Excursions

September 16th 2017

26th Congress of the European Vegetation Survey, Bilbao

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Universidad del País Vasco

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European Vegetation Survey

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introduction

General conditions of the Basque Country

Geology and geomorphology. The territory between the western Pyrenees and the eastern end of the Cantabrian range (Figure 0.1) is crossed by a set of parallel east-west oriented mountain ranges of low elevation connecting both great ranges and leave a number of depressions between them. The Basque Country–Euskal Herria-(Autonomous Community and Navarre) and some other territories such as northeastern Old Castile, the region of Cantabria, etc. can be found here. It is an area dominated by marine sedimentary materials, mostly of Cretaceous age, in which limestone, marl, sandstone and argillite are the most frequent rock types. These rocks sometimes build prominent calcareous massifs, other times form a stratified structure called flysch, and other times, when soft materials such as marl or argillite dominate, are eroded, thus forming depressions. The most prominent elevations are Castro Valnera (1,718 m), Picón del Fraile (1,632), Gorbeia (1,481), Anboto (1,331), Aizkorri (1,549), Aralar (1,430), Saioa (1,419), Adi (1,458) and Ortzainzurieta (1,567). They the highest peaks of the mountain chain which acts as the watershed between the Atlantic and the Mediterranean catchment areas. Northwards of the watershed a set of short rivers (ca, 40 km of average length) ending up in the Atlantic Ocean, carve the landscape into a high number of narrow valleys which skip the strong altitude gradient between the river head and the mouth. These rivers have a torrential character as they drain the abundant precipitations of this region. This northern section of the watershed is called the Cantabrian Fringe (Cornisa Cantábrica) and is very mountainous and steep, being under the direct influence of the Atlantic Ocean with its abundant precipitation and fogs as well as its tempering influence on temperature. South of the watershed, the landscape is less mountainous and the rivers flow slower as the slopes are not so steep, draining into the Ebro river and finally in the Mediterranean sea. In this part the east-

west oriented ranges alternate with depressions in which the main cities and human activities concentrate. This mountain complex is in contact with the Miocenic materials filling the Ebro depression, which form a flat or hilly territory constituted by clayey or sandy deposits and drained by the Ebro river network.

Climate. The Basque-Cantabrian area is characterized by a steep climatic gradient. This is determined by its geographic latitude and its position in the north of the Iberian Peninsula. In this area, the main cyclonic lows move from the north Atlantic towards the European continent, associated with fronts which bring regular precipitation. This succession of lows moving eastwards follows a southern path/route in winter which is displaced northwards in summer. This is the reason why the Mediterranean area, including the whole of Iberia and North Africa, receives its rainfall in winter, while in summer these regions suffer a regular dry season. The northern fringe of Iberia lies in the area where the fronts bring rains in winter and also in summer; thus there is moisture thorough all the seasons; and there is no drought or it scarcely happens during only one month. This is typical of the temperate climate which is the most common in Eu-

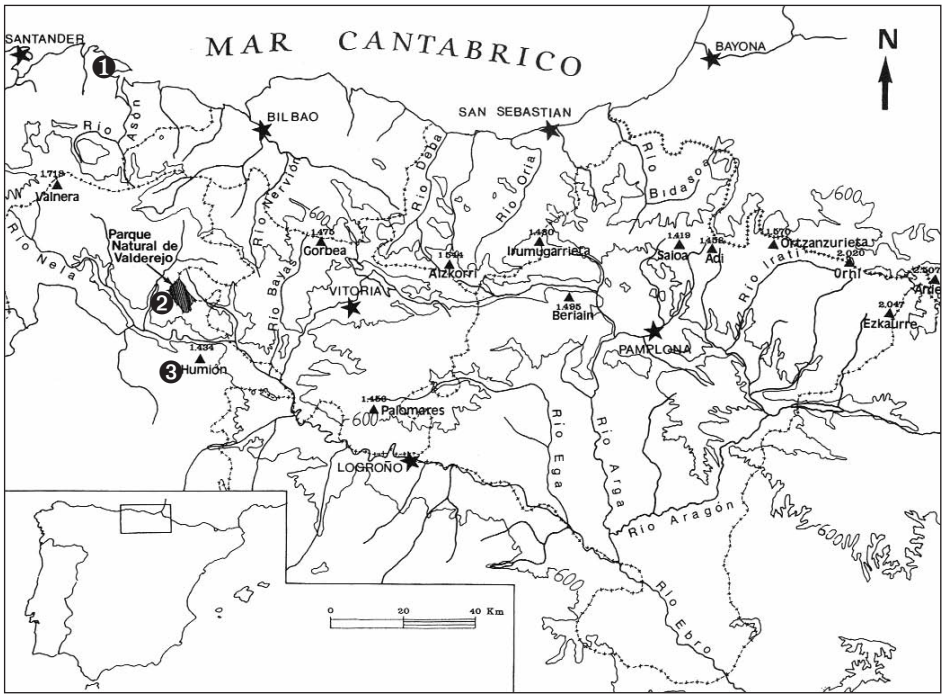


Figure 0.1. Basque-Cantabrian area in the north of the Iberian Peninsula. ① Excursion 1; ② Excursion 2; ③ Excursion 3.

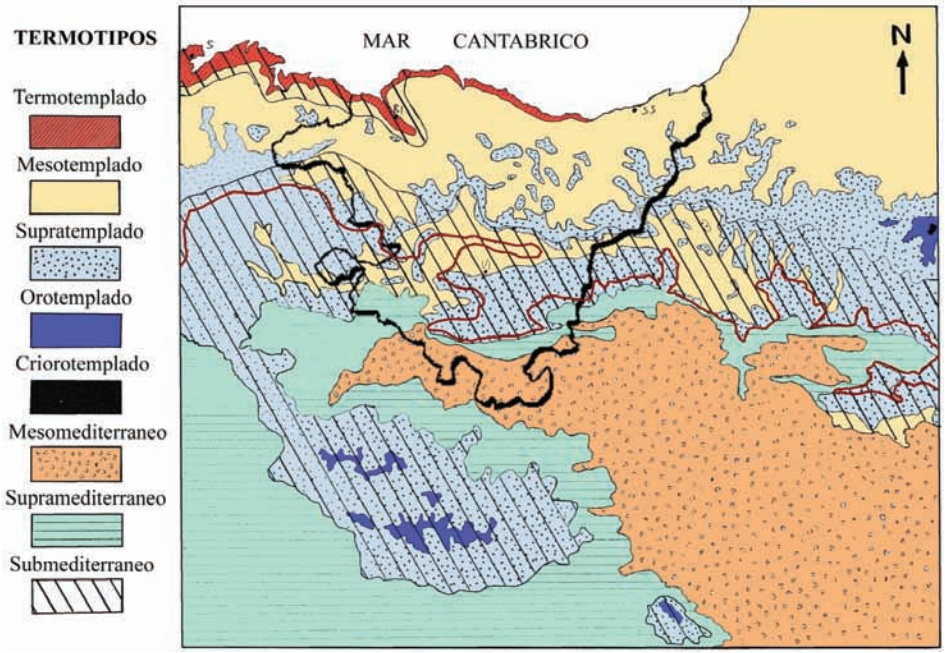


Figure 0.2. Thermotypes of the Basque Country and surrounding areas: Thermotemperate, Mesotemperate, Supratemperate, Orotemperate, Criorotemperate, Mesomediterranean, Supramediterranean and Submediterranean variants (from Loidi *et al.* 2011).

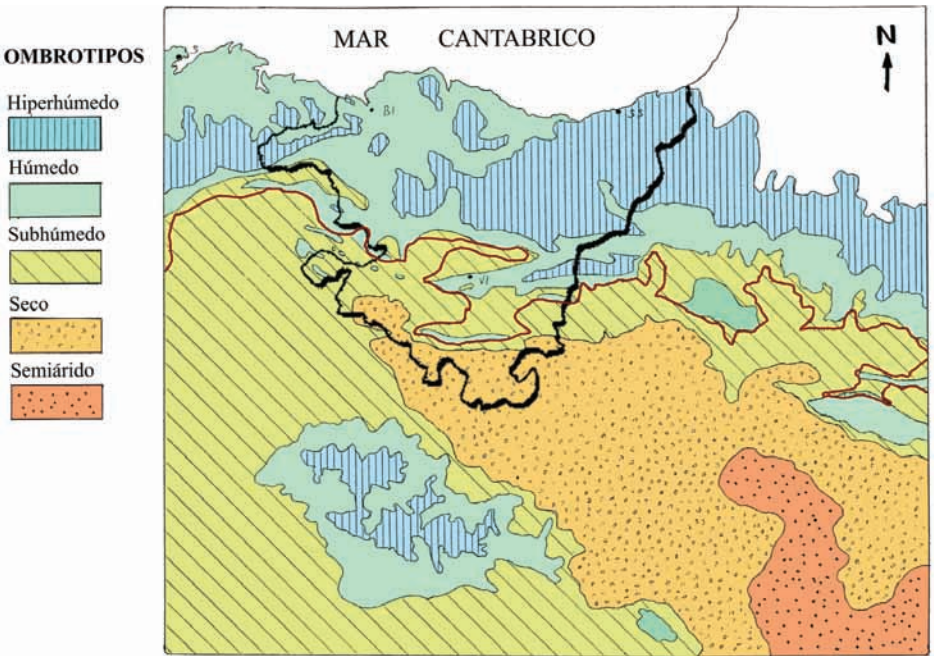


Figure 0.3. Ombrotypes of the Basque Country and surrounding areas: Hyperhumid, Humid, Subhumid, Dry and Semiarid (from Loidi *et al*. 2011).

rope. Nevertheless, the influence of the Atlantic lows with their fronts vanishes in summer south of latitude 42 º N in the Iberian Peninsula, entailing a growing summer drought for the central and southern parts of that territory. Summer drought is characteristic of the Mediterranean climate and the transition between the temperate and the Mediterranean is the most relevant feature of the climatic diversity of the Basque-Cantabrian region, where large areas are under transitional submediterranean conditions. The maps in figures 0.2 and 0.3 show the distribution of thermotypes (thermic conditions) and ombrotypes (rainfall importance), illustrating the distribution of temperature and precipitation in the Basque area. The warmest areas are those within the coastal strip, followed by the Ebro depression; in the mountains the subalpine conditions (orotemperate) are only represented in the Pyrenees, the Iberian Range and the Cantabrian Range above 1700 m, leaving most of the area under supra- and meso-conditions. The rainfall distribution is the result of the main trends in the movements of the lows and the fronts, in combination with orography. The deep aridity of the Ebro Depression contrasts with the hyperhumid conditions of the coastal mountain ranges. Another north-south gradient associated to summer drought is continentality, clearly increasing towards the east and the centre of the Peninsula.

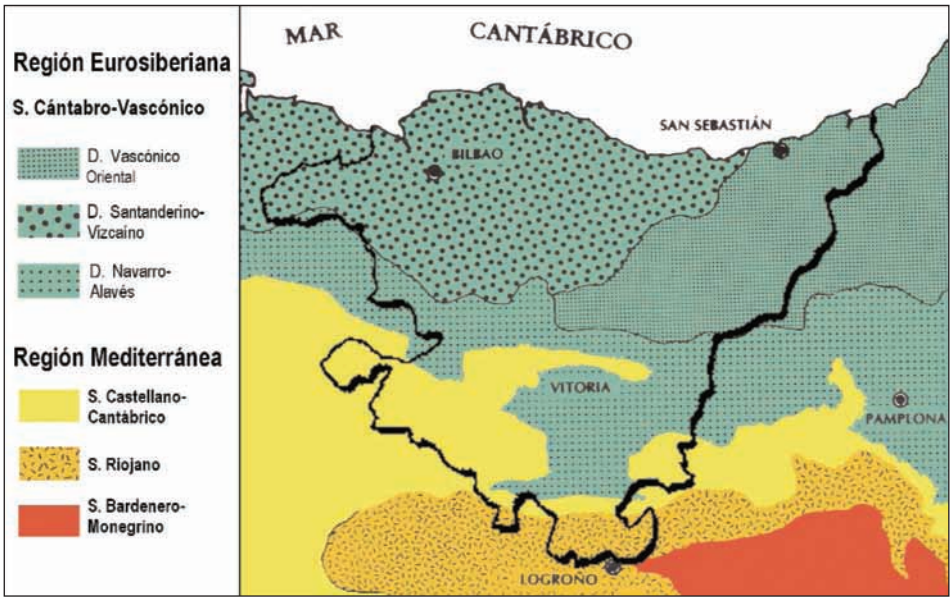


Figure 0.4. Biogeographical units of the Basque Country and surrounding areas: Eurosiberian Region, European Atlantic Province, Basque-Cantabrian Sector, Eastern Basque District, Santanderian-Biscayan District, Navarran-Alavesian District. Mediterranean Region, Mediterranean Central Iberian Province, Castilian-Cantabrian Sector, Riojan Sector, Bardenas-Monegros Sector (from Loidi *et al*. 2011).

Biogeography. The transitional character of this area, between the Meditarranean and Eurosiberian regions, is evident (Loidi et al. 1997, 2011). The map (figure 0.4) shows clearly how the northern part of the territory is included in the European Atlantic province while the southern part belongs to the Mediterranean Central Iberian province. The sectors and districts represent the diversity within these two main units. The limit between the two regions follows a line which leaves the moist vegetation types to the north and the dry vegetation types to the south. The upper levels of the mountain bring the limit to the south while the valleys do the same to the north: the temperate plants and vegetation types can reach southern locations in the elevations and northern slopes and, reversely, the Mediterranean ones enter northwards using the valley bottoms and southern slopes.

excursion 1

The Vegetation of The Monte Buciero and Noja Area

The excursion takes places in the marshlands of *Santoña, Victoria y Joyel Natural Park* (Cantabria province) (Figure 1.1), which was declared a protected area in 1992 and has a surface area of 6907 Ha. It is included in the Natura 2000 network and contains the most important set of wetlands for aquatic birds of the Northern Iberian Peninsula. We will be able to see *Quercus ilex* subsp. *Ilex* evergreen forests and coastal ecosystems such as dunes, cliffs and marshes.

Mount Buciero is a large calcareous rock located on the left bank of the Asón river mouth, next to the village of Santoña. We will approach it from this locality, famous for its fishing harbour and its canning industry, particularly of anchovies. The trail starts next to the San Martín military fort, built during Napoleonic times (1810-1814). From there we can see a fantastic panoramic view of the Asón river estuary and the Bay of Laredo.

