination of *Corema album*, *Rubia peregrina* var. *longifolia* and *Antirrhinum majus* ssp. *cirrhigerum*. This community is absent in Olissiponense Superdistrict.

The nanophanerophytic *Stauracantho genistoidis-Coremetum albi* (table IX) is a low-shrub community endemic to the Portuguese Coastal Superdistrict. It's very abundant under the pine stands and is probably the mature vegetation of the interior dunes, despite sometimes being in contact with the *Juniperus* community. The community is dominated by *Stauracanthus genistoides*, *Corema album*, *Ulex europaeus* ssp. *latebracteatus*, *Helichrysum picardi* var. *virescens*, *Halimium calycinum*, etc. It is a transitional community between *Cisto-Lavanduletea* and *Calluno-Ulicetea*. This association results from the destruction of the strawberrytree community *Myrico fayae-Arbutetum unedonis*, which is the climax in the sandy soils of Portuguese Coastal Superdistrict. *Arbutus unedo*, *Myrica faya*, *Erica arborea*, *Cytisus grandiflorus* are the more common species (CAPELO *et al.* 1998).

In general, wherever the dune communities have inputs of nitrogen compounds from organic matter (human disturbance) the *Chamaemelo mixti-Vulpietum alopecuoris* association appears. Frequent species are: *Vulpia alope-*

curus, *Chamaemelum mixtum*, *Centranthus calcitrapa*, *Bromus diandrus*, *Brassica barrelieri* ssp. *oxyrrhina*, *Arctotheca calendula*, *Lagurus ovatus*, *Reichardia gaditana*, *Silene colorata*, etc. (syntypus releve 11, table X). This association can be found on semi-nitrophilous sandy soils from south Aveiro to southwest Spain (RIVAS-MARTÍNEZ *et al.*, 1980, COSTA *et al.* 1997, LOUSÃ *et al.*, 1999). The nitrophilous *Anacyclo radiati-Hordeetum leporini arctothecetosum calendulae* is also found near roads in sandy soils. *Hordeum murinum* ssp. *leporinum*, *Anacyclus radiatus*, *Arctotheca calendula* are the dominant species in this SW-Iberian formation.

2. Sea-cliffs

In the limestone sea-cliffs of the Sector we found the most original flora and vegetation. In the late fall the strong salt-rich winds result in physiological dryness although the annual rainfall is high. In the most exposed sites three associations belonging to the Mediterranean alliance *Crithmo-Daucion halophili* (*Crithmo-Staticetea maritimae*) are found. The southernmost one is found from Peniche to Lisbon, except for the granites of Roca Cape, and is named *Limonietum multifloro-virgati*. Besides *Limonium virgatum* (= *L. oleifolium*) and *Limonium multiflorum* also common are *Dactylis marina*, *Crithmum maritimum*, *Plantago coronopus* ssp. *occidentalis*, *Daucus halophilus*, *Spergularia australis*, *Armeria welwitschii* ssp. *cinerea*, *Frankenia laevis*, *Inula crithmoides*, *Limonium ferulaceum* (COSTA *et al.*, 1998). Between the capes Carvoeiro (Peniche) and Mondego a community with a similar composition is found, but *L. multiflorum* and *L. virgatum* are absent and replaced by *Limonium plurisquamatum* and *Limonium ovalifolium*. This association is the *Dactylo marinae-Limonietum plurisquamati*. Both associations are found mostly on limestone and rarely on sandstone. The *Diantho cintrani-Daucetum halophili* is endemic among the granitic cliffs of Sintrano Superdistrict. *Daucus halophilus*, *Dactylis marina*, *Crithmum maritimum*, *Limonium virgatum*, *Dianthus cintranus* ssp. *cintranus*, *Armeria pseudarmeria*, *Plantago coronopus* ssp. *occidentalis* are the most frequent species (COSTA *et al.*, 1998). The *Spergulario rupicolae-Armerietum berlengensis*, is also endemic and occurs on the granitic cliffs of the Berlenguense Superdistrict. It is formed by *Armeria berlengensis*, *Crithmum maritimum*, *Dactylis marina*, *Spergularia rupicola*, *Plantago coronopus* ssp. *occidentalis*, *Silene uniflora*, *Angelica pachycarpa*, etc. (COSTA *et al.*, 1998). This community belongs to the Atlantic alliance *Crithmion maritimae*. In spring-time, an aerohalophilic and nitrophilous annual community resulting from the destruction of the *Limonium* communities is found: *Parapholido incurvae-Catapodietum marini* (*Saginetea maritimae*), where *Parapholis incurva*, *Catapodium marinum*, *Leontodon taraxacoides* are frequent (COSTA *et al.*, 1998). This community is found in the SW of the Iberian Peninsula and Balearic islands

(RIVAS-MARTÍNEZ *et al.*, 1990). But in the Berlenguense Superdistrict we can see *Cochlearia danica* and *Sagina maritima* that form the Atlantic association *Sagino maritimae-Cochlearietum danicae* (COSTA *et al.*, 1998). In the resting and feeding places of sea birds a community of halonitrophillous nanophanerophytes can be found. This vegetation belongs to the *Pegano-Salsoletea* vegetation class. *Atriplex halimus*, *Suaeda vera*, *Frankenia laevis*, *Beta vulgaris* ssp. *maritima*, *Inula crithmoides* are abundant – *Scrophulario sublyratae-Suaedetum verae* (COSTA *et al.*, 2000).

The climax vegetation (permanent community) of sea-cliffs is the juniper community *Quercococciferae-Juniperetum turbinatae*. Although the two name-giving *taxa* are dominant in the community, *Asparagus aphyllus*, *Olea europaea* var. *sylvestris*, *Rubia peregrina* var. *longifolia*, *Rhamnus alaternus*, etc. can also be found (table XI). It is an endemic community of Portugal and can be found from the Mondego cape to the Algarve (COSTA *et al.*, 1994). The theoretical climatic climax is not achieved on the sea cliffs due to the drying effect of strong winds despite the high annual rainfall in these environments.

The *Cisto salvifolii-Ulicetum humilis lavanduletosum luiseri* is another endemic syntaxon of the Portuguese Coastal Superdistrict (HONRADO *et al.*, 1999). It is an Atlantic community and can be found in the Foz do Arelho sea cliffs and it is formed by *Ulex europaeus* ssp. *latebracteatus* f. *humilis*, *Cistus salvifolius*, *Erica umbellata*, *Daphne gnidium* var. *maritima*, *Genista triacanthos*, *Brachypodium rupestre*, *Calluna vulgaris*, *Pseudarrhenatherum longifolium*, *Carlina corymbosa* var. *major*, *Dactylis marina*, *Asparagus aphyllus*, *Lavandula luisieri*, *Cistus ladanifer*, *Rubia peregrina* var. *longifolia*, *Phillyrea angustifolia* and others.

In «Sintrano» and the southmost Portuguese Coastal Superdistrict, on granitic soils and fossil and consolidated dunes, we can see the new community *Daphnomaritimi-Ulicetum congesti*; it is dominated by the endemic *Ulex jussiaei* ssp. *congestus* with *Daphne gnidium* var. *maritima*, *Carlina corymbosa* var. *major*, *Armeria pseudarmeria*, *Daucus halophilus*, *Dactylis marina*, *Euphorbia portlandica*, *Calluna vulgaris*, etc. (syntypus releve 2, table XII). It also forms a mosaic with the *Quercococciferae-Juniperetum turbinatae*. It is the southernmost association of the Atlantic alliance of sea-cliffs: *Dactylido maritimae-Ulicion maritimi*. It is endemic to the study area. We confirm this association in this work.

South of Nazaré, on limestone soils, the degradation of the juniper community results in a *Ulex densus* dominated low scrub. Other common species are: *Salvia sclareoides*, *Eryngium dilatatum*, *Anthyllis vulneraria* ssp. *maura*, *Plantago serraria* var. *hispanica*: *Salvio sclareoidis-Ulicetum densi ulicetosum densi* (table XIII). It is an endemic community of the Portuguese Divisory Sector. *Daphne gnidium* var. *maritima*, *Dactylis marina*, *Daucus halophilus*, *Carlina corymbosa* var. *major*, *Ononis natrix* ssp. *ramosissima*, *Calendula suffruticosa* ssp. *algarbiensis*, *Helichrysum decumbens* define a coastal variant of this association (variant of *Daphne maritima*) in relation to the typical community of

the Portuguese Coastal Superdistrict. It forms mosaic with the meadows of *Brachypodium phoenicoides* (*Phlomido lychnitidis-Brachypodietum phoenicoidis*) which are a wild-orchid rich habitat.

Other cliff communities are: reed communities of *Arundo donax* (*Arundini donacis-Convolvuletum sepium*) and *Tamarix africana* communities of semi-natural characteristics since these are promoted by cultivation for purposes of protection against sea-winds.

III. FLORA

The flora of the Portuguese coastal Superdistrict is mostly of the Mediterranean floristic element but includes several Atlantic groups of taxa since this area doesn't have any natural climatic or geographical barriers between the two influences. Typically Mediterranean taxa area found, such as: *Juniperus turbinata*, *Quercus lusitanica*, *Quercus coccifera*, *Cakile maritima* ssp. *maritima*, *Brassica barrelieri* ssp. *oxyrrhina*, *Lotus creticus*, *Stauracanthus genistoides*, *Daucus halophilus*, *Limonium virgatum*, *Corema album*, *Antirrhinum majus* ssp. *cirrhigerum*, *Anacyclus radiatus*, *Artemisia crithmifolia*, *Calendula suffruticosa* ssp. *algarbiensis*, *Helichrysum decumbens*, *Helichrysum picardi*, *Asparagus aphyllus*, etc., and Atlantic: *Salix arenaria*, *Honkenya peploides*, *Herniaria ciliolata* ssp. *robusta*, *Cakile maritima* ssp. *integrifolia*, *Cochlearia danica*, *Malcolmia ramosissima*, *Matthiola sinuata*, *Ulex europaeus* ssp. *latebracteatus*, *Hypericum elodes*, *Ange-lica plachyparca*, *Triglochin maritima*, *Elymus pycnanthus*, *Puccinellia maritima*, *Carex trinervis*, *Schoenoplectus supinus* etc.

Taxa endemic of the study area: *Dianthus cintranus* ssp. *cintranus*, *Herniaria berlegiana*, *Ulex jussiaei* var. *jussiaei* and var. *congestus*, *Armeria pseudarmeria*, *A. welwitschii* ssp. *welwitschii* and ssp. *cinerea*, *A. berlegensis*, *Limonium multiflorum*, *L. laxiusculum*, *L. plurisquamatum*, *Omphalodes kuzinskyanae*. Taxa endemic of Portugal: *Herniaria maritima*, *Ionopsidium acaule* (Bern Convention species), *Iberis procumbens* ssp. *microcarpa*, *Silene longicilia*, *Ulex densus*, *Euphorbia transtagana*, *Myosotis lusitanica*, *Antirrhinum majus* ssp. *linkianum*, *Verbascum litigiosum*, *Scrophularia sublyrata*, *Cirsium welwitschii*, *Allium pruinatum*. Taxa endemic of the Iberian Peninsula: *Silene scabriflora*, *Iberis procumbens* ssp. *procumbens*, *I. linifolia* ssp. *welwitschii*, *Cytisus striatus*, *C. grandiflorus*, *Stauracanthus genistoides*, *Lotus subbiflorus* ssp. *castellanus*, *Euphorbia uliginosa*, *Cistus psilosepalus*, *Angelica pachycarpa*, *Peuce-danum lancifolium*, *Corema album*, *Centaurium microcalyx*, *Anchusa calcarea*, *Myosotis persoonii*, *Callitriche lusitanica*, *Calamintha baetica*, *Thymus villosus*, *Lavandula luisieri*, *L. pedunculata* ssp. *lusitanica*, *Salvia sclareoides*, *Gratiola linifolia*, *Linaria caesia* ssp. *decumbens*, *Odontites tenuifolia*, *Pulicaria paludosa*, *Artemisia crithmifolia*, *Cirsium filipendulum* ssp. *filipendulum*, *Serratula monardii*, *Avenula sulcata* ssp. *occidentalis*, *Vulpia fontquerana*. Taxa

e n d e m i c
of Europe: *Pilularia globulifera*, *Herniaria ciliolata* ssp. *robusta*, *Cochlearia danica*, *Hypericum elodes*, *Carum verticillatum*, *Pseudorlaya minuscula*, *Centaurium chloodes*, *Myosotis ramosissima* ssp. *globularis*, *M. balbisiana*, *Callitriche truncata* ssp. *occidentalis*, *C. brutia*, *Teucrium scorodonia* ssp. *scorodonia*, *Verbascum thapsus* ssp. *crassifolium*, *Verbascum virgatum*, *Anarrhinum bellidifolium*, *Linaria spartea*, *Wahlenbergia hederacea*, *Taraxacum adamii*, *Elymus pycnanthus*, *Carex arenaria*, *Carex trinervis*.

Schoenoplectus supinus (L.) Palla was observed for the first time in Portugal (Vela lagoon). In this study area, several exotic taxa are frequent, such as: *Acacia melanoxylon*, *A. longifolia*, *Carpobrotus edulis*, *Hydrocotyle bonariensis*, *Cotula coronopifolia*, *Myriophyllum aquaticum*, *Oenothera stricta*, *Elodea canadensis*. *Acacia* spp., *Carpobrotus edulis* and *Myriophyllum aquaticum* are invaders in the area and cause problems of vegetation conservation.

SYNTAXONOMIC SCHEME

QUERCETEA ILICIS Br.-Bl. ex A. & O. Bolòs 1950

Pistacio lentisci-Rhamnetalia alaterni Rivas-Martínez 1975

Asparago albi-Rhamnion oleoidis Rivas Goday ex Rivas-Martínez 1975

Quercococciferae-Juniperetum turbinatae (Rivas-Martínez 1975) Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990

Juniperion turbinatae Rivas-Martínez 1975 corr. 1987

Osyrio quadripartitae-Juniperetum turbinatae (Rivas-Martínez 1975) Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990

Rubio longifoliae-Coremion albi Rivas-Martínez in Rivas-Martínez, Costa, Castroviejo & Valdés 1980

Rubio longifoliae-Coremetum albi Rivas-Martínez in Rivas-Martínez, Costa, Castroviejo & Valdés 1980

Ericion arboreae Rivas-Martínez (1975) 1987

Myrico fayae-Arbutetum unedonis Capelo & Mesquita 1998

CALLUNO-ULICETEA Br.-Bl. & Tüxen ex Klika & Hadac 1944

Ulicetalia minoris Quantin 1935

Dactylido maritimae-Ulicion maritimi Géhu 1975

Cisto salvifolii-Ulicetum humilis Br.-Bl., P. Silva & Rozeira 1964

lavanduletosum luisieri Honrado, Barreto Caldas & Napomuceno 1999

Daphno maritimi-Ulicetum congesti Rivas-Martínez, Díaz & J.C. Costa ex J.C. Costa, Espírito-Santo, Capelo e Lousã ass. nova.

CISTO-LAVANDULETEA Br.-Bl. in Br.-Bl., Molinier & Wagner 1940

Stauracantho genistoidis-Halimietalia commutati Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990

Coremion albi Rothmaler 1943

Stauracantho genistoidis-Coremetum albi Br.-Bl., P. Silva & Rozeira 1964

ROSMARINETEA OFFICINALIS Rivas-Martínez, Díaz, F. Prieto, Loidi & Penas 1991

Rosmarinetalia officinalis Br.-Bl. *ex* Molinier 1934
Eryngio-Ulicion erinacei Rothmaler 1943
Serratulo estremadurensis-Thymenion sylvestris Capelo, J.C. Costa, Espírito-Santo & Lousã 1993
Salvio sclareoidis-Ulicetum densi Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa *ex* Capelo, J.C. Costa, Lousã & Neto 1992
ulicetosum densi variant of *Daphne maritima*

FESTUCO-BROMETEA ERECTI Br.-Bl. & Tüxen *ex* Br.-Bl. 1949

Brachypodietalia phoenicoidis Br.-Bl. *ex* Molinier 1934
Brachypodion phoenicoidis Br.-Bl. *ex* Molinier 1934
Phlomido lychnitidis-Brachypodietum phoenicoidis Br.-Bl., P. Silva & Rozeira 1956

AMMOPHILETEA Br.-Bl. & Tüxen *ex*. Westhoff, Dijk & Passchier 1946

Ammophiletalia Br.-Bl. 1933
Ammophilion australis Br.-Bl. 1921 *corr.* Rivas-Martínez, Costa & Izco *in* Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990
Ammophilenion australis
Otantho maritimi-Ammophiletum australis Géhu & Tüxen 1975 *corr.* Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990
ammophiletosum australis
crucianelletosum maritimae Géhu & Tüxen 1975
Loto cretici-Ammophiletum australis (Rivas Goday & Rivas-Martínez 1958) Rivas-Martínez 1964
ammophiletosum australis
armerietosum welwitschii J. C. Costa, Lousã, Capelo, M.D. Espírito Santo & Izco *subass. nova*
Agropyro-Minuartion peplidis Tüxen *in* Br.-Bl. & Tüxen 1952
Agropyro-Minuartienion peplidis
Euphorbio paraliae-Agropyretum junceiformis Tüxen *in* Br.-Bl. 1952 *corr.* Darimont, Duvignaud & Lambinon 1962
agropyretosum junceiformis
otanthetosum maritimae Rivas-Martínez, Lousã, Díaz, Fernández-González & J.C. Costa 1990
Crucianelletalia maritimae Sissingh 1974
Helichryson picardii (Rivas-Martínez, Costa & Izco *in* Rivas-Martínez, Lousã, Díaz, Fernández-González & J. C. Costa 1990) *ex* Rivas-Martínez, Fernández-González & Loidi 1999
Armerio welwitschii-Crucianellietum maritimae J. & G. Br.-Bl., Rozeira & P. Silva 1972
Scrophulario-Vulpietum alopecuoris J. & G. Br.-Bl., Rozeira & P. Silva 1972

CAKILETEA MARITIMAE Tüxen & Preising *in* Tüxen 1950

Cakiletalia integrifoliae Tüxen *ex* Oberdorfer 1950 *corr.* Rivas-Martínez, Costa & Loidi 1992
Salsolo kali-Minuartion peplidis Tüxen 1950
Honckenyo-Euphorbietum peplis (Durand & Charrier 1911) Tüxen 1950
Euphorbion peplis Tüxen 1950
Salsolo kali-Cakiletum maritimae Costa & Mansanet 1981 *corr.* Rivas-Martínez, Costa & Loidi 1992

HELIANTHEMETEA (Br.-Bl. *in* Br.-Bl., Roussine & Nègre 1952) Rivas Goday &

Rivas-Martínez 1963 *em.* Rivas-Martínez 1978

Malcolmietalia Rivas Goday 1958

Linaria pedunculatae Díez-Garretas, Asensi & Esteves *in* Díez Garretas 1984

Viola henriquesii-Silenetum littoreae Izco, P. & J. Guitián 1988

SAGINETEA MARITIMAE Westhoff, Van Leeuwen & Adriani 1962

Saginetalia maritimae Westhoff, Van Leeuwen & Adriani 1962

Saginion maritimae Westhoff, Van Leeuwen & Adriani 1962

Sagino maritimae-Cochlearietum danicae Tüxen & Gillner *in* Tüxen, Bockelmann, Rivas-Martínez & Wildpret 1957

Frankenietalia pulverulentae Rivas-Martínez *ex* Castroviejo & Porta 1976

Frankenion pulverulentae Rivas-Martínez *ex* Castroviejo & Porta 1976

Parapholido incurvae-Catapodietum marini Rivas-Martínez, Lousá, Díaz, Fernández-González & J.C. Costa 1990

CRITHMO-STATICETEA Br.-Bl. 1947

Crithmo-Staticetalia Molinier 1934

Crithmo-Daucion halophili Rivas-Martínez, Lousá, Díaz, Fernández-González & J.C. Costa 1990

Limonietum multiflori-virgatae J.C. Costa & Capelo *in* J.C. Costa, Capelo, Lousá & Espírito-Santo 1998

Dactylo maritimae-Limonietum plurisquamatae J.C. Costa, Capelo & Lousá *in* J.C. Costa, Capelo, Lousá & Espírito-Santo 1998

Diantho cintrani-Daucetum halophili J.C. Costa, Capelo, Lousá & Espírito-Santo 1998

Crithmo-Armerietalia Géhu 1968

Crithmo-Armerion maritimae Géhu 1968

Spergulario rupiculae-Armerietum berlengensis Capelo, J.C. Costa & Lousá *in* J.C. Costa, Capelo, Lousá & Espírito-Santo 1998

PEGANO-SALSOLETEA Br.-Bl. & O. Bolòs 1958

Salsolo vermiculatae-Peganetalia harmalae Br.-Bl. & O. Bolòs 1954

Carthamo arborescentis-Salsolion oppositifoliae Rivas Goday & Rivas-Martínez 1963

Scrophulario sublyratae-Suaedetum verae J.C. Costa, Capelo & Lousá *inéd.*

STELLARIETEA MEDIAE Tüxen, Lohmeyer & Preising *ex* von Rochow 1951

CHENOPODIO-STELLARIENEA Rivas Goday 1956

Sisymbrietalia officinalis J. Tüxen *in* Lohmeyer *et al.* 1962 *em* Rivas-Martínez, Báscones, Díaz, Fernández-González & Loidi 1991