At the beginning of the trail we can see outcrops of calcareous rocks with chasmophytic communities of the class *Asplenietea trichomanis* with *Centranthus lecoqii, Phagnalon sordidum* and ferns like *Asplenium ruta-muraria, A. trichomanes* and *Ceterach officinarum.* As we move on along the coastal trail we will start to see shrub species that substitute the dominant vegetation, a *Quercus ilex* susbp. *ilex* forest (evergreen sclerophylle broadleaved forest) that grows on Cretaceous calcareous rocks. This forest belongs to the association *Lauro nobilis-Quercetum ilicis* and represents an evergreen sclerophyllous Mediterranean vegetation in a temperate Atlantic territory. In addition to the holm oaks, *Quercus ilex,* the following species are also common: *Laurus nobilis, Arbutus unedo, Phillyrea latifolia, Rhamnus alaternus, Rosa sempervirens* and *Ruscus aculeatus.* Some deciduous species such as *Crataegus monogyna, Ligustrum vulgare, Pistacia terebinthus, Prunus spinosa* and *Cornus sanguinea* are abundant particularly on the

edges of the holm oak forest. Lianas, *Hedera helix* subsp. *hybernica*, *Rubia peregrina* and *Smilax aspera,* show a substantial presence. *Smilax aspera* sometimes forms a dense vegetation curtain that makes access to the forest difficult. There are several herbaceous species, among them *Asplenium onopteris, Arum italicum* and *Brachypodium pinnatum* subsp. *rupestre* are common. Forest substitution shrubs are dominated by *Genista occidentalis* together with *Erica vagans, Helianthemum nummularium, Teucrium pyrenaicum*, *Glandora diffusa*, etc. Pasture lands that develop in mosaics be-

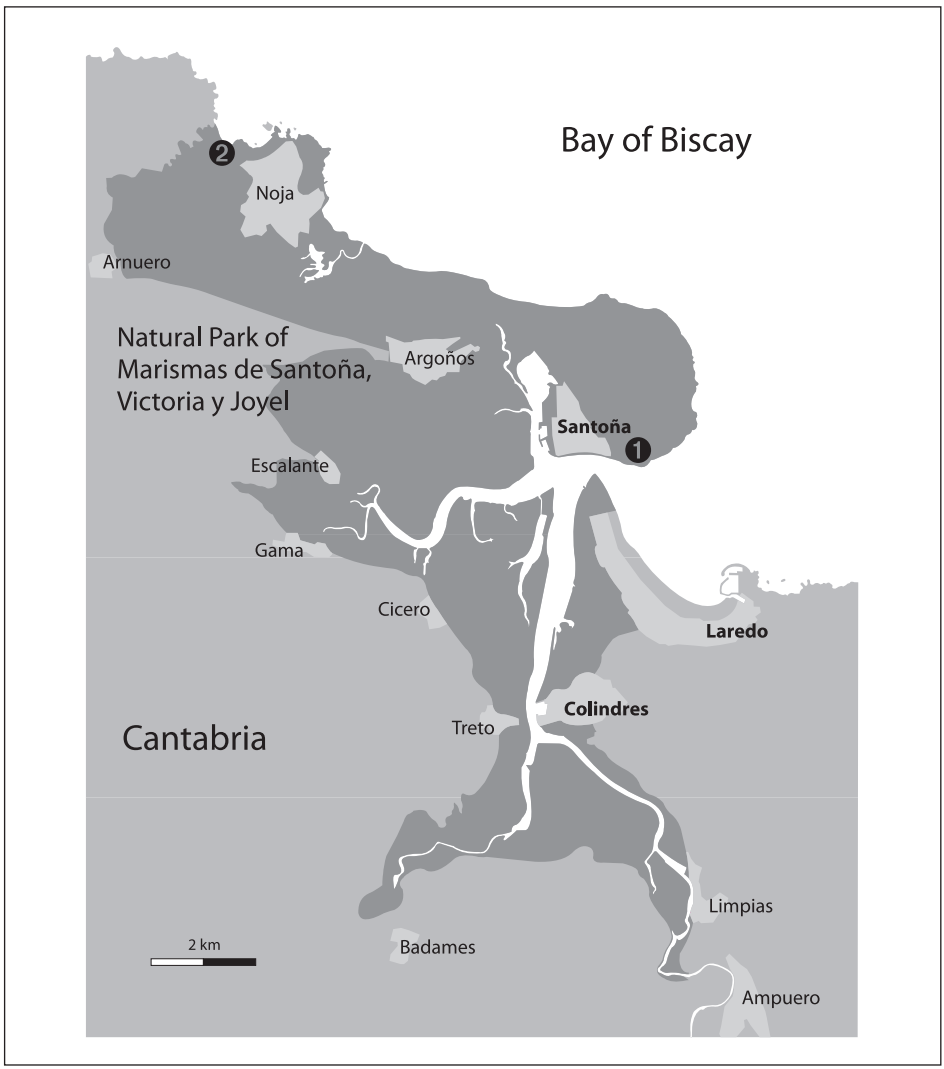


Figure 1.1. Map of Natural Park of Marismas de Santoña, Victoria y Joyel. Location of the excursion areas: ① Mte Buciero: *Quercus ilex* forests; ② Noja: Dunes, salt marshes and cliffs.

tween these shrubs belong to the alliance *Bromion erecti*, and it is common to find in them the following grasses: *Helictotrichon cantabricum, Sesleria argentea* and *Brachypodium pinnatum* subsp. *rupestre*.

These forests are generally in a good conservation state since the use of wood as domestic fuel and of charcoal for industry was abandoned about four decades ago.

This is the case for the entire eastern Cantabrian fringe. Shrubby formations that substitute holm oak forests are dominated by *Arbutus unedo* and *Phillyrea latifolia* (*Phyllireo-Arbutetum unedonis*).

The trail crosses the holm oak forest and reaches an open area with impressive calcareous cliffs. The dark green colour of the holm oaks contrasts with the white of the calcareous rocks and the blue of the sea, offering an extraordinary view. Closeby we will find a house, and next to it a turn on the way will lead us into the forest, after which we will arrive at a very interesting area where the rests of an old iron mine from the beginning of the XIXth century can be found. The vegetation is thick, with deciduous trees and shrubs: *Corylus avellana, Sorbus aria, Acer campestre, Quercus robur* and many ferns such as *Polystichum setiferum*, *Phillytis scolopendrium* and *Blechnum spicant*. Following the path we will arrive at a large doline known as "Valle de los avellanos" (hazenults valley), where, together with huge hazelnut trees we can see many ferns, *Allium ursinum, Melica uniflora, Helleborus occidentalis, Oxalis acetosella, Hepatica nobilis, Carex sylvatica, Hypericum androsaemum, Ranunculus tuberosus* and some deciduous trees such as *Cornus sanguinea, Ilex aquifolium* and *Euonymus europaeus*. This type of forest on dolines is commonly found in mosaic with *Quercus ilex* subsp. *Ilex* forests, which are the dominant vegetation on the limestone massifs of eastern Cantabria.

After a lunch in the village of Santoña we will head westwards to Noja. In this municipality we will have the opportunity to study beach, dune, salt marsh and cliff vegetation.

The sandy beaches that we will visit (Ris and Joyel) host on their upper reaches, above the high water mark and in contact with the embryonic dunes, halonitrophylic plant communities. These develop on the plant and animal rests brought in by the tides and are mainly formed by annual plants such as *Cakile maritima* subsp. *integrifolia* and *Salsola kali*, although sometimes *Honckenya peploides*, *Polygonum maritimum* and *Atriplex prostrate* can also be found there. They fall within the association *Honckenyo-Euphorbietum peplis* and are habitats in risk of disappearing due to the mechanical cleaning of the beaches during the summer season. *Chamaesyce peplis,* one of the most characteristic species in this habitat is classified as "vulnerable" in the Regional Catalogue

of endangered species of Cantabria and can only be found in one beach in Cantabria (Liencres beach). In the Basque Country it is classified as an endangered species and there are only a few specimens left in the Sopelana beach.

After that we will observe different vegetation belts parallel to the coast and perpendicular to the main winds (Figure 1.2). This zonation is determined by a series of gradients associated with the proximity to the sea. The sea winds act as principal agents influencing mobility of substrate, abrasion and salinity. There are three well differentiated substrates which host very specific plant communities:

Embryonic or primary dunes, are dunes still under construction and with very little stabilized sand. The most characteristic plant of this medium is the grass *Elymus farctus* subsp. *boreali-atlanticus.* It has long and deep rhyzomes that contribute to fixing the sand. Other common plants on these communities of the association *Euphorbio-Agropyretum junceiformis* are *Eryngium maritimum* and *Euphorbia paralias*, which can also be found in secondary dunes.

Secondary or white dunes, there are still active and with sand not completely stabilized yet. The dominant plant on these dunes is *Ammophila arenaria* subsp. *australis*, together with *Calystegia soldanella, Festuca juncifolia*, etc. They form belts parallel to the coast which can be broken during storms.

Fixed, tertiary or grey dunes, in which sand mobility is null or nearly null. The soils contain a greater proportion of organic matter and lower salinity than in the other dunes. Vegetation of these dunes form a priority habitat of the Habitats Directive since it is

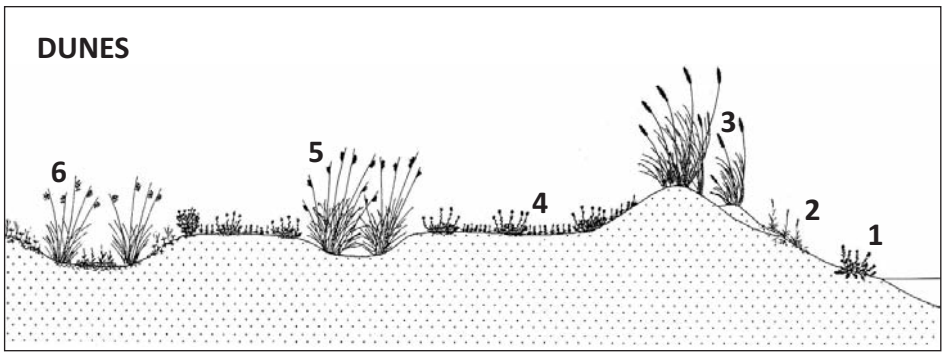


Figure 1.2. Dunes: 1. *Honckenyo-Euphorbietum peplis*. 2. *Euphorbio-Agropyretum junceiformis*. 3. *Otantho-Ammophiletum australis*. 4. *Helichryso-Koelerietum*. 5. *Carici-Juncetum acuti*. 6. *Cypero-Scirpetum holoschoeni* (from Herrera 1995).

very rare and fragile. There are plant communities formed mainly by small bushes (*Helichrysum stoechas*) and grasses (*Koeleria glauca, Festuca vasconcensis*). An interesting plant in these communities is *Crucianella marítima,* which has in Cantabria its northernmost limit. *Pancratium maritimum, Dianthus hyssopifolius, Asperula occidentalis, Ononis ramosissima, Herniaria ciliolata*, *Aetheorhiza bulbosa* and *Linaria maritima* are also common in these communities of the Cantabrian-Atlantic coast, and they belong to the association *Helychryso-Koelerietum albescentis.* This syntaxon can be found along the central eastern Cantabrian shore all the way to Britain.

After studying the dune systems we will head for the Joyel Marshland, where we will be able to observe the zonation resulting from the tidal inundation, with communities of *Zostereta, Spartinetea, Sarcocornietea* and *Salicornietea* (Figure 1.3). The hydrodynamics of this wetland is very particular: water exchange with the sea is limited since there is no river, its main source of continental water is an aquifer.

Zostera noltii is a marine phanerogam of narrow leaves that forms prairies only visible during low tide, and it is more common in the Cantabrian estuaries than *Zostera marina,* which can only be found in the Ason river estuary.

The communities of the seagrass *Spartina maritima* have been replaced in the Joyel marshland by *Spartina alterniflora*, an American invader.

Annual communities dominated by the genus *Salicornia* are common here, with tetraploid species such as *Salicornia fragilis* and *Salicornia dolichostachya,* and diploid

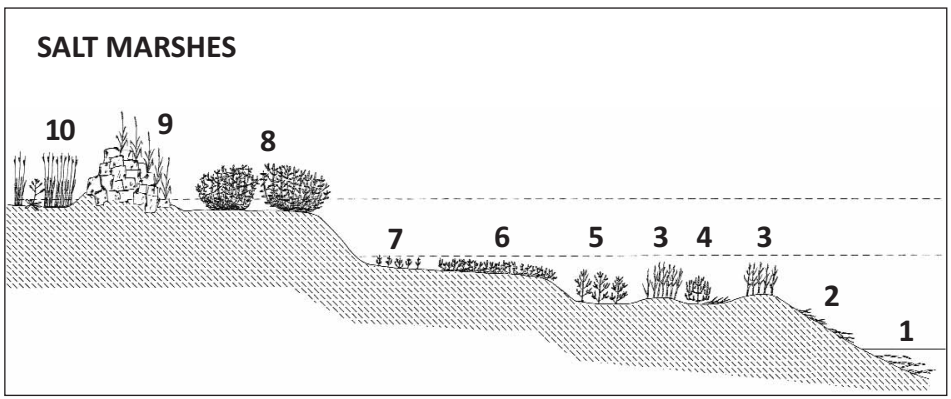


Figure 1.3. Salt marshes: 1. *Zosteretum marinae*. 2. *Zosteretum noltii*. 3. *Spartinetum alterniflorae*. 4. *Salicornietum dolichostachyae* 5. *Salicornietum fragilis*. 6. *Puccinellio-Sarcocornietum perennis*. 7. *Salicornietum ramosissimae*. 8. *Puccinellio-Sarcocornietum pruinosae*. 9. *Inulo-Elytrigietum athericae*. 10. *Junco-Caricetum extensae* (from Herrera 1995).

species like *Salicornia ramosissima* and *Salicornia obscura*. This pioneer vegetation settles in areas that are flooded daily with the high tide, and it is usually found in contact with *Zosterum noltii* and *Spartinetum alterniflorae*, and in the gaps between communities of *Sarcocornietea*.

Shrubs dominated by species of the genus *Sarcocornia* form two types of communities, in one of them the dominant species is *Sarcocornia perennis*, a creeping plant of reddish colour in autumn, and in the other one *Sarcocornia pruinosa* (=*S. fruticosa* auct.), a shrub up to 1 m high, with erectile, ramified woody stems. Plants such as *Puccinellia maritima, Halimione portulacoides, Juncus maritimus, Aster tripolum, Limonium vulgare, Inula crithmoides, Plantago maritima, Triglochin maritima*, etc. can be found in both communities. The syntaxa included within these communities are *Puccinellio maritimae-Sarcocornietum perennis* in more flooded areas and *Puccinellio-Sarcocornietum fruticosae* further from the tidal influence and in contact with communities of *Juncus maritimus*. Even though *Juncus maritimus* can be found within the above described halophylous communities of the class *Sarcocornietea*, its optimum habitat is in the rushes of the association *Junco maritimae-Caricetum extensae,* which usually occupy large areas in the subhalophylous zones of the estuaries, where there is a freshwater influx. In addition to *Juncus maritimus,* other plants characteristic of this community are *Carex extensa* and *Glaux maritima*.

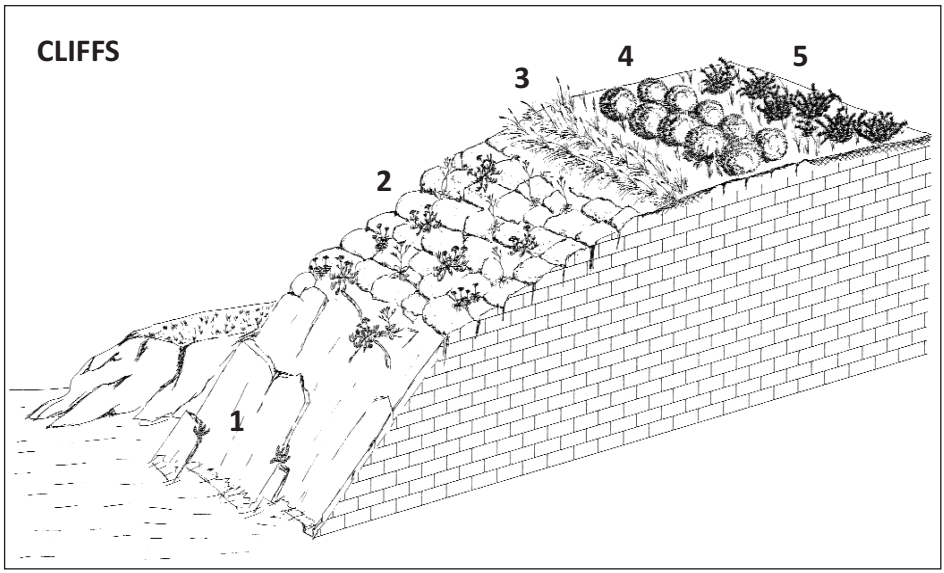


Figure 1.4. Cliffs: 1. Com. *Asplenium marinum*. 2. *Crithmo-Limonietum binervosi*. 3. *Leucanthemo-Festucetum pruinosae*. 4. *Helictotricho-Genistetum occidentalis*. 5. *Erico vagantis-Ulicetum europaei* (from Herrera 1995).

Elytrigia atherica is a grass which reaches up to one metre in height, and it is easy to distinguish from other communities in the marshland due to its light green colour. It forms very characteristic grasslands in areas where the high tide leaves organic rests that supply the soil with nitrogenous salts when they decompose. *Beta maritima* and *Atriplex prostrata* are two common plants in these halonitrophilous communities. *Matricaria marítima,* characteristic of this type of community, is a plant which is in regression in the eastern Cantabrian littoral (Cantabria and Basque Country).

The main ecological factors that exert a selective pressure upon the flora and fauna of the coastal cliffs are: direct sea splashes, mistloaded with salt, direct action of strong winds and exposure to intense sunlight. These factors influence the physiognomy, structure and composition of the plant cover. In the southern Cantabrian-Atlantic phytogeographic region three distinct vegetation belts can be seen from the coast towards the interior (Figure 1.4): halochasmophytic communities, aerohalophyle prairies and aerohalophyle shrubs. The cliffs of Noja that we will visit are located between two beaches and made of strongly karstified limestone which allows the growth of all these halochasmophytic communities. The most abundant plant there is *Crithmum maritimum*. Plants of the genus *Limonium,* e.g. *L. binervosum* and *L. ovalifolium,* as well as *Plantago maritima* and *Armeria pubigera* subsp. *depilata* are also characteristic of this environment (Ass. *Crithmo-Limonietum binervosi*). The fern *Asplenium marinum*, exclusive to coastal areas, can grow in crevices exposed to strong wave action within this first belt. We will see a splendid population of this fern in the ruins of an old building close to the cliff. The second vegetation belt is rooted on deeper and less saline soils, and it is made up of prairies of *Festuca rubra* subsp. *pruinosa* and other plants almost excusive to this habitat such as *Daucus carota* subsp. *gummifer*, *Silene uniflora* and *Leucanthemum crassifolium* (Ass. *Leucanthemo crasifoliae-Festucetum pruinosae*).

The last vegetation belt is made up of shrubs, with two dominant species: *Genista occidentalis* and *Erica vagans*. *Smilax aspera, Cistus salviifolius*, *Glandora diffusa* (*Helictotricho-Genistetum occidentalis*) are also common here. The wild olive, *Olea europea* var. *sylvestris,* is rarely found in the Cantabrian coastal región, only in some cliffs (from central Asturias to the Basque Country). A small population of these trees can be found in Noja.

excursion 2

The Vegetation of The Obarenes Natural Park

From Bilbao we will southwards for about 100 km, on the highway to Madrid until we reach the town of Pancorbo. There we will turn west, crossing the Bureba depression in the north of the Burgos province. We will cross the Obarenes Mountains via the Portillo de Busto pass and we will visit several locations in the area called "Las Merindades de Burgos" until we reach the Ebro river bank. There, we will follow its course along the Sobrón canyon and then we will continue directly back to Bilbao.

The territories we will visit during this day's journey constitute the southern foot- hills of the Basque-Santanderian Mountains and are geomorphologically linked to the Castilian Meseta. This area presents an abrupt relief although the gap between the highest and lowest points is not very big; the altitude ranges between 500 and 1,400 m. Geologically, calcareous rocks, mainly from the Upper Cretaceous period, dominate this region, with some patches of siliceous substrata. The presence of Tertiary sediments appearing in valleys and depressions is also significant. Biogeographically, this area belongs to the Mediterranean region, Mediterranean Central Iberian province, Castilian-Cantabrian sector. The bioclimatic conditions are quite homogeneous throughout the territory: almost the entire area is included in the subhumid ombrotype and in the supramediterranean thermotype. It is relevant, however, that the Mediterranean climatic conditions are profoundly attenuated by significant summer rainfalls and therefore a transitional character between the Temperate and the Mediterranean macrobioclimates is reflected in the vegetation of this area (Submediterranean variant).

This sector is characterised by two vegetation series. The first one, *Spiraeo obovatae-Querco fagineae* sigmetum, occupies marl substrata, whereas the other, *Spiraeo obovatae-Querco rotundifoliae* sigmetum, develops on hard limestone (Loidi & Femández Prieto 1986). Moreover, on the siliceous patches of these territories appears the *Quercus pyrenaica* series: *Festuco heterophyllae-Querco pyrenaicae* sigmetum. In the highest areas of the northern slopes of the mountains, the beech series, *Epipactido helleborines-Fageto* sigmetum, is present due to the persistent fogs. Another peculiarity of this sector is the alder forest, which belongs to the *Humulo lupuli-Alnetum glutinosae* association.

The intense rural emigration produced in the last few decades has led to a decline of animal husbandry. Therefore the thyme grasslands have been invaded by suffruticose species characteristic of a more developed stage, such as *Arctostaphylos uva ursi* subsp.*crassifolia* and *Genista occidentalis,* leading to the formation of a scrub that belongs to the *Genistion occidentalis* alliance *(Arctostaphylo crassifoliae-Genistetum occidentalis* association).

The karstification processes have caused big sinkholes and decalcification depressions covered with "terra rossa" permitting the growing of cereal crops. These deeper soils are now used for agriculture and correspond to the Castilian-Cantabrian *Q. faginea* series *Spiraeo obovatae-Querco fagineae* sigmetum.

The Bureba area is situated between 700 and 800 m above sea level and presents an intense agricultural activity; wheat and barley are the main crops. We will cross the northern part of this area, close to the Obarenes Mountains. The Tertiary sediments of this territory are sometimes covered with glacis of Quaternary sediments. These more recent lands formed by conglomerates are edaphically more xeric due to their texture, and are occupied by evergreen oak forests of *Spiraeo obovatae-Quercetum rotundifoliae*. We will see some remarkably sized forest patches that have traditionally been used for wood extraction. The best arable land, over Tertiary sediments, is totally devoted to intensive agriculture and is occupied by the "quejigo" series *Spiraeo-Querco fagineae* sigmetum, although there are a few remains of the climatic forest. Most of the area is occupied by the scrub of *Arctostaphylo crassifoliae-Genistetum occidentalis* or by *Brachypodium* pastures for sheep.

Arctostaphylo crassifoliae-Genistetum occidentalis: *Genista occidentalis* V, *Arctostaphylos uva-ursi* subsp. *crassifolia* V, *Erica vagans* V, *Lavandula latifolia* IV, *Dorycnium pentaphyllum* IV, *Brachypodium pinnatum* subsp. *rupestre* IV, *Genista scorpius* III, *Helianthemum nummularium* III, *Aphyllanthes monspeliensis* II, *Helictotrichon cantabricum* II, *Avenula mirandana* II, *Santolina chamaecyparissus* I, *Helichrysum stoechas* I, *Thymelaea ruizli* I, *Globularia nudicaulis* I, *Onobrichys reuteri* I, *Linum milleti* I, *Euphorbia flavicoma* subsp. *occidentalis* I, *Glandora diffusa* +, *Carduncellus mitissimus* +. (Rivas-Martínez, T.E. Díaz, F. Prieto, Loidi & Penas 1984: tab. 22, rels. 1-10)

Portillo de Busto

We will cross the Obarenes Mountains through the Portillo de Busto pass, where a stop is scheduled. The Portillo de Busto is a pass at 1000 m which crosses the top ridge of the Obarenes mountains, an E-W oriented range. In this place we will be able to observe the great contrast between the northern and southern slopes.

FIGURE 2.1

Locality: Portillo de Busto (Montes Obarenes). Burgos. Altitude: 1000 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Supramediterranean, subhumid.
Lithology: Limestone, marl.
① Holm-oak forest of *Spiraeo-Quercetum rotundifoliae.*
② Thyme scrub of *Koelerio-Thymetum mastigophori.*
③ Nitrophilous roadside community with *Artemisia alba.*
④ Furze scrub (aulagar) of *Arctostaphylo crassifoliae-Genistetum occidentalis.*
⑤ Overhanging calcareous cliff fissures community with *Asplenium celtibericum.*

On the southern slopes the rain shadow effect and the intense sunshine are noteworthy and the potential natural vegetation corresponds to the more xerophilous *Spiraeo-Quercetum rotundifoliae,* of which some quite big patches remain. In the piedmonts of the slope the land use has led to their transformation into cereal fields or thyme grasslands belonging to *Koelerio vallesianae-Thymetum mastigophori brachypodietosum retusi* (in the upper part of the slopes the thyme grasslands correspond to the typical subassociation *thymetosum mastigophori)*. The presence of *Erodium glandulosum* in this locality is remarkable. On bare and cryoturbated soils therophytic communities of *Bupleuro-Arenarietum ciliaris* develop. Nitrophilous communities dominated by *Artemisia alba* grow at the foot of the calcareous cliffs. Communities of the *Asplenio celtiberici-Saxifragion cuneatae* alliance (*Campanulo hispanicae-Saxifragetum cuneatae* association) colonize the limestone overhanging rock crevices; the singular fern *Asplenium celtibericum* participates in those chasmophytic communities. The summit of this limestone ridge is occupied by scrubs of *Arctostaphylo-Genistetum occidentalis* in its subassociation *juniperetosum alpinae* typical of biotopes with high- winds.

Figure 2.1. (From Loidi *et al.* 1999).

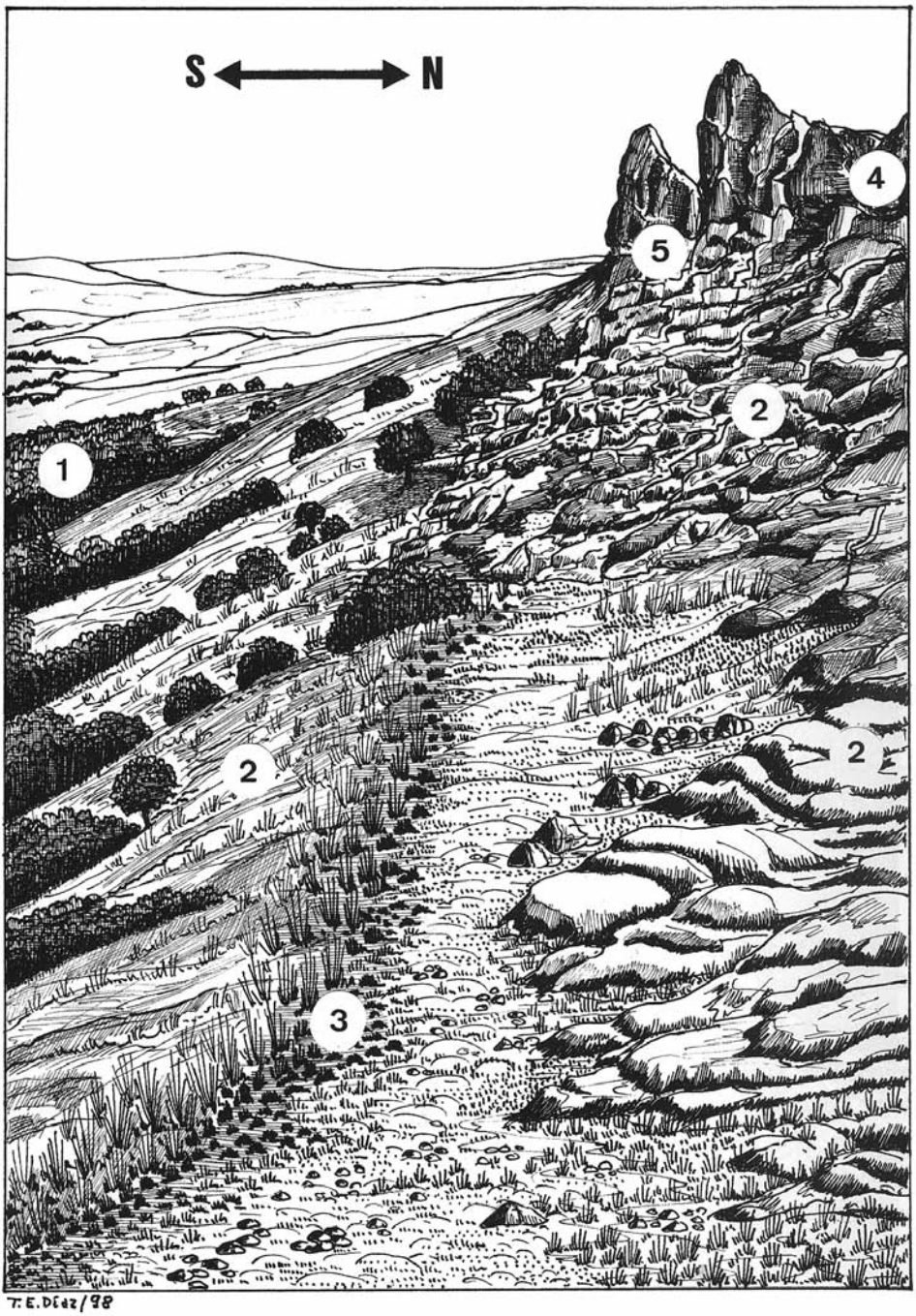


FIGURE 2.2

Locality: Portillo de Busto (Montes Obarenes). Burgos. Altitude: 1000 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Supramediterranean, subhumid.
Lithology: Limestone, marl,

① Calcareous rock crevices community of *Campanulo hispanicae-Saxifragetum cuneatae.*
② Nitrophilous roadside community with *Artemisia alba.*
③ Furze scrub (aulagar) of *Arctostaphylo crassifoliae-Genistetum occidentalis juniperetosum alpinae.*
④ Thyme scrub of *Koelerio- Thymetum mastigophori.*
⑤ Holm-oak forest of *Spiraeo-Quercetum rotundifoliae.*

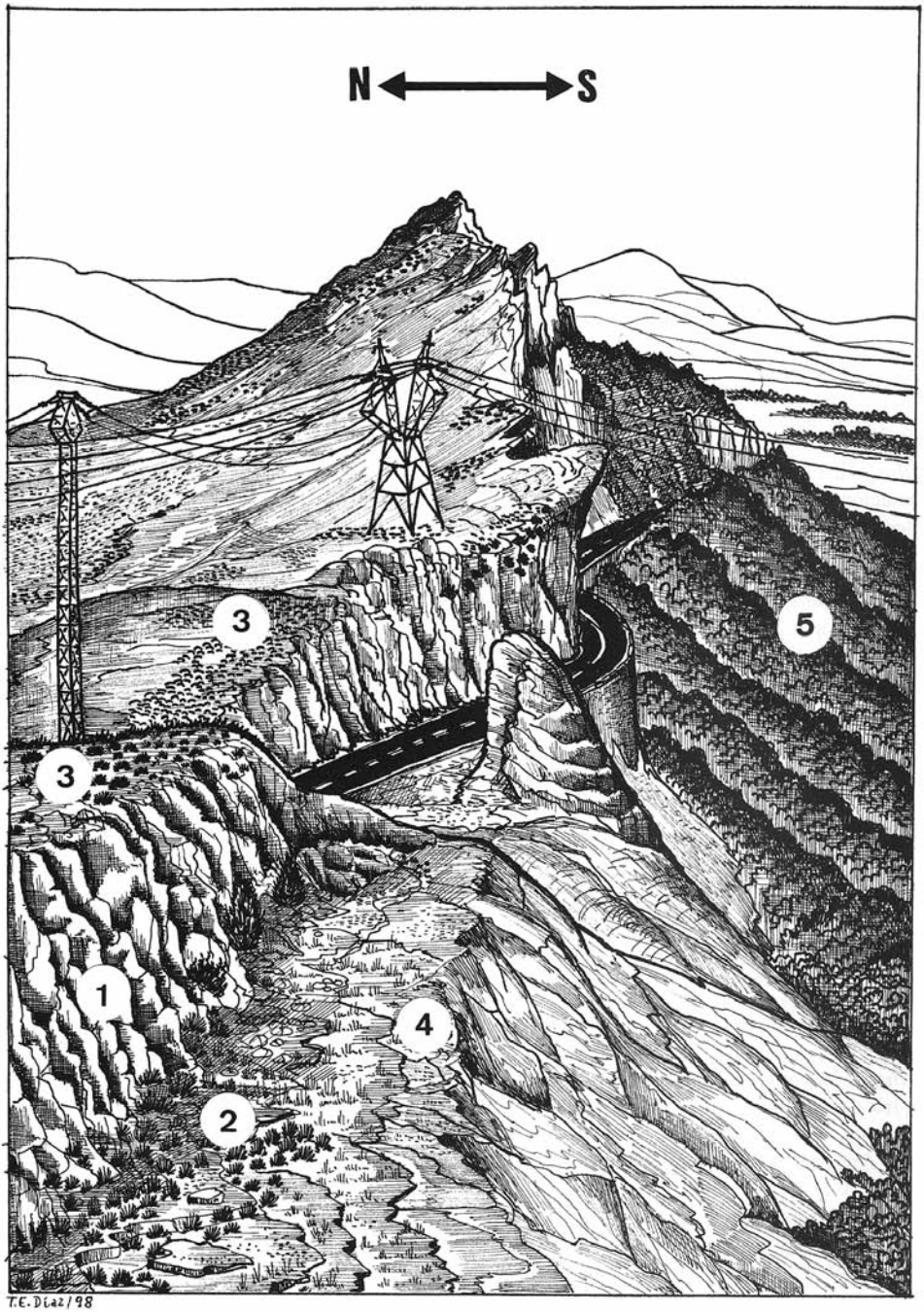
The floristic composition of those associations is shown in the following tables:

Spiraeo obovatae-Quercetum rotundifoliae: *Quercus rotundifolia* V, *Rubia peregrina* V, *Teucrium chamaedrys* V, *Juniperus communis* V, *Buxus sempervirens* IV, *Amelanchier ovalis* IV, *Genista scorpius* IV, *Genista occidentalis* IV, *Spiraea hypericifolia* subsp. *obovata* III, *Juniperus phoenicea* III, *Rhamnus alaternus* III, *Quercus faginea* III, *Arbutus unedo* II, *Carex hallerana* II, *Juniperus oxycedrus* II, *Ruscus aculeatus* II, *Ligustrum vulgare* II, *Crataegus monogyna* II, *Hedera helix* II, *Geum sylvaticum* II, *Buplerum rigidum* I. (García-Mijangos 1997: tab. 12a, rels. 1-29)

Arctostaphylo crassifoliae-Genistetum occidentalis subass. ***juniperetosum alpinae***: *Arctostaphylos uva-ursi* subsp. *crassifolia* V, *Genista occidentalis* V, *Erica vagans* V, *Helianthemum oelandicum* subsp. *incanum* IV, *Teucrium pyrenaicum* III, *Helictotrichon cantabricum* III, *Coronilla minima* III, *Helianthemum nummularium* III, *Filipendula vulgaris* III, *Thymus praecox* subsp. *britannicus* II, *Thymelaea ruizii* II, *Aphyllanthes monspeliensis* II, *Carex humilis* II, *Serratula nudicauilis* II, *Arenaria grandiflora* II, *Carduncellus mitissimus* II, *Koeleria vallesiana* II, *Linum milleti* II. Differentials of subassociation: *Juniperus alpina* V, *Sideritis hyssopifolia* subsp. *castellana* III, *Crepis albida* II, *Gentiana occidentalis* II. (García-Mijangos 1997: tab. 16b, rels. 1-31)

Koelerio vallesianae-Thymetum mastigophori subass**. *thymetosum* /** subass**. *brachypodietosum retusi***: *Koeleria vallesiana* V/V, *Festuca hystrix* V/II, *Helianthemum oelandicum* subsp. *incanum* V/III, *Carex humilis* V/II, *Teucrium expansum* IV/IV, *Coronilla minima* IV/III, *Arenaria grandiflora* IV/III, *Thymus praecox* subsp. *britannicus* IV/II, *Helianthemum violaceum* IV/II, *Ononis striata* III/+, *Seseli montanum* III/II, *Linum milleti* II/III, *Helichrysum stoechas* II/V, *Lavandula latifolia* II/IV, *Globularia vulgaris* II/III, *Serratula nudi-*

Figure 2.2. (From Loidi *et al.* 1999).



caulis II/+, *Helianthemum apenninum* II/II, *Thymus mastigophorus* II/+, *Coris monspeliensis* II/III, *Thesium divaricatum* II/II, *Aphyllanthes monspeliensis* I/III, *Silene legionensis* I/II, *Argyrolobium zannonii* I/IV, *Fumana ericifolia* I/III, *Genista scorpius* I/IV. Differentials of the subassociations: *Jurinea humilis* III/., *Sideritis hyssopifolia* subsp. *castellana* III/., *Plantago discolor* II/., *Arenaria erinacea* II/., *Paronychia kapela* II/., *Fumana procumbens* I/., *Brachypodium retusum* ./IV, *Thymus vulgaris* ./·IV, *Phlomis lychnitis* ·./II, *Santolina chamaecyparissus* subsp. *squarrosa* ./II, *Inula montana* ./II, *Fumana thymifolia* ./II. (García-Mijangos 1997: tab. 19a, rels. 1-44 / tab. 19b, rels. 1-24).

Bupleuro baldensis-Arenarietum ciliaris: *Arenaria obtusiflora* subsp. *ciliaris* V, *Cerastium pumilum* IV, *Bombycilaena erecta* IV, *Hornungia petraea* IV, *Erophila verna* II, *Euphorbia exigua* II, *Bupleurum baldense* II, *Minuartia hybrida* II, *Xeranthemum inapertum* II. (García-Mijangos 1997: tab. 25, rels. 1-13).

Campanulo hispanicae-Saxifragetum cuneatae: *Asplenium ruta-muraria* IV, *Asplenium trichomanes* III, *Campanula hispanica* III, *Jasonia glutinosa* III, *Ceterach officinarum* III, *Erinus alpinus* III, *Saxifraga cuneata* III, *Sedum dasiphyllum* III, *Chaenorhinum origanifolium* II, *Phagnalon sordidum* II, *Sarcocapnos enneaphylla* I, *Asplenium celtibericum* +. (García-Mijangos 1997: tab. 50, rels. 1-17)

The northern slopes of this mountain range present quite a different vegetation as a result of the different climatic conditions. The increased rainfall and especially the higher frequency of fog permit the development of the *Fagus* series, *Epipactido helleborines-Fago* sigmetum, in the higher stretches. However, most of the beech forests have disappeared and the seral scrub of *Arctostaphylo-Genistetum* is well represented.

Epipactido helleborines-Fagetum sylvaticae: *Fagus sylvatica* V, *Hepatica nobilis* V, *Helleborus occidentalis* V, *Hedera helix IV, Primula veris* subsp. *columnae III*, *Melittis melissophyllum* III, *Helleborus foetidus* III, *Poa nemoralis* III, *Ranunculus tuberosus* III, *Brachypodium sylvaticum* III, *Carex sylvatica* III, *Meliea uniflora* III, *Cephalanthera damasonium* III, *Mercurialis perennis* III, *Ilex aquifolium* III, *Buxus sempervirens* II, *Lonicera xylosteum* II, *Carex flacca* II, *Polystichum aculeatum* II, *Daphne laureola* II, *Vicia sepium* II, *Aquilegia vulgaris* II, *Stellaria holostea* II, *Fragaria vesca* II, *Viola reichenbachiana* II, *Sanicula europaea* II, *Epipactis helleborine* I, *Euphorbia amygdaloides* I. (García-Mijangos 1997: tab. 1, rels. 1-23).

From Portillo de Busto to Tobera

Going down from the Portillo de Busto pass we will get into the Q. *faginea* series and as we lose altitude rainfall decreases and temperature increases. The change takes place at approximately 800 m altitude. The landscape is dominated by the substitution scrub of *Arctostaphylo-Genistetum occidentalis,* which is shared by both vegetation series *Spiraeo-Querco fagineae* sigmetum and *Epipactido-Fago* sigmetum.

The terrain we will pass through is formed by a succession of small mountain ranges and valleys where the height gap is not very important. The route follows a little stream called Molinar which flows over Tertiary sediments. The bottom of the valley, used completely transformed by cereal and potatoes crops, corresponds to the *Q. faginea* series. The riverbank is dominated by *Salix atrocinerea* and its hybrids S. *cantabrica* and S. *x expectata*.

On the slopes of the hills surrounding this valley, the distribution of the different vegetation series is brought about by the substrata. In marl areas the potential vegetation corresponds to the *Q. faginea* forest but most of its area is now covered by the substitution communities. The grasslands belonging to the *Avenulo mirandanae-Brachypodietum phoenicoidis* association *(Festuco-Brometea)* are invaded by species of the scrub of *Arctostaphylo-Genistetum* when they are abandoned and grazing pressure disappears.

Avenulo mirandanae-Brachypodietum phoenicoidis: *Brachypodium phoenicoides* V, *Eryngium campestre* V, *Lotus corniculatus* V, *Plantago lanceolata* V, *Sanguisorba minor IV, Dactylis glomerata* subsp. *hispanica IV, Phleum pratense* subsp. *bertolonii IV, Bromus erectus IV, Daucus carota* IV, *Trifolium pretense IV, Galium verum* III, *Briza media* III, *Avenula mirandana* III, *Scabiosa columbaria* II, *Leucanthemum pallens* II, *Carex flacca* II, *Ononis spinosa* II, *Medicago lupulina* II, *Carlina vulgaris* II, *Onobrychis reuteri* II, *Phleum phleoides* II, *Anacamptis pyramidalis* I, *Ophrys sphegodes* I, *Trifolium ochroleuchon* I, *Pimpinella saxifraga* I, *Hypochoeris radicata* I. (García-Mijangos 1997: tab. 22, rels. 1-22).

Some spots of sandy soils are occupied by the Q. *pyrenaiea* series, *Festuco heterophyllae-Querco pyrenaieae* sigmetum. The seral communities belonging to the *Arctostaphylo crassifoliae-Daboecietum cantabricae* association appear on the degraded soils (Loidi et al. 1997).

Festuco heterophyllae-Quercetum pyrenaicae: *Quercus pyrenaica* V, *Lonicera periclymenum* V, *Pulmonaria longifolia* V, *Melampyrum pratense* V, *Rosa arvensis* V, *Serratula tinctoria* V, *Erica vagans* V, *Crataegus monogyna* V, *Corylus avellana* IV, *Lathyrus linifolius* IV, *Hypericum pulchrum* IV, *Agrostis capillaris* IV, *Brachypodium pinnatum* subsp. *rupestre* IV, *Stachys officinalis* IV, *Juniperus communis* IV, *Ligustrum vulgare* IV, *Hedera helix* IV, *Stellaria holostea* III, *Physospermum cornubiense* III, *Cruciata glabra* III, *Prunus spinosa* III, *Holcus mollis* II, *Acer campestre* II, *Melica uniflora* II, *Luzula forsteri* II, *Melittis melissophyllum* II. (García-Mijangos 1997: tab. 4, rels. 1-8).

Arctostaphylo crassifoliae-Daboecietum cantabricae: *Calluna vulgaris* V, *Erica vagans* V, *Erica cinerea* V, *Potentilla montana* V, *Daboecia cantabrica* V, *Cistus salvifolius* IV, *Genista occidentalis* IV, *Arctostaphylos uva-ursi* subsp. *crassifolia IV, Avenula sulcata IV, Thymelaea ruizii* III, *Genista sagittalis* III, *Simethis matiiazzü* III, *Agrostis curtisii* III, *Glandora diffusa* II, *Hypericum pulchrum* II, *Xolantha tuberaria* II, *Arenaria montana* II, *Physospermum cornubiense* II, *Halimium umbellatum* I. (García-Mijangos 1997: tab. 35, rels. 1-27).

The hard calcareous substrata bear the Q. *rotundifolia* series. The potential vegetation corresponds to the *Spiraeo-Quercetum rotundifoliae* and its seral stage, the thyme grassland of *Koelerio-Thymetum mastigophori brachypodietosum retusi* represents the most abundant vegetation type. Permanent communities dominated by *Buxus sempervirens* and *Juniperus phoenicea (Buxo-Juniperetum phoeniceae, Pistacio-Rhamnetalia, Quercetea ilicis)* occupy the rocky ridges of these small mountain ranges.

Buxo-Juniperetum phoeniceae: *Juniperus phoenicea* V, *Buxus sempervirens* V, *Amelanchier ovalis* V, *Fumana ericifolia* V, *Quercus rotundifolia* IV, *Helichrysum stoechas* IV, *Sedum sediforme* IV, *Helianthemum oelandicum* subsp. *incanum* IV, *Lavandula latifolia* IV, *Arenaria grandiflora* IV, *Galium fruticescens* IV, *Teucrium chamaedrys* III, *Juniperus oxycedrus* III, *Rhamnus alaternus* III, *Genista scorpius* III, *Thymus vulgaris* III, *Jasonia glutinosa* III, *Arctostaphylos uva-ursi* subsp. *crassifolia* III, *Spiraea hypericifolia* subsp. *obovata* II, *Bupleurum rigidum* II, *Pistacia terebinthus* I. (García-Mijangos 1997: tab. 14, rels. 1-24).

At about 600m a.s.l we will arrive atTobera, a small village named after the Quaternary travertine ("toba") deposits hollowed out by the Molinar river.

FIGURE 2.3

Locality: Santa Lucía (between Tobera and Frías). Burgos. 600 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Supramediterranean, subhumid.
Lithology: Limestone, marl.
① Holm-oak forest of *Spiraeo-Quercetum rotundifoliae.*
② Forest of *Spiraeo-Quercetum fagineae*
③ Crops
④ Remains of quejigar *(Spiraeo-Quercetum fagineae)*

Our route will take us along the path between Tobera and Frías, meandering along the southern slope of a small defile formed by the Molinar River. This situation favours warmer conditions permitting the growth of thermophilic species, such as *Quercus coccifera, Pistacia terebinthus* and *Phillyrea angustifolia.* Thus, the potential vegetation corresponds to the *Spiraeo-Quercetum rotundifoliae arbutetosum unedonis* and its first substitution stage is a shrubland of *Quercus coccifera* maquis belonging to the *Spiraeo-Quercetum cocciferae* association.

Spiraeo obovatae-Quercetum cocciferae: *Quercus coccifera* V, *Quercus rotundifolia* V, *Rubia peregrina* V, *Buxus sempervirens* V, *Juniperus oxycedrus* V, *Genista scorpius* V, *Lavandula latifolia* V, *Dorycnium pentaphyllum* V, *Juniperus phoenicea* IV, *Rhamnus alaternus* IV, *Brachypodium retusum* IV, *Thymus vulgaris* IV, *Erica vagans* IV, *Arbutus unedo* III, *Teucrium chamaedrys* III, *Spiraea hypericifolia* subsp. *obovata* III, *Aphyllanthes monspeliensis* III, *Juniperus communis* III, *Amelanchier ovalis* III, *Cistus salvifolius* III, *Arctostaphylos uva-ursi* subsp. *crassifolia* III, *Osyris alba* I. (García-Mijangos 1997: tab. 13, rels. 1-12).

The seral thyme grassland of *Koelerio-Thymetum mastigophori brachypodietosum retusi* presents here a facies dominated by *Lavandula latifolia.*

On arrival at the old city of Frías we will see thecastle which is built with travertine stone which crevices are colonised by communities of *Asplenio-Saxifragion cuneatae* alliance; plants such as *Sarcocapnos enneaphylla, Chaenorhinum origanifolium, Asplenium trichomanes* subsp. *pachyrachys* and *Saxifraga cuneata (Asplenio pachyrachydo-Sarcocapnetum enneaphyllae)* are characteristic.

The road from Frías to Montejo de Cebas runs along the Ebro riverbank, crossing a small defile which cuts the Cretaceous deposits of the Hurnión massif. First we can observe the riparian cornmunities of these territories: the alder forests corresponding to the

Figure 2.3. (From Loidi *et al.* 1999).