Hordeion leporini Br.-Bl. *in* Br.-Bl., Gajewski, Wraber & Walas 1936

Anacyclo radiati-Hordeetum leporini O. Bolòs & Rivas-Martínez 1978

arctothecetosum calendulae O. Bolòs & Rivas-Martínez 1978

chrysanthemetosum coronari O. Bolòs & Rivas-Martínez 1978

Brometalia rubenti-tectorum Rivas-Martínez & Izco 1977

Linario viscosae-Vulpion alopecuridis Rivas-Martínez & Costa *in* Rivas-Martínez, Costa, Castroviejo, & Valdés 1980

Chamaemelo mixti-Vulpietum alopecuroris Rivas-Martínez, Costa, Castroviejo, & Valdés *ex* J.C. Costa, Capelo, Lousá, Espírito Santo & Izco *ass. nova*

GALIO-URTICETEA Passarge *ex* Kopecky 1969

Convolvuletalia sepium Tüxen 1950

Senecionion fluvialis Tüxen 1950

Arundini donacis-Convolutum sepium Tüxen & Oberdorfer ex O. Bolòs 1962

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Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Minimum surface (m2)	1	4	4	3	2	2	4	10	4	6	2	4	6	4	6	4	6	4	4
Number of species	4	5	5	6	5	4	6	8	6	6	7	4	7	6	6	4	4	7	5
Characteristics																			
<i>Elymus farctus</i> ssp. <i>boreali-atlanticus</i>	2	3	2	2	1	3	3	2	2	3	2	1	2	2	4	3	2	2	3
<i>Euphorbia paralias</i>	.	+	+	+	3	+	+	1	1	3	+	2	3	+	1	.	.	.	.
<i>Eryngium maritimum</i>	+	.	1	1	.	+	2	+	1	+	+	+	1	1	.	2	1	1	1
<i>Calystegia soldanella</i>	.	.	.	.	2	1	+	+	1	+	.	.	.	.	+	.	+	1	.
<i>Pancreatium maritimum</i>	.	+	+	+	2	.	.	+	1	.	.	+	+	+	+	.	.	+	+
<i>Polygonum maritimum</i>	1	+	1	1	.	.	.	.	.	.	+	.	+	+	+	.	.	.	.
<i>Medicago marina</i>	.	.	.	.	.	.	.	+	.	.	+	.	1	.	.	1	.	+	.
Differential of subassociation <i>otanthosum maritimae</i>																			
<i>Otanthus maritimus</i>	.	.	.	.	.	.	.	2	3	2	2	3	2	3	+	2	3	2	3
Companions																			
<i>Cakile maritima</i>	+	+	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.
<i>Crucianella maritima</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Reichardia gaditana</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	.
<i>Silene nicaeensis</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Crithmum maritimum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+

Places: 1 Praia Azul; 2, 15, 19 Foz do Sisandro; 3 Cabo Raso; 4 Guincho; 5, 6 Peniche; 7 S. Martinho do Porto; 8 Murtinheira; 9 Quiaios; 10 Costa de Lavos; 11 Gala; 12 Pedrogão; 13 Leirosa; 14 S. Pedro de Muel; 16 Areia Branca; 17 Mira; 18 Tocha.

TABLE I
Euphorbio paraliae-Agropyretum junceiformis

TABLE II
Otantho-Ammophiletum australis

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Number of releve	10	30	10	20	20	10	20	30	40	20	10	30	10	20	10
Minimum surface (m2)	7	10	13	11	10	7	10	16	18	12	9	10	5	6	5
Number of species															
Characteristics															
<i>Ammophila arenaria</i> ssp. <i>australis</i>	4	3	3	3	3	3	2	3	3	3	3	3	4	3	3
<i>Otanthus maritimus</i>	+	1	1	+	1	1	4	2	2	3	2	+	.	.	.
<i>Eryngium maritimum</i>	1	1	.	.	+	+	1	1	2	1	2	+	1	.	.
<i>Medicago marina</i>	.	1	3	+	1	.	1	1	1	+	1	1	.	+	.
<i>Calystegia soldanella</i>	1	.	1	.	.	1	1	1	2	1	+	+	.	.	.
<i>Euphorbia paralias</i>	.	+	+	.	1	1	2	.	1	1	.	+	.	1	.
<i>Pancreatum maritimum</i>	.	.	+	.	+	2	.	+	+	1	.	.	.	+	.
<i>Leontodon arenarius</i>	.	+	+	.	1	.	.	+	+	+	.	+	.	.	.
<i>Polygonum maritimum</i>	.	.	+	1	.	.	+	+	.	.	.	.	.	.	.
<i>Aetheorhiza bulbosa</i>	.	1	+	+	.	.	.	+	+	.	.	.	.	.	.
<i>Matthiola sinuata</i>	.	+	.	+	.	.	.	.	+	.	.	.	.	.	.
<i>Cyperus capitatus</i>	.	+	.	.	.	.	.	.	.	+	.	.	.	.	.
Differentials of subassociation <i>crucianell-</i> <i>tosum maritimae</i>															
<i>Crucianella maritima</i>	.	.	1	.	1	2	+	+	+	.	+	1	.	+	.
<i>Artemisia crithmifolia</i>	.	.	1	+	+	.	.	1	.	.	.	1	2	2	+
<i>Helichrysum picardi</i>	.	.	.	+	.	.	.	.	+	+	+	.	1	.	.
<i>Armeria welwitschii</i> ssp. <i>welwitschii</i>	.	.	+	+	.	.	.	.	.	.	.	.	.	.	+
<i>Iberis procumbens</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Companions															
<i>Carpobrotus edulis</i>	.	.	+	.	.	1	.	.	1	1	1	.	.	.	1
<i>Elymus farctus</i> ssp. <i>boreali-atlanticus</i>	.	1	.	.	.	.	.	+	+	+	.	+	.	.	.
<i>Seseli tortuosum</i>	+	.	.	.	.	.	+	+	+	.	.	.	.	.	.
<i>Malcolmia littorea</i>	+	.	.	.	.	.	.	.	.	.	.	.	+	.	+
<i>Hydrocotyle bonariensis</i>	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.
<i>Verbascum litigiosum</i>	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.
<i>Silene littorea</i>	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.
<i>Sedum sediforme</i>	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.
<i>Silene nicaeensis</i>	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Reichardia gaditana</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Crithmum maritimum</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.

Places: 1, 12 S. Martinho do Porto; 2, 4 Murtinheira; 3 S. Pedro de Muel; 5 Quiaios; 6, 13 Peniche; 7 Costa de Lavos; 8 Palheiros da Tocha; 9 Palheiro; 10 Palheiros de Mira; 11 Leirosa; 14 Areia Branca; 15 Praia de Consolação.

TABLE III
Loto cretici-Ammophiletum australis

	1	2	3	4	5	6	7	8	9
Number of releve	4	6	5	4	3	4	4	10	10
Minimum surface (m2)	8	7	12	15	9	12	12	13	11
Characteristics									
<i>Ammophila arenaria</i> ssp. <i>australis</i>	3	3	4	4	4	3	3	4	4
<i>Lotus creticus</i>	1	1	2	1	+	2	1	+	1
<i>Eryngium maritimum</i>	+	+	+	+	1	1	.	+	1
<i>Otanthus maritimus</i>	1	+	.	.	2	+	+	2	+
<i>Medicago marina</i>	.	.	+	+	.	1	+	.	.
<i>Pancreatium maritimum</i>	.	.	.	1	.	+	+	1	.
<i>Euphorbia portlandica</i>	.	.	+	+	.	+	.	.	+
<i>Polygonum maritimum</i>	1	+	.	.	.	.	.	.	+
<i>Calystegia soldanella</i>	+	.	.	+	+	.	.	.	+
<i>Euphorbia paralias</i>	+	+	.	.	.	.	+	.	+
Differentials of subassociation <i>armerietosum welwitschii</i>									
<i>Armeria welwitschii</i> ssp. <i>welwitschii</i>	.	.	1	+	1	+	+	+	1
<i>Artemisia crithmifolia</i>	.	.	1	2	1	+	+	.	.
<i>Helichrysum picardi</i>	.	.	1	1	+	+	+	+	.
<i>Ononis natrix</i> ssp. <i>ramosissima</i>	.	.	1	.	.	+	+	+	+
<i>Crucianella maritima</i>	.	.	.	+	.	.	+	.	+
<i>Malcolmia littorea</i>	.	.	.	.	.	.	.	+	.
Companions									
<i>Carpobrotus edulis</i>	.	1	.	1	.	1	1	1	.
<i>Elymus farctus</i> ssp. <i>boreali-atlanticus</i>	+	.	+	.	1	.	.	+	.
<i>Verbascum litigiosum</i>	.	.	+	+	.	.	.	+	.
<i>Iberis procumbens</i>	.	.	+	+	.	.	.	.	.
<i>Lobularia maritima</i>	.	.	+	.	.	.	.	+	.
<i>Silene littorea</i>	.	.	.	+	.	.	.	.	.

Places: 1, 9 Guincho; 2, 5 Praia da Areia Branca; 3, 4 Praia Azul (Foz do Sizandro); 6 S. Julião; 7 Praia de St.^a Rita; 8 Entre Oitavos e o Cabo Raso