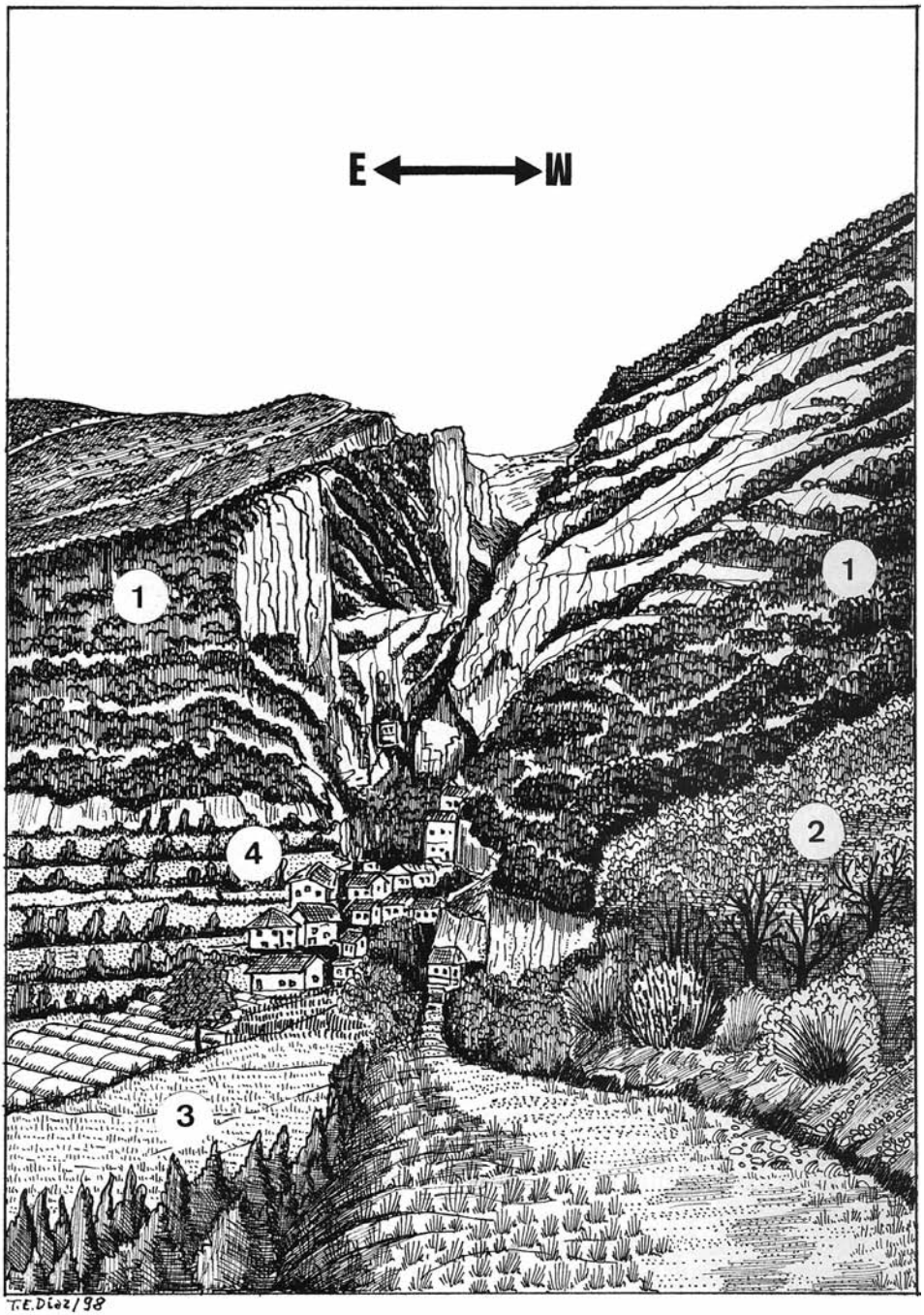


FIGURE 2.4

Locality: Frías. Burgos. 595 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Supramediterranean, subhumid.
Lithology: Limestone, marl.

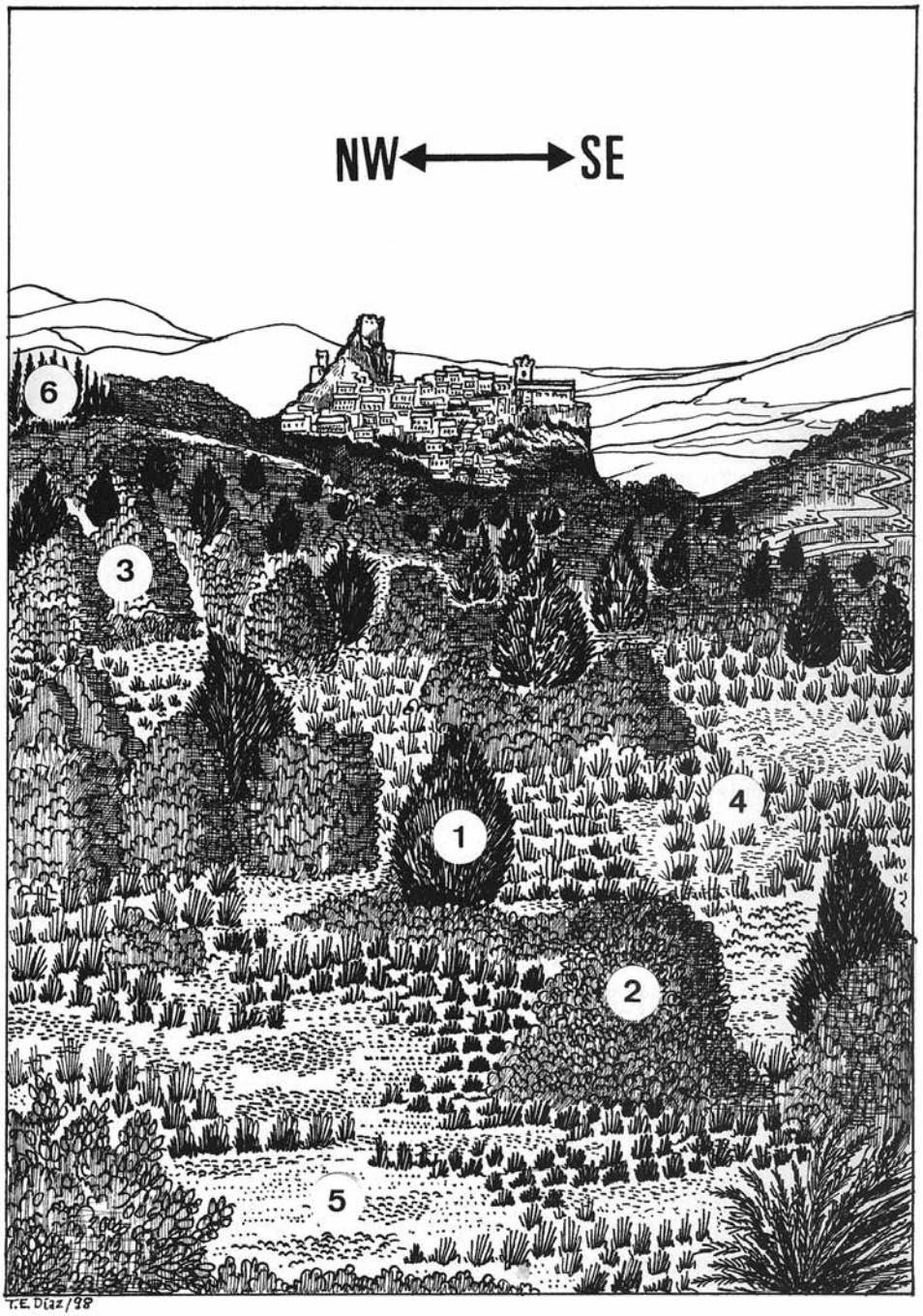
① Secondary coscojar of *Spiraeo-Quercetum cocciferae,* covering old crop fields with abundant juniper (*Juniperus*).
② *Quercus coccifera*.
③ *Buxus sempervirens*.
④ *Lavandula latifolia.*
⑤ Lichen communities with *Cladonia* in the gaps of the coscojar.
⑥ Pine plantations.

Humulo lupuli-Alnetum glutinosae association *(Populion albae),* with several Mediterranean riparian elements such as *Fraxinus angustifolia.* These alder forest represent a transitional aspect between the Eurosiberian alder forests and the riverine *Populus alba* forests of the large Mediterranean rivers. Willow communities of *Salicion triandro-neotrichae (Salicetea purpureae)* grow on the riverbeds. In this locality the alder forest was cut a few years ago and is now in a regeneration stage.

Humulo lupuli-Alnetum glutinosae*: Alnus glutinosa* V, *Humulus lupulus* V, *Salix purpurea* subsp. *lambertiana* V, *Cornus sanguinea* V, *Fraxinus angustifolia* IV, *Salix neotricha* IV, *Clematis vitalba* IV, *Hedera helix* IV, *Brachypodium sylvaticum* IV, *Salix alba* III, *Salix atrocinerea* III, *Ligustrum vulgare* III, *Frangula alnus* III, *Crataegus monogyna* III, *Elymus caninus* III, *Rubus caesius* III, *Salix eleagnos* subsp. *angustifolia* II, *Salix x expectata* II, *Geranium robertianum* II, *Corylus avellana* II, *Euphorbia amygdaloides* II, *Carex pendula* II, *Arum italicum* II, *Populus nigra* II, *Ulmus minor* II, *Solanum dulcamara* II, *Rosa canina* II, *Poa nemoralis* II, *Iris foetidissima* II, *Lonicera xylosteum* II, *Viburnum lantana* II, *Bryonia dioica* II. (Biurrun, García-Mijangos & Loidi 1994: tab. 2, rels. 1-14)

The potential vegetation of this canyon corresponds to the *Quercus rotundifolia* forest ("carrascal") and particularly to the thermophilic subassociation with *Arbutus unedo,* due to the favourable thermic conditions (lower frequency and intensity of frosts). The scrub of *Quercus coccifera* constitutes its substitution stage. We will be able to observe the permanent communities of *Buxo-Juniperetum phoeniceae* on the limestone ridges and cornmunities of *Asplenio celtibericae-Saxifragion cuneatae* in the rock crevices.

Figure 2.4. (From Loidi *et al.* 1999).



From Montejo de Cebas to the Sobrón canyon

After leaving the short defile of Montejo de Cebas, we will arrive at the Villarcayo depression covered by Tertiary sediments. The land use is predominantly agricultural with cereal crops. The potential natural vegetation corresponding to *Spiraeo-Quercetum faginea* forest (quejigar) only remains as hedges on the crop boundaries and as small wooded patches on small hills.

FIGURE 2.5

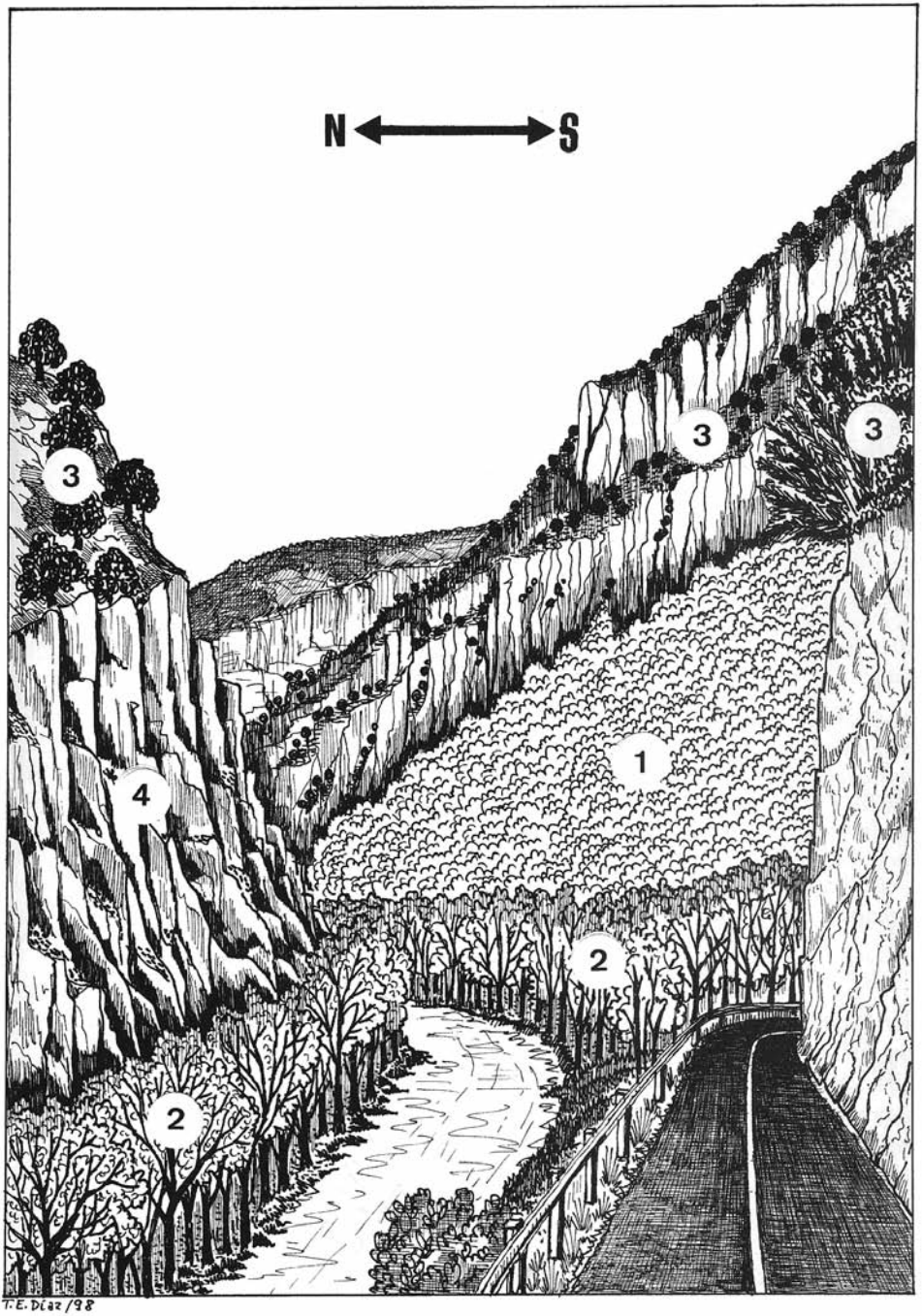
Locality: Ebro river valley between Frías and Montejo. Burgos. 540 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Supramediterranean, subhumid.
Lithology: Limestone, marl.
① Holm-oak forest of *Spiraeo-Quercetum rotundifoliae.*
② Riverine alder forest of *Humulo lupulo-Alnetum glutinosae.*
③ *Buxo-Juniperetum phoeniceae.*
④ Rupicolous communities of *Campanulo-Saxifragetum cuneatae.*

From the village of Santa María de Garoña the road continues along the Sobrón dam. The border of the dam is colonized by the alder forest of *Humulo-Alnetum glutinosae.* We will also be able to observe *Phragmition* communities in the shallow waters of the dam. Before arriving at the village of Sobrón, the Ebro River hollows out the Sierra de Arcena forming a spectacular canyon.

In this beautiful defile the primitive (primeval) vegetation still exists due to the inaccessibility of some of the slopes half way down the cliffs, especially on the right side, bearing *Quercus faginea* and *Q. rotundifolia* forests. The former growing on marl and the latter on hard limestone. The thermic conditions permit the development of thermophilic species such as *Viburnum tinus, Phillyrea angustifolia* and *Pistacia terebinthus,* characterizing the *arbutetosum unedonis* subassociation. Besides, at the foot of the calcareous cliff, species such as *Tilia platyphyllos* and *Acer monspessulanus* are abundant. In the highest parts some beeches appear and even beech forests of *Epipactido-Fagetum* develop.

Spiraeo-Quercetum fagineae: *Quercusfaginea* V, *Viburnum lantana* IV, *Hedera helix* IV, *Crataegus monogyna* IV, *Hepatica nobilis* IV, *Corylus avellana* IV, *Stachys officinalis* IV, *Erica vagans* IV, *Rubia peregrina* IV, *Genista occidentalis* IV, *Carex flacca* IV, *Rosa pimpinellifolia* IV, *Pulmonaria longifolia* IV, *Primula veris* subsp. *columnae* III, *Prunus spinosa* III, *Ligustrum vulgare* III, *Amelanchier ovalis* III, *Juniperus communis* III, *Rosa arvensis* III, *Quercus rotun-*

Figure 2.5. (From Loidi *et al.* 1999).



difolia III, *Spiraea hypericifolia* subsp. *obovata* II, *Lonicera xylosteum* II, *Sorbus aria* II, *Lonicera periclymenum* II, *Stellaria holostea* II, *Acer monspessulanum* II, *Buxus sempervirens* II, *Acer campestre* II, *Melittis melissophyllum* II, *Brachypodium sylvaticum* II, *Helleborus viridis* subsp. *occidentalis* II, *Sorbus torminalis* I, *Lathyrus niger* I. (García-Mijangos 1997: tab. 5, rels. 1-23).

Spiraeo-Quercetum rotundifoliae subass. ***arbutetosum unedonis***: *Quercus rotundifolia* V, *Rubia peregrina* V, *Amelanchier ovalis* V, *Buxus sempervirens* V, *Teucrium chamaedrys* IV, *Juniperus phoenicea* IV, *Rhamnus alaternus* IV, *Carex hallerana* IV, *Ruscus aculeatus* IV, *Genista occidentalis* III, *Genista scorpius* III, *Stachys officinalis* III, *Hedera helix* III, *Sorbus aria* IIL *Spiraea hypericifolia* subsp. *obovata* II, *Juniperus oxycedrus* II, *Lonicera implexa* II, *Piptatherum paradoxum* II, *Bupleurum rigidum* II, *Osyris alba* II, *Phillyrea latifolia* II, *Acer monspessulanum* II, *Tilia platyphyllos* II. Differentials of subassociation: *Arbutus unedo* V, *Viburnum tinus* IV, *Pistacia terebinthus* IV, *Phillyrea angustifolia* IV. (García-Mijangos 1997: tab. 12b, rels. 1-25).

FIGURE 2.6

Locality: Embalse del Ebro (Ebro dam) in Sobrón Canyon. Álava. 520 m
Biogeography: Castilian-Cantabrian sector, Mediterranean Central Iberian province.
Bioclimatic belt: Lower supramediterranean, subhurnid.
Lithology: Limestone, marl.
① Holm-oak forest of *Spiraeo-Quercetum rotundifoliae,* with *Arbutus unedo.*
② Forest of *Spiraeo-Quercetum fagineae* on colluvia.
③ Rupicolous communities of *Campanulo hispanicae-Saxifragetum cuneatae.*
④ *Buxo-Juniperetum phoeniceae.*

Figure 2.6. (From Loidi *et al.* 1999).

excursion 3

The Vegetation of The Valderejo Natural Park

The Natural Park of Valderejo extends over an area of 3,494 ha and is located in the westernmost part of the Basque province of Alava, bordering with the Castilian province of Burgos. It is included in its totality in the municipality of Valdegobia (Figure 3.1). The fauna, flora and vegetation of this territory have, together with its landscape, a high biodiversity conservation value (Fernández de Montoya & al. 1991) which supports its protection. The Natural Park was legally established by decree of 14th January 1992, under the regulations of the law 4/89 about Conservation of Natural Areas and Wild Flora and Fauna. The human population of Valderejo has suffered a severe decrease over the last century. After having reached 400 inhabitants in the early nineteen hundreds, the population started to decrease; at the beginning of the 1960s there were still 200 inhabitants distributed in the four villages existing in the park: Lalastra, Lahoz, Villamardones and Ribera, but currently scarcely 20 persons live permanently within the limits of the park. Cattle and sheep ranching have been, and are still, the main economic activities for the park dwellers, complemented by agriculture and beekeeping.

The general geological conditions of the region are those of a sedimentary marine depression which was lifted by a folding orogeny during the Oligocene, in the context of the Alpine Orogenic cycle. Valderejo is an anticline with a NW-SE axis, where all strata belong to the Cretaceous and all the materials were deposited by marine sedimentation (Figure 3.2). The most recent strata, which constitute the border of the anticline, are the hard limestones of the Coniacian period in the upper Cretaceous. The stratigraphic column is followed by successive marl and limestone strata, and ends with lower Cretaceous (Albian) sandstones. This latter appear in the centre of the valley, at the core of the anticline, as they are the oldest materials. Three types of substrata can be distinguished: Coniacian or Urgonian (Cenomanensian) limestone, Turonian marl

and Albian sandstone. They are carbonate-rich rocks and form base-rich soils, although sandstone has a lower content of lime and can easily form more acidic soils. Consequently, and with the exception of the sands, the majority of the substrata are calcareous and the flora and plant communities that inhabit them are predominantly basophilous.

The orographic structure of the area is determined by theabove mentioned anticline. Its borders are formed by calcareous Coniacian alignments which close the valley in the northeast and southwest and reach the highest summits of the park, such as Recuenco (1,240 m), Vallegrull (1,226), Peña Carria (1,100) and Santa Ana (1,042). The fluvial network is governed by the Purón river, a tributary of the Ebro, which after crossing the Valderejo anticline entirely enters the Tobalina Valley before joining the mightyEbro river, a major Iberian waterway; the rivulets Polledo and Ampo are its main tributaries.

Valderejo can be considered a good example of the vegetation of the Castilian-Cantabrian biogeographic sector (Loidi & Fernández Prieto 1986) as it is shown in Figure 0.4. The relatively high elevations together with the occurrence of some areas with acidic substrata give a certain originality to its vegetation. Beech forests, acidophile heathlands and mires, vegetation types normally scarce in the Castilian-Cantabrian sector, are responsible for this particularity.

From the bioclimatic point of view, the whole area of Valderejo is under the Suprasubmediterranean thermotype and the ombrotypes range between subhumid and humid, depending on elevation and orientation: north and northwestern are the rainiest slopes, while the south and southeast are the driest. In the excursion, the climatic moisture (rain, snow, fog) gradient will be followed as we descend in elevation, and as walk southwards, leaving behind us several mountain ranges which will increase the rainshadow effect.

On hard limestones, Urgonian and mostly Coniacian lithosols often develop and on them thrive the most xerohytic vegetation types such as *Quercus rotundifolia* and *Juniperus phoenicea* woodlands, *Festuca hystrix* grasslands, rupicolous (cliffs and screes) communities, etc. Marl substrata sustain more dependent on watervegetation; usually all the communities associated to *Quercus faginea* forest are found on them. In this case, the soils are deeper and more valuable for human exploitation and hence the vegetation is more transformed due to a higher intensity of human activities. Finally, Albian lime-rich sandstone, due to its high water storage capacity, is covered by the most water-demanding (hygrophilic) vegetation types, such as beech forests. This type of substratum is easily leached of the soluble bases and the upper layers of the soil become acidic, favouring the existence of acidophilous heathlands. In the contact areas

between sandstone and limestone are a number of wells which give way to small fens and even mires.

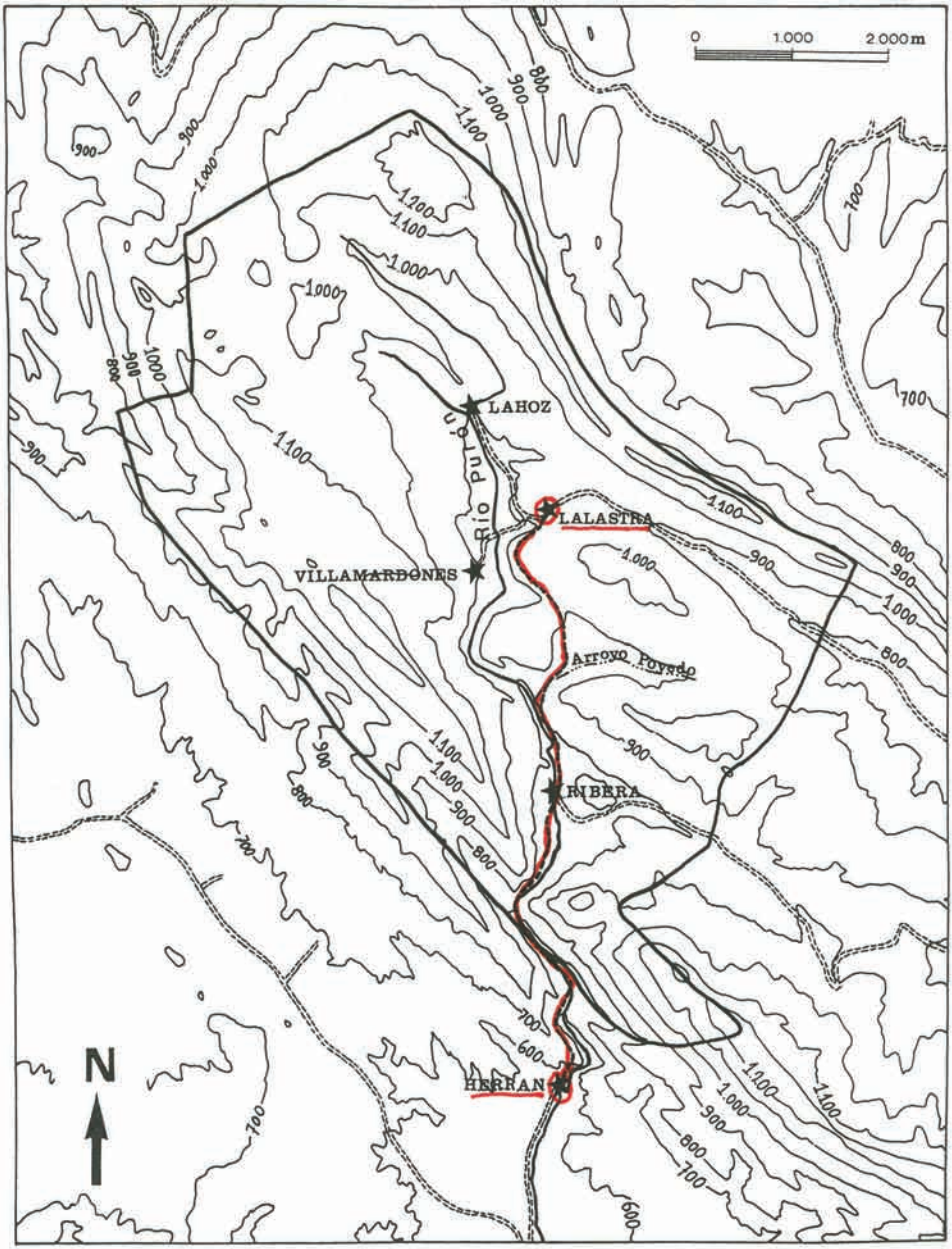


Figure 3.1. Map of Valderejo Natural Park: layout of the hike (from Loidi *et al.* 1994).

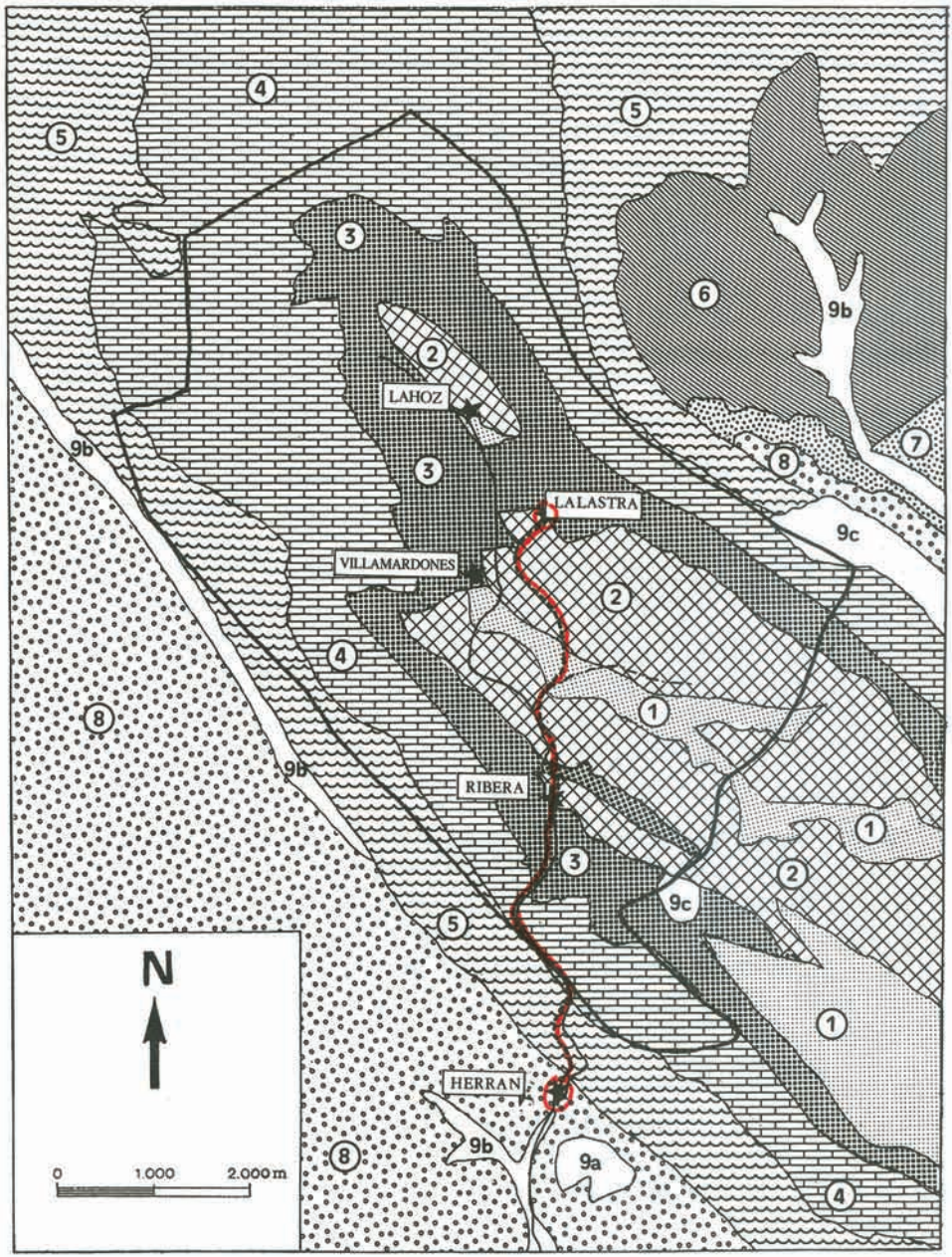


Figure 3.1. Geologic map of Valderejo. 1. Albian sandstone; 2. Cenomaniensian (Urgonian) limestone; 3. Turonian marl; 4. Coniacian limestone and dolomite; 5. Santonian marl; 6. Campanian sandy marl, sandstone and limolite; 7. Maestrichtian limestone; 8. Tertiary conglomerates, clay and sandstone; 9. Quaternary : 9a Terraces (Pleistocene), 9b Alluvial (Holocene), 9c Colluvial (Holocene) (from Loidi *et al.* 1994).

Land use has changed throughout the history of Valderejo. For many centuries, it was predominantly cattle and sheep ranching complemented by subsistence agriculture. Forestry has been also relevant in the area, mostly based on the logging of *Pinus sylvestris* which, historically, has produced a profound transformation in the landscape of many areas within the park. This pine forestry has been based on selective logging of other competing trees that grew in the surroundings in order to obtain firewood or charcoal. As a result, pines were favoured and the pine stands developed to a height and size suitable for houses or ship building purposes. Pines were differentially treated in comparison with other competing trees, such as *Fagus sylvatica, Quercus faginea* or *Quercus rotundifolia*, leading to a sort of "pinarization" of the landscape of Valderejo. This has induced the idea that in Valderejo there is a *Pinus sylvestris* natural forest (as PNV), when they really are artificially favoured pine stands occupying the natural area (tessella) of the beech and oaks (Loidi et al. 1994). This is revealed by the stubborn appearance of *Fagus* and *Quercus* saplings within the pine stands. The decrease of the logging activity has been accompanied by an increase of the *Quercus* and *Fagus* populations growing within the pine forest understory. Only sufficient time without human disturbance will reveal if pines can endure the competition of the local *Fagaceae*.

Itinerary of the hike

The excursion has a descending route of about 8 km in length and an altitudinal gradient of approximately 300 m (starting at 850 m and ending at 550 m); we will leave the village of Lalastra (VI) and reach Herrán (BU), passing through the abandoned village of Ribera and crossing the border between the Basque Country and the Castile and León autonomous communities (Figure 3.1). It begins in a zone of marls, in which Lalastra is located, to immediately pass to the Urgonian limestones for a short stretch. After crossing them, the path is interred by the Albian sandstones, which later give way again to another portion of Urgonian limestones, which, before Ribera, give rise to a small gorge. This village, now abandoned, is also located in marls, which are bounded by the sloping strata of the Coniacian limestones that make up the western edge of the anticline and draw the peaky and rocky skyline of the valley. These hard limestones are crossed by the river Purón, giving rise to an impressive gorge to the end of which is the village of Herrán, the end point of our hike (Figure 3.2).

Leaving the village of Lalastra, the path crosses the landscape on Turonian marls for a short stretch, showing the set of communities typical of the *Quercus faginea* forest (sigmetum). One of the most relevant communities is that corresponding to the hedges of the forest mantle association *Lonicero-Rosetum agrestis,* of which we made the following relevé: Outskirts of Lalastra at an elevation of 860. on 200 m^2:

Crataegus monogyna 3, *Acer monspessulanum* 2, *Prunus spinosa* 2, *Corylus avellana* 2, *Rubus ulmifolius* 2, *Rosa micrantha* 2, *Rosa agrestis 1, Lonicera xylosteum 1, Acer campestre 1, Fraxinus excelsior 1, Lonicera periclymenum* +, *Quercus faginea* +, *Viburnum lantana* +. *Ulmus minor* +. *Ilex aquifolium* +.