TABLE IV
Armerio welwitschii-Crucianellietum maritimae

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Number of releve	20	40	20	20	40	60	50	60	40	80	40	40	80	80	60	80	80	60	40	40	80	40
Minimum surface (m2)	12	14	15	14	15	17	18	14	15	25	16	16	18	25	21	19	26	19	12	17	23	18
Number of species																						
Characteristics																						
<i>Crucianella maritima</i>	2	2	1	1	3	1	2	2	2	2	1	3	3	2	1	2	3	2	1	3	2	2
<i>Helichrysum picardi</i>	.	+	1	3	2	2	2	2	2	3	+	2	3	2	1	1	+	3	3	2	2	1
<i>Armeria welwitschii</i> ssp. <i>welwitschii</i>	2	1	2	3	2	3	2	1	2	1	2	1	2	2	+	1	1	1	.	.	.	.
<i>Pancreatium maritimum</i>	.	.	.	.	1	1	1	+	+	1	1	1	1	1	1	+	+	+	1	+	1	1
<i>Artemisia crithmifolia</i>	+	.	.	.	.	.	1	4	2	2	3	+	2	1	2	3	3	1	2	1	2	3
<i>Sedum sedifforme</i>	.	.	+	.	+	1	+	1	1	1	+	2	1	+	1	2	+	2	+	.	1	.
<i>Ononis natrix</i> ssp. <i>ramosissima</i>	.	3	2	1	3	2	2	.	2	2	1	+	2	2	2	.	.	.	1	.	+	.
<i>Malcolmia littorea</i>	.	.	+	.	+	+	.	.	1	+	3	+	1	2	2	.	.	.	1	+	1	+
<i>Aetheorhiza bulbosa</i>	+	1	1	+	.	.	.	+	.	+	+	.	+	+	.	+	1	+	.	+	.	.
<i>Euphorbia portlandica</i>	.	+	1	.	1	.	+	.	+	+	2	.	+	+	+	.	+	+	.	+	+	.
<i>Lotus creticus</i>	2	2	2	1	1	2	2	1	1	2	+	+	.	.	.	.	.	.	.	.	.	+
<i>Corynephorus canescens</i> var. <i>maritimus</i>	.	.	.	2	.	1	.	.	.	.	.	.	.	+	1	+	+	1	1	+	+	+
<i>Scrophularia frutescens</i>	.	+	.	.	+	.	.	.	1	+	.	.	+	1	1	1	2	.	.	1	2	1
<i>Iberis procumbens</i>	.	.	+	.	.	.	.	2	1	+	.	.	.	1	1	.	+	.	.	+	1	+
<i>Cyperus capitatus</i>	.	.	.	.	.	.	.	.	.	.	2	+	+	+	+	1	+	1	.	.	+	+
<i>Linaria caesia</i> ssp. <i>decumbens</i>	.	.	.	.	.	.	+	.	.	.	.	.	+	2	2	+	+	+	1	+	+	+
<i>Seseli tortuosum</i>	.	.	.	.	.	.	.	.	1	.	2	1	1	.	+	+	+	1	+	+	.	.
<i>Medicago marina</i>	.	.	.	.	.	.	.	.	.	+	.	+	.	+	.	1	+	1	.	.	+	+
<i>Anagallis monelli</i> var. <i>microphylla</i>	.	.	.	.	.	+	.	.	.	+	.	.	.	.	+	.	+	1	.	.	+	+
<i>Silene nicaeensis</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	+	.	1	+	+	.	.	.	.
<i>Carex arenaria</i>	.	.	.	2	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Matthiola sinuata</i>	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	1	.	.	.	+	.
<i>Herniaria maritima</i>	.	+	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
<i>Herniaria ciliolata</i> ssp. <i>robusta</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	.
<i>Leontodon arenarius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Characteristics of Ammophilion																						
<i>Ammophila arenaria</i> ssp. <i>australis</i>	.	.	+	1	1	.	1	+	1	.	+	1	.	1	1	1	.	.	.	1	+	1
<i>Calystegia soldanella</i>	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	1	.	1	+
<i>Otanthus maritimus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	.
<i>Eryngium maritimum</i>	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	+
Companions																						
<i>Carpobrotus edulis</i>	2	2	1	2	1	1	1	2	2	+	1	1	1	2	2	2	1	+	.	.	2	1
<i>Verbascum litigiosum</i>	.	.	.	.	+	+	.	1	.	+	.	1	.	+	.	+	+	+	.	+	+	+
<i>Vulpia alopecurus</i>	+	+	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	.	.	1	1	2
<i>Calendula suffruticosa</i> ssp. <i>algarbiensis</i>	+	+	+	+	+	+	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
<i>Senecio gallicus</i>	+	.	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	+
<i>Silene littorea</i>	.	.	.	.	.	.	+	+	.	+	.	.	.	.	+	+	.	.	.	.	.	.
<i>Dactylis marina</i>	+	+	.	+	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lobularia maritima</i>	.	+	+	.	1	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Reichardia gaditana</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	+	.	.	+	.	.
<i>Anchusa calcarea</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	+
<i>Pimpinella villosa</i>	.	.	.	+	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	+
<i>Corema album</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	+	.	.	.	.
<i>Medicago littoralis</i>	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Crithmum maritimum</i>	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Euphorbia terracina</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.

Places: 1 Cambelas; 2 S. Julião; 3 S. Lourenço; 4 Santa Cruz; 5 St.ª Rita; 6 Cabo Raso; 7 Guincho; 8 Praia Azul; 9, 11 Praia da Consolação; 10 Areia Branca; 12 Ferrel; 13 Peniche, 14 S. Pedro de Muel; 15 Pedrogão; 16 Quaios; 17, 18 Murtinheira; 19 S. Martinho do Porto; 20 Costa de Lavos; 21 Leirosa; 22 Gala.

TABLE V
Scrophulario-Vulpietum alopecuroris

Number of releve	1	2	3	4	5	6	7	8
Minimum surface (m2)	60	60	50	60	40	50	60	8 0
Number of species	21	24	17	21	21	22	18	1 8
Characteristics								
<i>Crucianella maritima</i>	2	3	3	1	2	2	2	3
<i>Helichrysum picardi</i>	3	1	2	3	3	2	1	3
<i>Sedum sediforme</i>	+	+	1	1	+	+	1	1
<i>Artemisia crithmifolia</i>	2	1	2	2	.	2	3	1
<i>Seseli tortuosum</i>	.	+	1	1	1	+	1	+
<i>Medicago marina</i>	+	1	+	.	1	2	2	+
<i>Pancreatium maritimum</i>	.	1	.	1	1	+	+	1
<i>Leontodon arenarius</i>	+	+	.	1	.	+	1	+
<i>Corynephorus canescens</i> var. <i>maritimus</i>	.	+	1	1	.	1	.	1
<i>Aetheorhiza bulbosa</i>	1	+	1	+	2	.	.	.
<i>Euphorbia portlandica</i>	+	1	+	1	1	.	.	.
<i>Cyperus capitatus</i>	.	.	.	1	1	1	+	+
<i>Linaria caesia</i> ssp. <i>decumbens</i>	1	.	.	+	.	.	1	1
<i>Carex arenaria</i>	1	.	.	.	+	+	.	+
<i>Reichardia gaditana</i>	.	.	.	.	+	+	+	+
<i>Malcolmia littorea</i>	1	+	.	.	.	1	.	.
<i>Anagallis monelli</i> var. <i>microphylla</i>	+	.	.	.	.	.	1	1
<i>Herniaria ciliolata</i> ssp. <i>robusta</i>	.	.	.	1	.	.	+	1
<i>Scrophularia frutescens</i>	1	.	.	1	.	.	.	.
<i>Silene nicaeensis</i>	.	.	.	.	.	.	+	+
<i>Matthiola sinuata</i>	.	1	.	.	.	.	.	.
Characteristics of <i>Ammophilon</i>								
<i>Ammophila arenaria</i> ssp. <i>australis</i>	+	1	1	1	1	1	1	.
<i>Calystegia soldanella</i>	1	1	+	+	.	+	+	.
<i>Eryngium maritimum</i>	+	+	.	.	.	+	+	.
<i>Otanthus maritimus</i>	.	+	.	.	.	+	.	.
<i>Elymus farctus</i> ssp. <i>boreali-atlanticus</i>	+	.	.	.	.	.	.	.
<i>Polygonum maritimum</i>	.	.	.	.	+	.	.	.
Companions								
<i>Carpobrotus edulis</i>	2	1	1	1	2	1	+	1
<i>Vulpia alopecurus</i>	1	2	1	1	+	2	.	+
<i>Hydrocotyle bonariensis</i>	1	1	1	.	2	+	.	.
<i>Corema album</i>	.	1	.	1	1	+	.	.
<i>Verbascum litigiosum</i>	.	.	1	+	1	.	.	.
<i>Plantago coronopus</i>	+	.	+	+	.	.	.	.
<i>Arctotheca calendula</i>	.	+	.	.	1	.	.	.
<i>Bromus diandrus</i>	.	+	.	.	+	.	.	.
<i>Paronychia argentea</i>	.	.	.	.	+	.	.	.

Places: 1 Poço da Cruz; 2 Palheiros de Mira; 3 Palheiros da Tocha; 4 Sandoa; 5 Palheiros de Mira; 6 Posto da Guarda Fiscal do Palheiro; 7, 8 Vagueira.

TABLE VI
Violo henriquesii-Silenetum littoreae

	1	2	3	4	5	6	7	8	9	10	11
Number of releve	4	1	2	1	2	6	4	2	2	4	1
Minimum surface (m2)	11	6	10	9	14	15	10	10	10	15	4
Characteristics											
<i>Silene littorea</i>	3	2	3	1	3	3	2	3	3	2	2
<i>Polycarpon alsinifolium</i>	.	2	2	2	1	+	1	3	2	3	2
<i>Erodium aethiopicum</i> ssp. <i>pilosum</i>	2	.	1	1	2	2	+	1	1	2	.
<i>Medicago littoralis</i>	.	1	+	+	2	+	2	2	1	.	.
<i>Leontodon longirostris</i>	1	+	+	+	1	3	+	+	.	1	.
<i>Rumex bucephalophorus</i> ssp. <i>gallicus</i>	.	.	+	3	+	+	1	.	.	1	.
<i>Cutandia maritima</i>	.	.	1	3	2	+	.	.	+	.	.
<i>Pseudorhiza minuscula</i>	2	.	.	.	.	+	+	1	.	2	.
<i>Tuberaria guttata</i>	+	.	.	.	.	.	.	.	.	1	+
<i>Polycarpon diphyllosum</i>	2	.	.	.	+	.	.	.	.	.	.
<i>Malcolmia ramosissima</i>	.	.	.	.	+	.	.	.	1	.	.
<i>Coronilla repanda</i>	.	.	.	.	.	+	.	.	.	1	.
<i>Trifolium campestre</i>	+	.	.	.	.	.	.	.	.	1	.
<i>Ornithopus pinnatus</i>	.	.	.	.	.	.	.	.	.	+	.
Companions											
<i>Senecio gallicus</i>	1	1	+	2	1	1	2	2	1	1	+
<i>Centranthus calcitrapae</i>	+	.	.	+	1	1	1	1	.	.	.
<i>Reichardia gaditana</i>	.	.	.	.	+	.	+	+	.	.	.
<i>Plantago coronopus</i>	+	.	.	.	.	+	.	.	.	1	.
<i>Vulpia alopecurus</i>	.	+	.	.	.	.	.	.	+	+	.
<i>Anagallis arvensis</i>	.	.	+	.	.	+	.	+	.	.	.
<i>Paronychia argentea</i>	+	.	.	.	.	.	.	.	+	.	.
<i>Iberis procumbens</i> (plant.)	.	.	+	.	.	+	.	.	.	.	.
<i>Anagallis monelli</i> var. <i>microphylla</i>	.	.	.	.	+	+	.	.	.	.	.
<i>Hedypnois cretica</i>	.	.	.	.	+	.	.	.	.	.	.
<i>Lolium multiflorum</i>	.	.	.	.	.	.	.	.	.	+	.
<i>Bromus rigidus</i>	.	.	.	.	.	.	.	.	.	+	.

Places: 1 Palheiros da Tocha; 2 Palheiros de Mira; 3 Praia Azul; 4 Areia Branca; 5, 9 Murtinheira; 6 St.^a Cruz; 7 Praia da Consolação; 8 Palheiro; 10 Poço da Cruz; 11 Sandoa.

TABLE VII
Osyrio quadripartitae-Juniperetum turbinatae

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Aspect	NW	SW	W	NW	E	NW	W	W	S	S	W	N	W	NW	W	SW
Minimum surface (1=10m2)	3	6	3	10	5	4	4	5	4	10	6	4	5	4	6	20
Number of species	13	18	16	13	17	21	14	24	18	20	15	22	12	14	8	12
Characteristics																
<i>Juniperus turbinata</i>	4	3	4	4	5	4	4	4	4	4	3	4	4	3	5	5
<i>Rubia peregrina</i> var. <i>longifolia</i>	.	.	.	2	1	1	1	1	+	+	+	1	1	2	+	2
<i>Asparagus aphyllus</i>	.	+	+	+	+	1	+	+	+	+	+	+	+	.	.	.
<i>Daphne gnidium</i>	.	.	+	1	+	1	1	1	+	+	2	.	.	2	.	.
<i>Pistacia lentiscus</i>	.	.	.	.	.	.	.	1	2	1	3	+	+	1	.	+
<i>Phillyrea angustifolia</i>	.	.	2	.	.	.	.	1	2	1	2	2	.	1	.	.
<i>Smilax aspera</i> var. <i>nigra</i>	.	.	.	.	2	2	1	+	1	.	.	+	.	2	.	.
<i>Antirrhinum majus</i> ssp. <i>cirrhigerum</i>	+	1	.	.	.	.	.	.	+	+	.	+	+	.	+	.
<i>Corema album</i>	1	1	.	.	1	.	.	.	.	.	.	.	2	.	.	.
<i>Rhamnus alaternus</i>	+	.	.	.	2	.	2	.	1	.	.	.	.	.	.	+
<i>Olea europaea</i> var. <i>sylvestris</i>	.	.	.	.	.	+	.	1	.	.	.	.	.	.	.	.
<i>Arisarum vulgare</i> var. <i>clusii</i>	.	.	.	.	.	+	.	+	.	+	.	.	.	.	.	.
<i>Lonicera implexa</i>	.	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.
<i>Scilla monophylla</i>	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Bupleurum rigidum</i> ssp. <i>paniculatum</i>	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
<i>Myrtus communis</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Osyris alba</i>	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
<i>Quercus coccifera</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Companions																
<i>Armeria welwitschii</i> ssp. <i>welwitschii</i>	+	+	+	+	+	+	+	+	1	+	+	+	+	.	+	+
<i>Cistus salvifolius</i>	1	+	1	.	1	1	+	1	.	+	1	1	.	.	.	.
<i>Carpobrotus edulis</i>	1	1	1	.	+	+	1	+	1	1	1	.	.	.	1	.
<i>Ononis natrix</i> ssp. <i>ramosissima</i>	+	+	.	+	+	.	1	.	+	+	+	+	.	+	.	.
<i>Crucianella maritima</i>	+	+	+	.	.	.	.	+	+	+	.	.	+	+	.	+
<i>Helichrysum picardi</i>	+	+	.	.	+	+	1	.	+	.	.	.	+	.	1	+
<i>Euphorbia portlandica</i>	.	+	+	.	.	+	.	.	+	+	+	.	.	+	.	.
<i>Halimium calycinum</i>	1	1	.	.	2	.	.	.	.	+	.	.	.	.	.	.
<i>Lotus creticus</i>	.	.	.	+	.	.	+	+	+	+	.	.	.	+	.	+
<i>Calluna vulgaris</i>	.	.	1	.	.	.	.	+	.	.	+	1	+	.	.	.
<i>Dactylis marina</i>	.	.	2	.	+	.	+	.	+	+	.	.	.	+	.	.
<i>Ulex jussiae</i> ssp. <i>congestus</i>	.	.	2	.	2	.	1	.	.	1	1	1	.	.	.	.
<i>Calendula suffruticosa</i> ssp. <i>algarbiensis</i>	.	.	1	.	.	.	+	+	+	.	.	.	.	+	.	.
<i>Artemisia crithmifolia</i>	+	+	.	.	.	.	.	.	+	.	.	.	+	.	.	+
<i>Urginea maritima</i>	.	.	+	.	.	.	.	+	.	.	.	+	.	.	.	.
<i>Malcolmia littorea</i>	.	+	.	.	+	.	.	.	+	.	.	.	+	.	.	.
<i>Seseli tortuosum</i>	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	+
<i>Lonicera periclymenum</i> ssp. <i>hispanica</i>	.	.	.	.	.	1	.	+	.	.	.	+	.	.	.	.
<i>Aetheorhiza bulbosa</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+	+
<i>Scrophularia frutescens</i>	.	+	.	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Daucus halophilus</i>	.	.	.	.	.	.	+	.	+	.	.	.	.	+	.	.
<i>Lobularia maritima</i>	.	.	.	.	.	.	.	+	.	+	.	+	.	.	.	.
<i>Ammophila australis</i>	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Lithodora lusitanica</i>	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.
<i>Geranium purpureum</i>	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.
<i>Brachypodium phoenicoides</i>	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.
<i>Pimpinella villosa</i>	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Sedum sediforme</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	+
<i>Cistus crispus</i>	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.

More: releve 4: +*Oxalis pes-caprae*; releve 5: +*Iberis procumbens*; releve 8: +*Thapsia villosa*; releve 11: 1*Erica scoparia*, +*Hedera helix* ssp. *canariensis*; releve 15: +*Urtica urens*.
 Places: 1 Praia do Norte Nazaré; 2 S. Pedro de Muel; 3, 9 S. Lourenço; 4 Areia Branca; 5, 15 Praia da Consolação; 6, 7 Magoito; 8, 11 S. Julião; 10 Cabo Raso; 12 Praia da Adraga; 13 Casal do Seixo; 14 Foz do Sisandro; 16 Praia Azul.

TABLE VIII
Rubio longifoliae-Coremetum albi

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13
Minimum surface (m2)	20	40	40	50	50	60	80	40	10	30	20	10	20
Number of species	12	12	16	12	13	14	16	10	10	16	15	7	10
Characteristics													
<i>Corema album</i>	4	4	4	4	3	3	4	3	4	4	5	5	3
<i>Rubia peregrina</i> ssp. <i>longifolia</i>	.	+	1	1	1	+	1	+	2	2	+	2	1
<i>Antirrhinum cirrhigerum</i>	2	1	2	1	+	1	1	1	1	+	+	.	.
<i>Daphne gnidium</i>	.	.	.	.	.	.	.	.	1	+	+	1	1
<i>Asparagus aphyllus</i>	.	.	+	1	+	.	.	.	.	.	.	.	+
<i>Scilla monophyllos</i>	.	.	.	.	.	+	+	.	.	.	.	.	.
<i>Juniperus turbinata</i>	.	.	.	.	.	.	.	.	.	1	+	.	.
<i>Pistacia lentiscus</i>	.	.	.	.	.	.	.	.	.	2	.	.	.
<i>Euphorbia characias</i>	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Quercus coccifera</i>	.	.	.	.	.	+	.	.	.	.	.	.	.
<i>Smilax mauritanica</i>	.	.	.	.	.	.	.	.	.	+	.	.	.
Companions													
<i>Helichrysum picardi</i>	1	+	+	+	1	+	1	+	+	1	+	.	+
<i>Cistus salviifolius</i>	1	+	+	1	2	1	2	.	1	1	.	.	1
<i>Armeria welwitschii</i> ssp. <i>welwitschii</i>	.	.	1	+	1	.	+	+	.	+	+	+	+
<i>Artemisia crithmifolia</i>	+	.	+	.	+	+	1	+	.	+	1	+	.
<i>Carpobrotus edulis</i>	1	+	+	.	2	1	2	.	.	+	.	1	.
<i>Crucianella maritima</i>	+	.	+	.	+	+	1	+	.	.	+	.	.
<i>Sedum sediforme</i>	+	.	.	.	.	+	+	.	+	+	+	.	+
<i>Seseli tortuosum</i>	+	+	.	.	.	.	+	.	+	+	.	+	+
<i>Ammophila australis</i>	.	+	.	+	.	.	.	.	1	+	1	.	.
<i>Corynephorus canescens</i> var. <i>maritimus</i>	.	.	1	.	+	+	+	.	.	.	+	.	.
<i>Scrophularia frutescens</i>	+	+	.	.	.	.	+	+	.	.	+	.	.
<i>Aetheorhiza bulbosa</i>	+	.	.	+	.	+	.	.	.	.	.	.	.
<i>Iberis procumbens</i>	.	.	+	+	.	+	.	.	.	.	.	.	+
<i>Ononis natrix</i> ssp. <i>ramosissima</i>	.	.	.	.	.	.	.	.	+	1	+	.	.
<i>Euphorbia portlandica</i>	.	+	+	.	.	.	.	+	.	.	.	.	.
<i>Vulpia alopecurus</i>	.	+	.	+	.	.	.	.	.	.	.	.	.
<i>Linaria caesia</i> ssp. <i>decumbens</i>	.	.	+	+	.	.	.	.	.	.	.	.	.
<i>Carex arenaria</i>	+	.	.	.	.	.	+	.	.	.	.	.	.
<i>Lotus creticus</i>	.	.	.	.	+	.	.	+	.	.	.	.	.
<i>Carlina corymbosa</i>	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Anagallis monelli</i> var. <i>microphylla</i>	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Malcolmia littorea</i>	.	.	.	.	.	.	.	.	.	.	+	.	.

Places: 1 Palheiro; 2 Sandoa; 3 S. Pedro Muel; 4 Pedrogão; 5 Vale Janelas; 6 Palheiros da Tocha; 7 Quiaios; 8 Peniche; 9 Bom Sucesso (Óbidos); 10 Lagoa de Óbidos; 11 Praia do Norte da Nazaré; 12 Murtinheira; 13 Praia da Consolação.