After a few meters we will encounter the Urgonian hard limestones and thePNV changes in the *Quercus rotundifolia* woodland. The sigmetum completely changes, and several seral stages can be observed and are represented in figure 3.3. From this place, the northwestern part of Valderejo, included the abandoned village of Villamardones, can be seen.

The core of the anticline is reached in the stretch of the path in which it descends parallel to the Polledo rivulet, and we will have the opportunity to see the Albian sandstones. This area encompasses another dramatic change in the vegetation as several water-demanding communities appear: the beech forests of *Carici sylvaticae-Fagetum verinicetosum montanae* (Figure 3.4) and some other communities, among which acidiphilous heathlands (probably favoured the lixiviation of soluble basic nutrients in upper soil layers) are remarkable.

The association for these heathlands is *Daboecio-Ulicetum gallii* and we made a relevé of it at an elevation 820 m, and on an area of 30 m^2:

Ulex gallii 3, *Erica vagans* 3, *Daboecia cantabrica* 2, *Pteridium aquilinum 1, Lathyrus linifolius* 1, *Rubus ulmifolius* 1, *Potentilla erecta* 1, *Avenula marginata 1, Arenaria montana* 1, *Hypericum pulchrum* +, *Serratula tinctoria* +, *Stachys officinalis* +, *Thymelaea ruizii* +, *Potentilla montana* +, *Cruciata glabra* +, *Polygala serpyllifolia* +, *Thymus pulegioides* +.

In this area a site with a spring which give way to a rush community and to a small fen can be found. This is represented in figure 3.5.

After passing this point, we will cross through the little canyon before Ribera, in which the *Quercus rotundifolia* woods and associated communities (sigmetum) appear. On the rocky steep slopes and crests, the edafoxerophilous *Juniperus phoenicea* is present on lithosols, while the willow woods of *Salix eleagnos* subsp. *angustifolia* thrive in the Polledo rivulet (Figure 3.6). At the end of the gorge the ruins of Ribera appear, in the edge of a little flatland of marly materials. This open land has been the arable land for the Ribera dwellers and is now devoted to forage crops for cattle. At this point, the path joins with the Purón river and our trek will follow that watercourse until the end of our hike. At the end of the little flatland we will enter a second canyon which crosses the Coniacian hard limestones. The distribution of the *Quercus rotundifolia* and the *Q.*

faginea forests following the soil moisture gradient can be appreciated (Figure 3.7), as well as the *Buxo-Juniperetum phoeniceae* woods in the cliffs and steeper positions. Across the canyon there are some cliffs, often overhanging, on which some particular *Asplenietea* communities establish. Among them is a noteworthy Iberian endemic fern *Asplenium celtibericum*, as found in the following relevé:

Calcareous overhang, Purón canyon, 700 m of altitude, on 20 m^2

Asplenium celtibericum 1, *Asplenium trichomanes* 1, *Asplenium ruta-muraria* 1, *Campanula hispanica* l.

Figure 3.8 represents the typical communities found in the Purón canyon, such as *Quercus rotundifolia* woods, cliffs and screes.

FIGURE 3.3. Outskirts of Lalastra towards Ribera. 860 m

Urgonian limestones with *Genistion occidentalis* scrub and *Plantagini-Thymion mastigophori* grassland. In the northwest the ruins of the village of Villamardones can be envisaged at the foot of the cliffs and at the right side of the croplands occupying the lowlands.

① Basophilous beech forest: ***Carici sylvaticae-Fagetum.***
② Pine stands of ***Pinus sylvestris***.
③ Meadows of ***Cynosurion cristati***.
④ Basophilous scrub: ***Arctostaphylo-Genistetum occidentalis*** (50 m^2):
Erica vagans 4, *Arctostaphylos crassifolia* 3, *Genista occidentalis* 1, *Avenula vasconica* 2, *Potentilla verna* 1, *Potentilla montana* 2, *Helianthemum nummularium* 2, *Brachypodium rupestre* 2, *Sanguisorba minor* 1, *Teucrium pyrenaicum* 1, *Juniperus communis* 1, *Arenaria grandiflora* 1, *Geum sylvaticum* 1, *Crataegus monogyna* 1, *Filipendula vulgaris* +, *Quercus rotundifolia* +, *Globularia vulgaris* +, *Carduncellus mitissimus* +.
⑤ Grassland-scrub: ***Koelerio vallesianae-Thymetum mastigophori*** (30 m^2):
Festuca hystrix 1, *Koeleria vallesiana* 3, *Carex humilis* 2, *Thymus praecox* subsp. *britannicus* 2, *Carduncellus monspeliensis* 2, *Globularia vulgaris* 1, *Teucrium expassum* 1, *Coronilla minima* 1, *Filipendula vulgaris* 1, *Seseli montanum* 1, *Ononis striata* 1, *Helianthemum canum* 1, *H. apenninum* 1, *Bellis perennis* 1, *Plantago lanceolata 1, Leontodon taraxacoides* 1, *Linum milleti* +, *Anthyllis vulneraria* +, *Teucrium chamaedrys* +, *Convolvulus cantabrica* +, *Aphyllantes monspeliensis* +, *Arenaria grandiflora* +, *Acinos alpinus* +, *Geum sylvaticum* +. *Lavandula latifolia* +, *Genista scorpius* +, *Eryngium campestre* +, *Sanguisorba minor* +, *Helichrysum stoechas* +, *Muscari comosum* +, *Sedum album* +, *Galium pinetorum* +, *Arenaria ciliaris* +, *Trinia glauca* +, *Sherardia arvensis* +, *Euphorbia exigua* +, *Asterolinon linum-stellatum* +, *Cerastium pumilum* +', *Bombycilaena erecta* +, *Logfia minima* +.
⑥ Villamardones ruins.

Figure 3.3. (From Loidi *et al.* 1994).

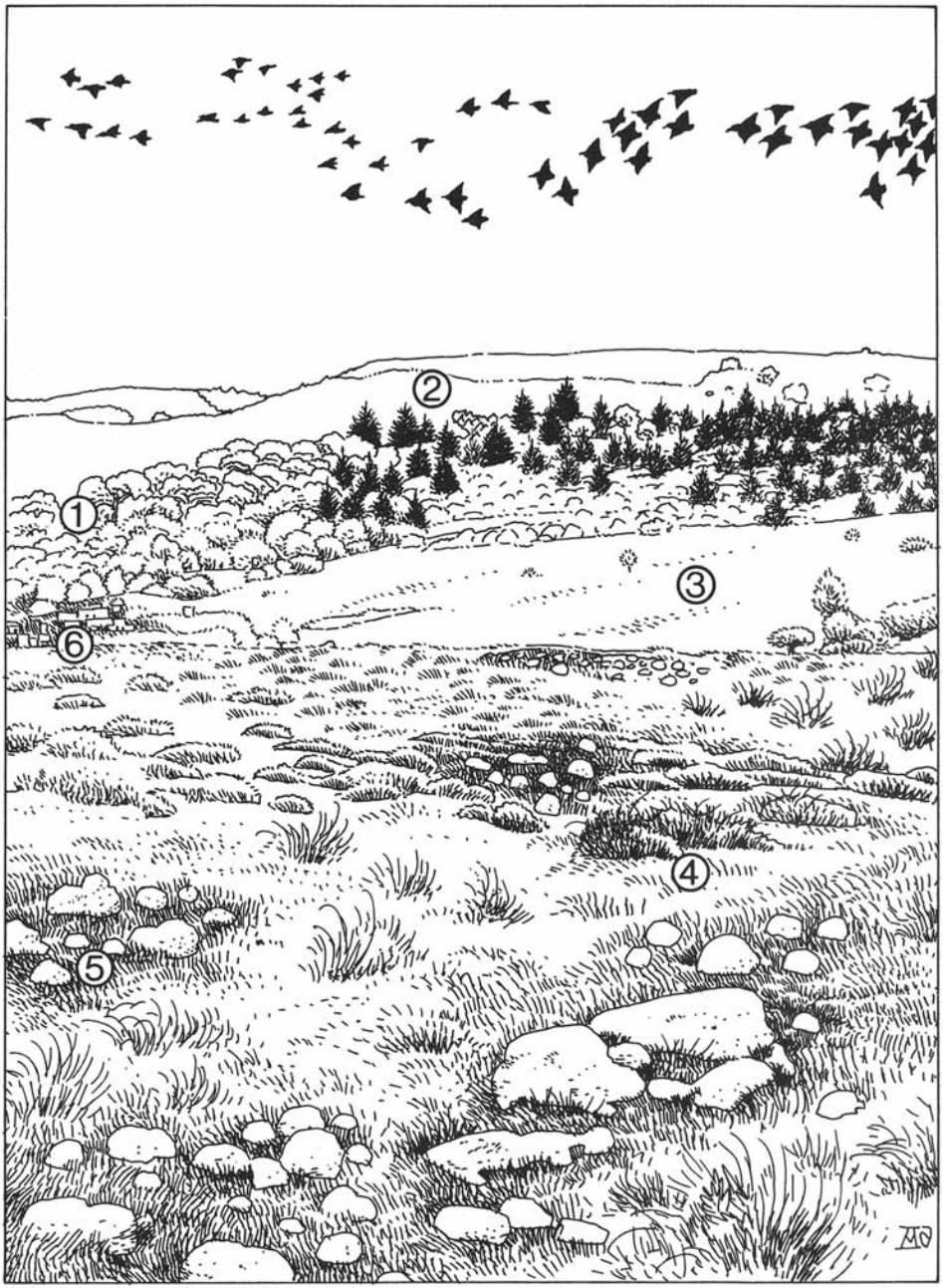


FIGURE 3.4. Beech forest. 900 m

At the end of the first stretch of the Urgonian limestones, we encounter the sandstone substrata of the Albian period. This is accompanied by the appearance of beech forests. There we can appreciate how these Basque-Cantabrian beech forests have very sparse understory layers. In this place there is a site which was prepared to make charcoal (ikaztegi). Charcoal making was a very important activity in the Basque Country in the past because it had to provide abundant charcoal to the primitive but important iron industry (ironworks). It is estimated that to obtain 2 kg of iron 4- 5 kg of beech or oak charcoal are needed, and to obtain 1 kg of charcoal 5 kg of firewood are needed. Thus, 25 kg of firewood were needed to obtain 1 kg of iron using the old artisanal methods Between the XVI to XVIII centuries, it is estimated that the 300 ironworks functioning in the Basque Country produced annually ca. 21,000 tons of iron and steel, i.e. they needed 530,000 tons of firewood per year. The forests and woodlands of this area suffered intensive coppicing and pruning for firewood production as there was this important demand added to the domestic uses (López Quintana 1984).

Carici sylvaticae-Fagetum veronicetosum montanae (250 m^2):
Fagus sylvatica 5, *Helleborus viridis* subsp. *occidentalis* 1, *Carex sylvatica* 1, *Ilex aquifolium* 1, *Holcus mollis* 1, *Euphorbia dulcis* 1, *Veronica chamaedrys* +, *Hepatica nobilis* 1, *Viola* gr. *sylvestris* 1, *Ranunculus tuberosus* 1, *Poa trivialis* 1, *Crataegus monogyna* +, *Vicia sepium* +, *Stellaria holostea* +, *Veronica montana* +, *Euphorbia amygdaloides* +, *Ajuga reptans* +, *Pinus sylvestris* +, *Festuca rubra* +, *Melica uniflora* +, *Pteridium aquilinum* +, *Dryopteris affinis* +, *Erica vagans* +, *Deschampsia flexuosa* +, *Conopodium* sp. +, *Anthoxanthum odoratum* +, *Carexflacca* +, *Luzula multiflora* +, *Rubus* sp. +.

Figure 3.4. (From Loidi *et al.* 1994).

FIGURE 3.5. Fen and rush vegetation. 840 m

The end of the sandstone coincides with the source of waters from the aquifer they host. In this place, the well causes the rise of a little fen surrounded by a reed community formed by *Juncus subnodulosus*. The fen presents a floristic composition similar to that found in the lowlands of the Basque-Cantabrian area, as happens with beech forests and heathlands.

① Reed community: ***Lysimachio ephemeri-Holoschoenetum*** (40 m^2)
Juncus subnodulosus 3, *Molinia caerulea* 2, *Schoenus nigricans* 2, *Mentha aquatica* 1, *Epipactis palustris* 1, *Eriophorum latifolium* 1, *Carex panicea* 1, *Lysimachia ephemerum* +, *Carex lepidocarpa* +, *Equisetum arvense* +, *Potentilla erecta* +, *Dactylorhiza elata* subsp. *sesquipedalis* +, *Gymnadenia conopsea* +, *Succisa pratensis* +.

② Fen: ***Anagallido-Juncetum bulbosi*** (15 m^2)
Juncus bulbosus 2, *Molinia caerulea* 2, *Carex lepidocarpa* 2, *Schoenus nigricans* 2, *Anagallis tenella* 1, *Scirpus cernuus* 1, *Eriophorum latifolium* 1, *Pinguicula grandijlora* +, *Mentha aquatica* +, *Carex panicea* +, *Carex echinata* +, *Pedicularis sylvatica* +.

Figure 3.5. (From Loidi *et al.* 1994).

FIGURE 3.6. Polledo rivulet gorge. 750 m

The Urgonian limestones are again crossed along the route, and in this section they form a small gorge carved by the Polledo rivulet, with typical geomorphological formations such as cliffs and crests. The river banks have several willow species intermingled with beech individuals.

① Juniper groves: ***Buxo-Juniperetum phoeniceae*** (70 m^2)
Juniperus phoenicea 4, *Juniperus oxycedrus* 2, *Amelanchier ovalis* 2, *Spiraea hypericifolia* subsp. *obovata* 2, *Genista occidentalis* 1, *Genista scorpius* 1, *Rhamnus alpina* 1, *Globularia nudicaulis* 1, *Thymus vulgaris* 1, *Aphyllantes monspeliensis* 1, *Arctostaphylos uva-ursi* subsp. *crassifolia* 1, *Helianthemum canum* 1, *Carex humilis* 1, *Festuca hystrix* 1, *Pinus sylvestris* +, *Lavandula latifolia* +, *Sanguisorba minor* +, *Quercus rotundifolia* +, *Teucrium pyrenaicum* +, *Anthyllis vulneraria* +, *Quercus faginea* +, *Dorycnium pentaphyllum* +, *Koeleria vallesiana* +, *Teucrium chamaedrys* +, *Erinus alpinus* +, *Juniperus communis* +.
② Holm-oak forests: ***Spiraeo-Quercetum rotundifoliae***.
③ Willows: ***Salicion albae***
④ ***Genistion occidentalis*** scrub in mosaic with ***Plantagini-Thymion mastigophori*** grasslands.

Figure 3.6. (From Loidi *et al.* 1994).