TABLE IX
Stauracantho genistoidis-Coremetum albi

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number of releve	4	10	3	2	4	8	10	5	8	8	6	6	10	3	6	4
Minimum surface (1=10m ²)	13	19	16	13	14	19	18	19	18	17	22	19	13	16	20	17
Number of species	13	19	16	13	14	19	18	19	18	17	22	19	13	16	20	17
Characteristics of association, alliance and order																
<i>Stauracanthus genistoides</i>	2	2	4	2	2	1	1	2	2	2	3	2	3	2	2	4
<i>Corema album</i>	4	3	1	2	2	3	4	3	3	3	+	+	1	2	3	.
<i>Helichrysum picardi</i> var. <i>virescens</i>	+	1	2	+	2	1	1	1	+	1	1	+	2	.	.	1
<i>Halimium calycinum</i>	2	.	2	4	.	.	.	1	1	2	1	3	2	3	3	2
<i>Halimium halimifolium</i>	.	.	.	.	3	2	3	3	2	3	2	2	3	3	2	.
<i>Lavandula pedunculata</i> ssp. <i>lusitanica</i>	.	.	.	.	.	2	.	.	1	+	1	+	.	2	2	.
<i>Iberis welwitschii</i>	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Characteristics of Cisto-Lavanduletea																
<i>Cistus salvifolius</i>	2	.	1	+	.	2	1	2	1	+	1	1	1	+	2	2
<i>Cistus crispus</i>	.	.	.	+	+	1	.	.	.	.	.	+	.	.	1	.
<i>Lavandula luisieri</i>	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.	2
<i>Cytinus hypocistis</i>	.	.	.	.	.	.	1	1	+	.	.	.	.	.	.	.
Differentials of Ericion umbellatae																
<i>Ulex europaeus</i> ssp. <i>latebracteatus</i>	.	3	2	2	2	3	2	3	2	2	3	3	2	3	+	1
<i>Calluna vulgaris</i>	2	3	.	.	.	2	+	1	+	1	1	2	.	+	1	2
<i>Genista triacanthos</i>	2	.	.	.	.	1	1	1	1	+	.	.	.	.	.	.
<i>Erica umbellata</i>	.	.	.	.	1	.	1	.	.	.	+	1	.	.	.	.
<i>Chamaespartium tridentatum</i>	.	.	.	.	.	1	.	.	.	.	1	1	.	.	.	.
<i>Tuberaria lignosa</i>	.	.	.	.	.	+	.	.	.	.	.	+	.	.	1	.
<i>Erica scoparia</i>	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
<i>Agrostis curtisii</i>	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Erica australis</i>	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Companions																
<i>Corynephorus canescens</i> var. <i>maritimus</i>	+	+	1	+	.	.	+	1	+	+	+	.	+	.	.	+
<i>Pinus pinaster</i>	.	.	+	.	.	1	+	1	1	1	1	.	+	.	1	+
<i>Carpobrotus edulis</i>	.	+	1	1	1	.	+	.	.	1	.	+	1	.	1	1
<i>Pteridium aquilinum</i>	.	.	.	.	+	.	+	+	.	1	.	1	.	.	1	1
<i>Carex arenaria</i>	.	.	2	.	.	.	.	1	+	.	+	.	.	1	.	.
<i>Carlina corymbosa</i>	.	+	.	.	+	.	1	.	.	+	+	.	.	.	.	.
<i>Thapsia villosa</i>	.	+	.	.	.	+	+	.	.	+	.	.	.	.	.	.
<i>Dactylis marina</i>	.	+	+	+	.	.	.	.	.	.	+	.	.	.	.	+
<i>Linaria caesia</i> ssp. <i>decumbens</i>	.	.	.	.	+	.	+	+	+	.	.	.	.	+	.	.
<i>Armeria welwitschii</i>	.	+	2	.	1	.	.	.	+	.	.	.	.	.	.	+
<i>Ammophila arundinacea</i>	.	+	+	.	.	.	1	.	.	.	.	.	.	.	.	1
<i>Daphne gnidium</i>	.	1	.	.	.	.	.	.	.	+	.	+	.	.	.	1
<i>Scrophularia frutescens</i>	.	.	.	+	.	+	.	.	.	.	+	.	.	+	.	.
<i>Sedum sediforme</i>	.	.	.	.	.	+	.	.	.	+	.	.	+	.	+	.
<i>Seseli tortuosum</i>	.	.	.	.	.	.	.	+	.	.	+	.	.	+	+	.
<i>Briza maxima</i>	.	.	.	.	.	.	.	+	+	.	+	.	.	+	.	.
<i>Cytisus grandiflorus</i>	.	.	.	.	.	2	.	.	.	.	.	.	.	.	1	+
<i>Juniperus turbinata</i>	1	+	.	.	.	.	.	.	.	.	.	.	+	.	.	.
<i>Rubia peregrina</i>	+	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
<i>Aetheorhiza bulbosa</i>	.	.	+	.	.	.	.	+	+	.	.	.	.	.	.	.
<i>Artemisia crithmifolia</i>	.	+	.	.	2	.	.	.	.	.	.	.	.	.	.	.
<i>Asparagus aphyllus</i>	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Lotus creticus</i>	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Silene nicaeensis</i>	.	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Dittrichia viscosa</i>	.	+	.	.	.	.	.	.	.	.	.	+	.	.	.	.

More: releve 2: + *Centaurea sphaerocephala* ssp. *polyacantha*; releve 11: + *Anagallis monelli* var. *microphylla*; releve 14: + *Lupinus angustifolius*, + *Vulpia alopecurus*, + *Brassica barrelieri*; releve 15: + *Euphorbia characias*, + *Scilla monophyllos*, + *Euphorbia portlandica*, + *Umbilicus rupestris*; releve 16: + *Pistacia lentiscus*
 Places: 1 Bom Sucesso; 2 Cabo Carvoeiro; 3 St.^a Cruz; 4 Lagoa de Óbidos; 5 Tocha; 6 Vale Janelas; 7 Casal Seixo; 8 Pinhal Leiria; 9 S. Pedro Muel; 10 Pataias; 11 Quiaios; 12 Famalicão (Nazaré); 13 Praia do Norte Nazaré; 14 Quiaios; 15 Sandoa; 16 Foz do Arelho.

TABLE X
Chamaemelo mixti-Vulpietum alopecuroris

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Minimum surface (m2)	6	6	8	4	8	6	8	10	10	10	6	8	4	6
Number of species	19	15	23	19	20	22	21	32	25	21	16	19	14	13
Characteristics														
<i>Vulpia alopecurus</i>	3	2	3	2	3	2	1	4	3	3	3	2	3	3
<i>Chamaemelum mixtum</i>	1	2	2	1	1	2	2	2	1	2	+	1	.	.
<i>Centranthus calcitrapae</i>	.	.	+	1	+	+	1	+	+	1	+	+	+	1
<i>Senecio gallicus</i>	+	+	+	1	+	+	.	+	+	+	+	2	1	1
<i>Silene colorata</i>	.	2	+	+	.	+	.	1	+	+	2	1	1	3
<i>Reichardia gaditana</i>	+	1	.	1	.	+	.	1	.	1	2	2	1	1
<i>Bromus diandrus</i>	3	1	.	3	2	2	3	2	.	1	.	1	1	.
<i>Arctotheca calendula</i>	+	2	.	2	1	1	2	2	1	+	.	.	1	1
<i>Lagurus ovatus</i>	1	1	.	1	1	2	2	+	.	1	.	.	1	.
<i>Brassica barrelieri</i> ssp. <i>oxyrrhina</i>	+	1	2	+	2	+	2	1	1	.	.	.	.	.
<i>Paronychia argentea</i>	+	.	.	1	1	1	+	1	.	1	2	.	.	2
<i>Sonchus tenerimus</i>	.	.	+	+	+	.	+	+	+	+	+	.	.	+
<i>Lolium rigidum</i>	.	.	1	+	+	+	1	.	1	+	.	.	.	2
<i>Bromus rigidus</i>	1	.	.	+	+	.	.	2	1	1	+	1	.	.
<i>Senecio vulgaris</i>	+	.	+	.	+	+	+	+	+	.	.	.	.	.
<i>Anagallis arvensis</i>	.	.	.	.	.	+	+	.	.	.	+	+	.	+
<i>Hordeum leporinum</i>	.	.	.	.	1	.	+	1	+	.	+	.	.	.
<i>Urospermum picroides</i>	.	.	.	.	.	+	.	.	+	+	+	+	.	.
<i>Echium gaditanum</i>	.	1	.	.	.	.	.	+	+	.	.	1	.	.
<i>Cerastium glomeratum</i>	.	.	+	.	.	+	1	+	.	.	.	.	.	.
<i>Emex spinosa</i>	.	.	.	.	.	1	+	.	.	.	+	+	.	.
<i>Hypochoeris glabra</i>	.	.	+	.	.	+	+	.	.	.	.	.	+	.
<i>Erodium moschatum</i>	.	.	.	.	.	+	.	+	+	.	.	+	.	.
<i>Carduus meoanthus</i>	.	.	.	.	.	.	.	.	1	1	.	+	.	.
<i>Spergularia purpurea</i>	.	.	1	+	.	.	+	.	.	.	.	.	.	.
<i>Anacyclus radiatus</i>	1	.	.	.	.	.	.	+	+	.	.	.	.	.
<i>Corrigiola littoralis</i>	.	.	.	.	.	.	1	+	+	.	.	.	.	.
<i>Trifolium glomeratum</i>	.	.	.	.	.	.	.	+	.	+	1	.	.	.
<i>Avena barbata</i>	.	.	.	.	.	.	.	1	+	.	.	+	.	.
<i>Bromus hordeaceus</i>	.	.	.	.	.	.	.	1	+	.	.	.	.	.
<i>Papaver dubium</i>	+	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Logfia minima</i>	.	.	+	.	.	.	.	.	.	.	.	.	+	.
<i>Geranium molle</i>	.	.	.	+	.	.	.	+	.	.	.	.	.	.
<i>Trifolium tomentosum</i>	.	.	.	.	.	.	.	+	.	.	.	+	.	.
<i>Oxalis pes-caprae</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	+
<i>Bromus madritensis</i>	.	.	2	.	.	.	.	.	.	.	.	.	.	.
<i>Avena longiglumis</i>	.	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Lophochloa cristata</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.
<i>Geranium rotundifolium</i>	.	.	.	.	+	.	.	.	.	.	.	.	.	.
<i>Raphanus raphanistrum</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Melilotus messanensis</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Trifolium nigrescens</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Plantago lagopus</i>	.	.	.	.	.	.	.	+	.	.	.	.	.	.
<i>Trifolium striatum</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Companions														
<i>Plantago coronopus</i>	1	1	+	.	1	1	1	+	1	1	.	1	1	1
<i>Briza maxima</i>	+	+	1	+	1	.	+	.	.	.	.	.	+	.
<i>Leontodon taraxacoides</i> ssp. <i>longirostris</i>	+	.	.	1	+	+	.	.	.	.	.	.	1	.
<i>Trifolium campestre</i>	+	+	.	1	+	.	+	.	.	.	.	.	.	.
<i>Silene scabriflora</i>	.	.	1	.	1	.	.	+	.	.	.	+	.	.
<i>Anagallis monelli</i> var. <i>microphylla</i>	+	+	.	.	.	.	.	.	.	.	.	.	2	.
<i>Medicago littoralis</i>	.	.	.	.	.	.	.	.	.	+	1	+	.	.
<i>Trifolium cherleri</i>	.	.	.	.	.	.	+	+	+	.	.	.	.	.
<i>Silene nicaensis</i>	.	.	.	.	.	.	.	.	.	+	.	+	.	+
<i>Trifolium angustifolium</i>	.	.	.	.	.	+	.	+	.	.	.	.	.	.
<i>Euphorbia terracina</i>	.	.	.	.	.	.	.	.	.	+	+	.	.	.
<i>Pseudorhiza pumila</i>	.	.	.	.	.	.	.	.	.	+	.	.	.	+

More: releve 1: + *Oenothera stricta*, releve 3: + *Lathyrus angulatus*, + *Ornithopus pinnatus*, + *Medicago tornata*, + *Teesdalia nudicaulis*; releve 9: + *Polycarpon tetraphyllum*
Places: 1 Poço da Cruz; 2 Sines; 3, 5 Quiaios; 4 Vieira de Leiria; 6 Quinta da Marinha; 7 Coia; 8 Quinta de Marim (Olhão); 9 Faro Airport; 10 Manta Rota; 11 Ancão (Quinta do Lago); 12 Tavira island; 13 Palheiros da Tocha; 14 Ratas island (Faro).

TABLE XI
Quercu cocciferae-Juniperetum turbinatae

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Aspect	NE	W	NW	SW	SW	SW	W	S	N	S	SW	W	SW	S	S	W	NW	W	W
Minimum surface (1=10 m ²)	10	5	10	7	8	5	4	5	6	6	5	10	4	10	5	4	4	10	3
High (1= 10 m)	1	4	1	4	3,5	3	5	3	4	3	3	7	3	4	17	10	2	1	3, 5
Number of species	28	28	36	27	29	27	29	33	32	16	28	16	26	35	23	24	17	22	1 4
Characteristics																			
<i>Juniperus turbinata</i>	3	3	2	2	4	4	4	4	5	4	4	4	2	1	3	4	4	4	3
<i>Rubia peregrina</i> var. <i>longifolia</i>	2	+	+	1	2	1	1	1	+	2	+	2	+	1	1	+	1	+	.
<i>Asparagus aphyllus</i>	+	1	+	+	+	1	1	+	+	1	+	1	1	.	+	+	+	1	+
<i>Daphne gnidium</i> var. <i>maritima</i>	2	+	+	+	1	+	1	+	+	1	1	1	1	+	2	+	1	1	2
<i>Smilax aspera</i> var. <i>nigra</i>	.	1	+	2	+	1	1	1	1	+	+	1	2	1	1	1	1	2	1
<i>Pistacia lentiscus</i>	1	3	.	4	+	+	.	2	1	2	2	.	2	3	1	+	.	1	3
<i>Quercus coccifera</i>	3	3	4	3	2	1	1	1	.	2	.	.	2	3	2	1	.	.	.
<i>Rhamnus alaternus</i>	3	2	1	.	1	2	.	+	1	1	2	.	.	+	1	1	.	2	1
<i>Phillyrea angustifolia</i>	.	2	+	4	2	.	1	2	+	1	2	.	2	+	2	.	2	.	1
<i>Olea europaea</i> var. <i>syvestris</i>	1	+	+	.	.	1	+	.	.	.	.	+	.	+	+	.	+	1	.
<i>Arisarum vulgare</i> var. <i>clusii</i>	.	.	1	.	1	1	+	+	+	.	.	.	.	1	+	+	+	.	.
<i>Lonicera implexa</i>	2	1	+	.	1	.	.	.	.	+	1	.	.	+	1	.	.	.	.
<i>Euphorbia characias</i>	.	.	.	.	.	+	1	1	1	.	.	.	+	+	.	.	.	.	.
<i>Osyris alba</i>	2	.	1	.	.	.	+	+	.	.	.	.	1	.	.	.	.	.	.
<i>Bupleurum rigidum</i> ssp. <i>paniculatum</i>	+	.	1	+	.	2	.	.	.	.	.	.	.	.	.	.	1	.	.
<i>Rhamnus oleoides</i>	.	.	+	.	.	.	+	1	+	.	.	.	.	.	.	+	.	.	.
<i>Myrtus communis</i>	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.	1	.
<i>Coronilla glauca</i>	.	.	2	.	.	.	.	.	.	.	.	1	.	2	.	.	.	.	.
<i>Phillyrea media</i>	.	1	.	.	.	.	1	2	.	.	.	.	.	.	.	.	.	.	.
<i>Ruscus aculeatus</i>	.	.	.	1	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.
<i>Rosa sempervirens</i>	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
<i>Genista tournefortii</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
<i>Melica arrecta</i>	.	.	.	+	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
<i>Hyacinthoides hispanica</i>	.	.	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.
<i>Carex distachya</i>	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Asparagus acutifolius</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Selaginella denticulata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Scilla monophyllus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
Companions																			
<i>Cistus salvifolius</i>	+	+	1	+	1	1	1	1	+	+	1	.	1	1	1	1	1	1	1
<i>Brachypodium phoenicoides</i>	2	+	1	1	2	1	1	.	1	1	2	.	+	1	+	.	+	.	.
<i>Dactylis marina</i>	+	+	+	+	.	.	+	+	1	+	+	+	+	+	+	+	.	.	+
<i>Calendula suffruticosa</i> ssp. <i>algarbiensis</i>	.	+	+	+	+	.	.	.	1	+	+	+	+	1	.	+	+	+	.
<i>Ulex densus</i>	1	2	2	2	2	1	2	2	+	1	.	.	.	.	.	.	.	.	.
<i>Pulicaria odora</i>	.	+	+	+	+	+	.	+	+	+	+	.	.	+	+	+	.	.	.
<i>Eryngium dilatatum</i>	+	+	+	+	+	+	1	.	+	.	.	.	.	+	.	.	.	.	.
<i>Urginea maritima</i>	.	+	+	+	+	+	1	+	+	.	.	.	.	+	+	.	.	+	.
<i>Cistus crispus</i>	.	+	+	.	.	+	.	.	.	+	.	.	.	+	1	+	+	.	.
<i>Sedum sediforme</i>	.	+	+	.	+	.	.	+	+	.	.	1	1	.	.	.	.	+	+
<i>Daucus halophilus</i>	+	+	.	.	.	.	.	.	.	+	+	+	+	+	+	+	.	.	.
<i>Lonicera periclymenum</i> ssp. <i>hispanica</i>	.	.	+	1	.	2	1	.	.	+	.	.	.	.	.	.	1	+	.
<i>Carlina corymbosa</i>	+	.	.	.	.	.	.	+	+	+	+	+	+	+	.	.	.	.	.
<i>Ulex jussiaei</i> ssp. <i>congestus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	1	1	1	2	1	1
<i>Helichrysum decumbens</i>	.	.	.	+	.	.	.	1	1	+	.	.	.	.	.	+	.	+	.
<i>Cistus monspeliensis</i>	+	.	1	.	2	.	+	.	.	1	.	.	.	.	.	.	.	.	.
<i>Carpobrotus edulis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	+	+	1
<i>Ditrichia viscosa</i>	+	+	.	.	.	.	.	.	.	.	.	+	+	1	.	.	.	.	.
<i>Antirrhinum majus</i> ssp. <i>linkianum</i>	.	.	1	.	.	.	1	+	+	.	.	.	.	.	.	.	.	.	.
<i>Cheiranthus sempervirens</i>	+	.	.	1	.	.	.	.	.	1	.	.	+	.	.	.	.	.	.
<i>Iberis microcarpa</i>	.	.	.	+	.	.	.	+	1	.	.	.	.	1	.	.	.	.	.
<i>Plantago serraria</i> var. <i>hispanica</i>	.	.	+	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.
<i>Convolvulus althaeoides</i>	+	+	.	.	+	.	.	.	.	.	.	.	.	+	.	.	.	.	.
<i>Anthyllus vulneraria</i> ssp. <i>maura</i>	.	.	.	.	+	+	.	.	.	+	+	.	.	.	.	.	.	.	.
<i>Lobularia maritima</i>	.	.	.	.	+	.	.	+	+	.	.	.	.	+	.	.	.	.	+
<i>Limonium virgatum</i>	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.	.	.	.	.
<i>Crithmum maritimum</i>	.	.	.	.	.	.	.	.	+	+	+	.	+	+	.	.	.	.	.
<i>Echium tuberculatum</i>	+	.	.	+	.	.	.	+	.	.	.	.	+	.	.	.	.	.	.
<i>Ionopsidium acaule</i>	.	.	.	.	.	+	.	+	+	.	.	.	.	.	.	+	.	.	.
<i>Thapsia villosa</i>	.	.	.	+	.	+	.	+	.	.	.	.	.	.	.	.	.	.	+
<i>Cynara humilis</i>	.	.	.	+	.	.	+	.	.	.	+	.	.	.	.	+	.	.	.
<i>Euphorbia portlandica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	+
<i>Narcissus bulbocodium</i> ssp. <i>obesus</i>	.	.	+	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
<i>Romulea bulbocodium</i>	.	.	.	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.
<i>Bellis sylvestris</i>	.	.	+	.	+	.	.	.	.	.	+	.	.	.	.	.	.	.	.
<i>Armeria pseudameria</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	.

More: releve 1: + *Ulex densus* x *congestus*, +*Rubus ulmifolius*, +*Scabiosa atropurpurea*; releve 2: 1 *Erica scoparia*; +*Schoenus nigricans*, +*Holcus lanatus*; releve 3: +*Phagnalon saxatile*, +*Calamintha baetica*, +*Ajuga reptans*, releve 4: *Erica scoparia*, +*Rubus ulmifolius*, +*Carex hallerana*, +*Rosmarinus officinalis*, +*Calamintha baetica*; releve 5: +*Plantago lanceolata*; releve 6: 1 *Ulex densus* x *congestus*, +*Phagnalon saxatile*; releve 7: 1 *Prunus insititoides*; releve 8: +*Carex hallerana*, +*Iris subbiflora*, +*Silene longicilia*; releve 9: +*Pimpinella villosa*, +*Iris subbiflora*, +*Silene longicilia*; releve 10: 1 *Pinus halepensis*; releve 11: 1 *Astragalus lusitanicus*; releve 12: 1 *Suaeda vera*, 1 *Atriplex halimus*; releve 13: 1 *Ulex europaeus* ssp. *latebracteatus*; 1 *Schoenus nigricans*, +*Herniaria ciliolata* ssp. *robusta*; releve 14: +*Reichardia picroides*, +*Anagallis monelli* var. *microphylla* +*Herniaria ciliolata* ssp. *robusta*; releve 15: +*Stipa gigantea*, +*Calluna vulgaris*; releve 16: 1 *Silene cintrana*; releve 17: 2 *Halimium calycinum*, +*Armeria welwitschii* ssp. *cinerea*, +*Calluna vulgaris*; releve 19: +*Halimium calycinum*, +*Armeria welwitschii* ssp. *cinerea*

Places: 1, 18 S. Julião; 2, 7 S. Lourenço; 3 Foz Lizandro; 4 Salir do Porto; 5 Ericeira; 6, 17 Magoito; 8 e 9 Praia Adraga; 10 S. Martinho do Porto; 11 Norte da Praia da Areia Branca; 12 Sítio da Nazaré; 13 Cabo Carvoeiro; 14 Cabo Mondego; 15 Cabo da Roca; 16 Urça; 19 Casais de S. Lourenço.

TABLE XII
Daphno maritimi-Ulicetum congesti

Number of releve	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Aspect	SW	S	NW	W	NW	NW	W	SW	SW	W	W	S	W	W	W	W
Minimum surface (m2)	80	50	40	50	20	30	40	60	40	40	50	50	30	50	50	60
High (1= 10m)	13	12	14	15	15	19	11	47	15	17	25	30	7	1	6	2
Characteristics																
<i>Ulex jussiaei</i> ssp. <i>congestus</i>	3	3	2	4	3	4	4	4	5	5	3	3	4	4	4	4
<i>Daphne gnidium</i> var. <i>maritima</i>	1	2	+	2	1	1	1	1	2	1	2	1	+	1	1	2
<i>Carlina corymbosa</i> var. <i>major</i>	+	+	.	.	+	+	+	.	+	+	+	.	.	+	+	+
<i>Armeria pseudarmeria</i>	1	+	3	3	1	2	+	1	.	.	.	.	.	.	.	.
<i>Calluna vulgaris</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ulex europaeus</i> ssp. <i>latebracteatus</i>	.	.	.	.	.	.	.	.	.	.	1	1	.	.	.	.
<i>Ulex minor</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
<i>Ulex congestus</i> x <i>latebracteatus</i>	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
<i>Simethis plantifolia</i>	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Companions																
<i>Cistus salviifolius</i>	2	2	2	1	2	2	1	2	1	1	1	2	1	1	2	2
<i>Daucus halophilus</i>	1	1	1	+	+	1	+	+	+	+	+	1	+	+	1	+
<i>Dactylis marina</i>	2	1	2	1	1	1	+	1	+	.	.	+	+	1	2	2
<i>Euphorbia portlandica</i>	+	+	+	.	+	+	+	+	+	+	+	+	+	+	1	1
<i>Calendula suffruticosa</i> ssp. <i>algarbiensis</i>	+	.	+	2	1	1	+	1	+	+	.	1	+	2	+	.
<i>Carpobrotus edulis</i>	3	2	3	1	1	1	+	+	+	+	+	1	+	2	2	+
<i>Brachypodium phoenicoides</i>	.	.	.	1	1	1	+	1	+	+	+	1	+	.	+	1
<i>Cistus crispus</i>	1	1	.	1	.	+	+	1	.	+	+	1	.	+	1	.
<i>Urginea maritima</i>	.	.	.	.	+	+	+	.	.	+	+	+	+	+	+	+
<i>Stipa gigantea</i>	1	+	.	.	1	1	.	2	1	1	1	.	.	.	.	.
<i>Thapsia villosa</i>	1	+	+	.	+	+	.	1	+	.	.	.	.	.	.	+
<i>Dianthus cintranus</i>	.	+	.	.	+	+	+	+	+	+	+	.	.	.	.	.
<i>Lobularia maritima</i>	.	.	1	+	.	.	+	+	+	+	+	+	+	+	+	+
<i>Juniperus turbinata</i>	+	.	.	.	.	.	1	.	.	.	.	.	1	2	+	1
<i>Lavandula luisieri</i>	.	.	.	.	+	+	+	.	.	1	.	.	1	.	.	1
<i>Asparagus aphyllus</i>	+	1	+	.	+	.	.	.	.	.	.	.	.	+	.	+
<i>Lithodora lusitanica</i>	.	.	.	.	.	.	.	+	+	+	+	.	+	1	.	.
<i>Pulicaria odora</i>	.	.	.	.	+	.	1	+	.	+	.	.	.	.	.	+
<i>Eryngium dilatatum</i>	.	.	.	.	+	.	.	.	.	.	.	+	+	+	1	+
<i>Briza maxima</i>	+	+	+	+	.	+	.	+	.	.	.	.	.	.	.	.
<i>Anagallis monelli</i> var. <i>microphylla</i>	.	+	+	.	+	.	+	.	.	.	.	+	+	.	.	.
<i>Holcus lanatus</i>	.	.	.	.	+	.	1	.	.	.	+	+	.	.	.	.
<i>Dittrichia viscosa</i>	+	+	.	1	.	+	.	.	.	.	.	+	.	.	.	.
<i>Agrostis castellana</i>	.	.	.	.	+	+	.	.	+	+	+	.	.	.	.	.
<i>Avena barbata</i>	+	+	+	.	.	.	.	+	+	+	+	.	.	.	.	.
<i>Asphodelus ramosus</i>	.	.	.	.	+	+	.	+	+	+	.	.	.	.	.	.
<i>Rubus ulmifolius</i>	.	.	.	1	.	+	.	1	.	.	1	.	.	.	.	.
<i>Armeria welwitschii</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	1	1	+
<i>Avenula sulcata</i>	.	.	.	.	.	.	.	+	1	+	+	.	.	.	.	.
<i>Centaureum grandiflorum</i>	.	.	.	.	+	.	1	.	.	.	.	.	+	.	.	+
<i>Galactites tomentosa</i>	+	.	+	+	.	.	.	+	.	.	.	.	.	.	.	.
<i>Andryala integrifolia</i>	.	.	+	.	+	.	+	.	.	.	+	.	.	.	.	.
<i>Crucianella maritima</i>	.	.	.	.	.	.	.	.	.	.	+	+	+	+	.	+
<i>Quercus pyrenaica</i>	.	.	.	.	1	.	.	+	.	.	1	.	.	.	.	.
<i>Helichrysum decumbens</i>	.	.	1	.	.	.	1	.	+	.	.	.	.	.	.	.
<i>Pimpinella villosa</i>	1	+	.	.	.	.	+	.	.	.	.	.	.	.	.	.
<i>Lathyrus clymenum</i>	+	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.
<i>Centaurea sphaerocephala</i>	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.
<i>Halimium calycinum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	2	1	.
<i>Helichrysum picardi</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
<i>Cistus ladaniifer</i>	.	.	.	.	.	.	.	.	2	3	.	.	.	.	.	.
<i>Quercus coccifera</i>	.	.	.	.	2	.	.	.	.	+	.	.	.	.	.	.
<i>Pteridium aquilinum</i>	.	.	.	.	.	.	.	1	.	.	+	.	.	.	.	.
<i>Schoenus nigricans</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	1
<i>Plantago lanceolata</i>	.	.	.	.	+	.	.	+	.	.	.	.	.	.	.	.
<i>Cuscuta kotschyi</i>	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
<i>Coincya cintrana</i>	.	.	.	.	.	.	.	+	.	.	+	.	.	.	.	.
<i>Anthyllis vulneraria</i> ssp. <i>maura</i>	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Bellis perennis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
<i>Ionopsidium acaule</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
<i>Rhamnus alaternus</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+
<i>Smilax aspera</i> var. <i>nigra</i>	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	+

More: releve 5: +*Anthyllis gerardi*, +*Centaurea pullata*; releve 7: 1 *Elaeoselinum gummiferum*, +*Jasione montana*, +*Spergularia australis*; releve 8: 1 *Arenaria montana*; releve 12: +*Critthmum maritimum*, +*Seseli tortuosum*, +*Beta vulgaris* ssp. *maritima*; releve 13: +*Ononis natrix* ssp. *ramosissima*, +*Lotus creticus*, +*Aetheorhiza bulbosa*, +*Limonium virgatum*; releve 16: 1 *Sedum sediforme*, 1 *Iberis welwitschii*, +*Silene littorea*, +*Scrophularia frutescens*, +*Carex hallerana*;
Places: 1, 2, 3, 4 Cabo da Roca; 5, 7 Ursa; 6 Azóia; 8 Peninha; 9, 10 Biscaia; 11 Entre Azóia e Biscaia; 12 Cabo Mondego; 13 Praia de S. Julião; 14 Casais de S. Lourenço; 15 Ribamar; 16 Magoito.

TABLE XIII
Salvio sclareoidis-Ulicetum densi

Number of releve	1	2	3	4	5	6	7	8
Aspect	W	S	NW	W	E	S	W	E
Minimum surface (m2)	30	30	20	30	40	10	20	6 0
High (m)	50	60	15	40	60	35	50	4 0
Number of species	18	27	23	17	18	15	18	2 4
Characteristics								
<i>Ulex densus</i>	4	3	3	3	3	4	3	4
<i>Eryngium dilatatum</i>	1	1	2	1	2	2	1	2
<i>Salvia sclareoides</i>	+	1	2	+	2	1	+	.
<i>Anthyllis vulneraria</i> ssp. <i>maura</i>	.	1	+	1	+	.	1	+
<i>Plantago serraria</i> var. <i>hispanica</i>	+	+	+	+	.	+	+	.
<i>Carex hallerana</i>	.	+	+	.	+	.	+	1
<i>Cistus monspeliensis</i>	+	2	.	.	1	.	.	.
<i>Ruta chalepensis</i>	.	1	.	+	.	1	.	.
<i>Rosmarinus officinalis</i>	.	.	.	.	.	+	.	2
<i>Bartsia aspera</i>	.	.	.	.	.	.	2	.
<i>Iberis microcarpa</i>	.	.	.	.	.	.	.	1
Differentials of the variant of <i>Daphne maritima</i>								
<i>Daphne gnidium</i> var. <i>maritima</i>	1	1	1	1	1	1	+	+
<i>Dactylis marina</i>	1	.	+	1	2	+	.	1
<i>Calendula suffruticosa</i> ssp. <i>algarbiensis</i>	+	+	+	+	.	+	.	+
<i>Daucus halophilus</i>	+	.	+	+	+	+	.	+
<i>Carlina corymbosa</i> var. <i>major</i>	.	.	+	+	+	+	+	1
<i>Ononis natrix</i> ssp. <i>ramosissima</i>	.	+	1	1	1	.	.	.
<i>Helichrysum decumbens</i>	.	+	1	+	.	.	.	.
Companions								
<i>Brachypodium phoenicoides</i>	2	2	2	1	2	1	1	2
<i>Cistus salvifolius</i>	2	1	1	2	1	2	1	2
<i>Asparagus aphyllus</i>	+	+	+	.	+	+	+	+
<i>Rubia peregrina</i>	.	1	+	.	+	+	.	+
<i>Pulicaria odora</i>	.	+	+	+	.	.	+	+
<i>Urginea maritima</i>	+	+	+	.	.	+	+	.
<i>Scabiosa atropurpurea</i>	.	.	+	+	+	.	+	+
<i>Echium tuberculatum</i>	+	.	.	.	+	.	+	+
<i>Cynara humilis</i>	.	+	.	+	.	.	+	+
<i>Quercus coccifera</i>	.	1	.	.	.	.	+	+
<i>Erica scoparia</i>	1	.	.	.	.	.	.	1
<i>Juniperus turbinata</i>	.	.	1	.	.	+	.	.
<i>Plantago lanceolata</i>	.	+	+	.	.	.	.	.
<i>Holcus lanatus</i>	+	.	.	.	+	.	.	.

More: releve 1: 2 *Schoenus nigricans*, +*Centaurium erythraea* ssp. *grandiflorum*; releve 2: +*Smilax nigra*, +*Convolvulus althaeoides*, +*Arisarum vulgare*, +*Lonicera implexa*, +*Romulea bulbocodium*, +*Rhamnus alaternus*, +*Allium roseum*, +*Lobularia maritima*; releve 3: +*Allium ampeloprasum*; releve 8: +*Cheirolophus sempervirens*, +*Daucus crinitus*, +*Pistacia lentiscus*, +*Phillyrea angustifolia*.

Places: 1 S. Lourenço; 2 Ericeira; 3 Ribeiras das Ilhas; 4 Serra do Bouro (Foz do Arelho); 5 S. Julião; 6 S. Martinho do Porto; 7 Serra das Pescarias; 8 Salir do Porto.