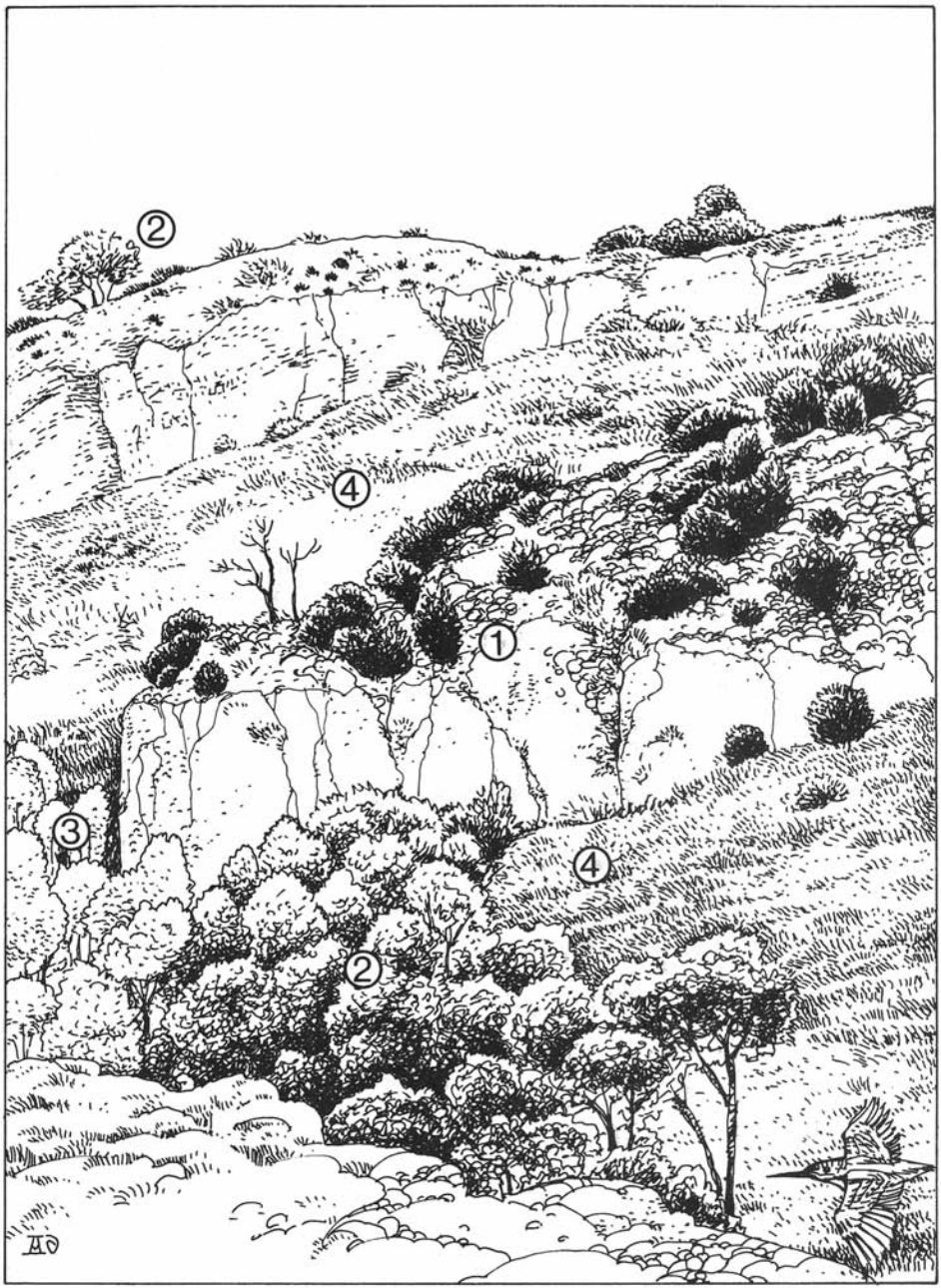


FIGURE 3.7. Ribera, entrance to the Purón river gorge. 730 m

The abandoned village of Ribera is built on Urgonian limestones which border the marl materials of the flat area that lies between them and the Coniacian limestones which form the next gorge. This flat area was the arable land worked by the village inhabitants and is currently a grassland. The entrance to the gorge presents a view with cliffs crossed by strips of land covered with *Quercus faginea* vegetation.

Figure 3.7. (From Loidi *et al.* 1994).

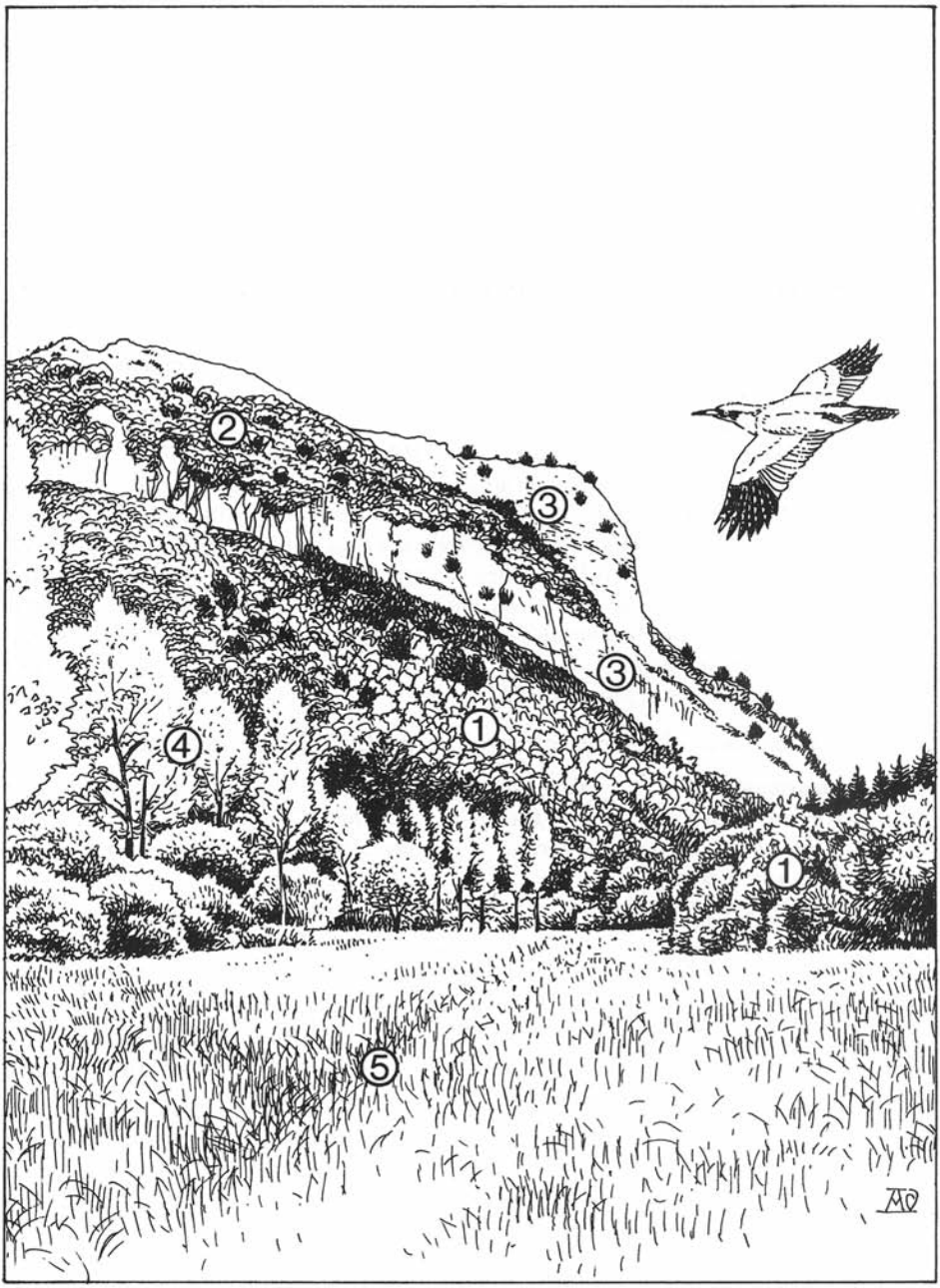


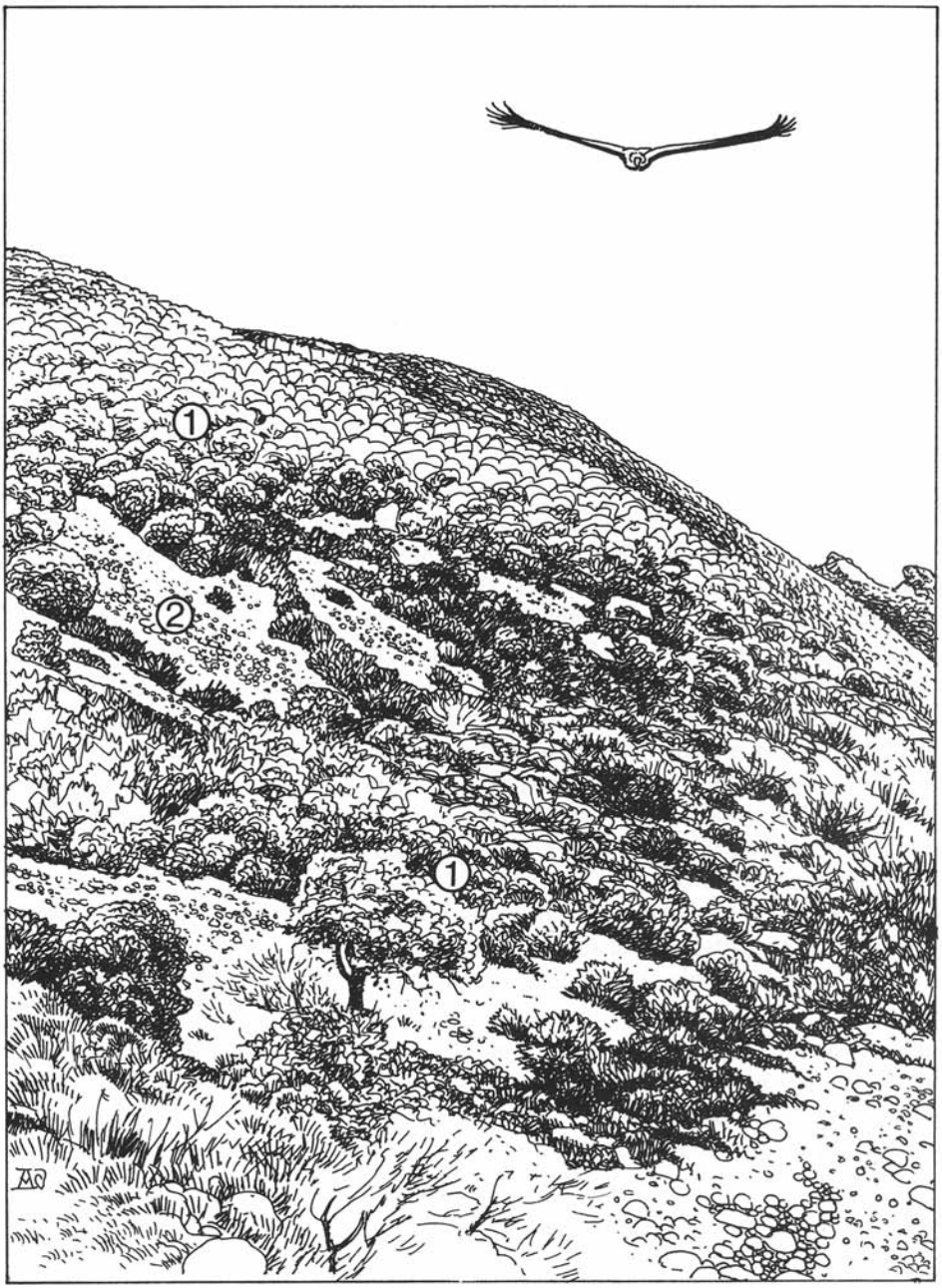
FIGURE 3.8. Purón river gorge. 700 m

The Coniacian limestones are carved to make a narrow gorge with many vertical and overhanging surfaces. The waters flow along little cascades and the wells originate travertine rocks (tuff) much used in old timers as building material. This can be observed in the small medieval bridges. The main Vegetation series is that of the Castilian-Cantabrian holm-oak, but the steep relief offers many different rocky habitats such as cliffs, screes and crests.

① Holm-oak forest: ***Spiraeo-Quercetum rotundifoliae*** (two reléves. 850/800 m, 100/150 m^2) *Quercus rotundifolia* 3/4, *Juniperus communis* 4/1, *Quercus x gracilis* -/2, *Juniperus phoenicea* 1/1, *Rhamnus saxatilis* 1/-, *Spiraea obovata* 1/2, *Quercus faginea* +/11, *Amelachier ovalis* -/1, *Rosa agrestis* 1/1, *Crataegus monogyna* +/+, *Rosa micrantha* -/+, *Prunus spinosa* +/+, *Ilex aquifolium* -/+, *Viburnum lantana* -/+, *Rhamnus alpina* -/+, *Genista scorpius* 2/-, *Erica vagans* 2/-, *Rosa squarrosa* +/-, *Genista occidentalis* 1/1, *Teucrium chamaedrys* 1/1, *Brachypodium rupestre* 1/1, *Helleborus foetidus* -/1 , *Thalictrum tuberosum* -/1, *Lavandula latifolia* +/1, *Aphyllantes monspeliensis* -/1, *Bromus erectus* -/2, *Primula veris* -/1, *Arctostaphylos crassifolia* +/-, *Cistus salvifolius* +/-, *Artemisia alba* -/+, *Sesleria argentea* -/+, *Poa nemoralis* -/+, *Euphorbia occidentalis* -/+, *Pinus sylvestris* -/+, *Rubus ulmifolius* -/+, *Acer campestre* -/+, *Sanguisorba minor* -/+, *Viola* gr. *sylvestris* -/+, *Epipactis helleborine* -/+, *Brachypodium phoenicoides* -/+,

① Communities within limestone gravel (outcrops?): ***Iberido-Linarion propinquae*** (100 m^2) *Linaria proxima* 1, *Scrophularia crithmifolia* subsp. *burundana* 1, *Geranium purpureum* 1, *Rumex scutatus* 1, *Biscutella laevigata* 1, *Centranthus lecoqii* +, *Sedum altissimum* +, *Rubia peregrina* +, *Sedum dasiphyllum* +, *Teucrium pyrenaicum* +.

Figure 3.8. (From Loidi *et al.* 1994).



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list of taxa

Acer campestre L.
Acer monspessulanum L.
Acer pseudoplatanus L.
Achillea millefolium L.
Acinos alpinus (L.) Moench
Aetheorhiza bulbosa (L.) Cass
Agrostis capillaris L.
Agrostis curtisii Kerguélen
Agrostis stolonifera L.
Aira caryophyllea L.
Ajuga reptans L.
Alliaria petiolata (M. Bieb.) Cavara & Grande
Allium ericetorum Thore
Allium sphaerocephalon L.
Alnus glutinosa (L.) Gaertn.
Alyssum minus Rothm.
Alyssum montanum L.
Amaranthus blitum L.
Amaranthus deflexus L.
Amaranthus hybridus L.
Amaranthus retroflexus L.
Ambrosia artemisiifolia L.
Amelanchier ovalis Medik.
Ammophila arenaria (L.) Link subsp. *australis* (Mabille) Laínz
Anacamptis pyramidalis (L.) Rich.

Anagallis tenella (L.) L.
Andryala integrifolia L.
Anemone nemorosa L.
Anthoxanthum odoratum L.
Anthriscus sylvestris (L.) Hoffm.
Anthyllis vulneraria L. subsp. *sampaioana* (Rothm.) Vasc.
Anthyllis vulneraria L. subsp. *iberica* (W. Becker) Jalas ex Cullen
Aphyllantes monspeliensis L.
Apium graveolens L.
Aquilegia vulgaris L.
Arbutus unedo L.
Arctostaphylos uva-ursi (L.) Spreng. subsp. *crassifolia* (Braun-Blanq.) Rivas Mart. in De la Torre, Alcaraz & M.B. Crespo
Arctotheca calendula (L.) Levyns
Arenaria ciliaris see *Arenaria obtusiflora* subsp. *ciliaris*
Arenaria erinacea Boiss.
Arenaria grandiflora L.
Arenaria leptoclados (Reichenb.) Guss.
Arenaria montana L.
Arenaria obtusiflora Kunze subsp. *ciliaris* (Loscos) Font Quer
Argyrolobium zannonii (Turra) P.W. Ball
Armeria pubigera (Desf.) Boiss. subsp. *depilata* (Bernis) Fdez Prieto &Loidi
Arrhenatherum elatius (L.) Beauv. Ex J. & C. Presl subsp. *bulbosum* (Willd.) Schübl. & G. Martens
Artemisia alba Turra
Arum italicum Mill.
Asparagus officinalis L. subsp. *prostratus* (Dumort.) Corb
Asperula cynanchica L.
Asphodelus albus Mill. subsp. albus
Asphodelus fistulosus L.
Asplenium adiantum-nigrum L.
Asplenium celtibericum Rivas Mart.
Asplenium marinum L.
Asplenium onopteris L.
Asplenium ruta-muraria L.
Asplenium trichomanes L.
Asterolinon linum-stellatum (L.) Duby in DC.
Atriplex prostrata Boucher ex DC.
Avenula lodunensis (dealstre) Kerguélen
Avenula mirandana Sennen see *A. pratensis* subsp. *vasconica*
*Avenula pratensis (*L). Dumort. subsp. *vasconica* (St Yves) Romo

Avenula sulcata Gay ex Boiss. see. *A. lodunensis*
Baccharis halimifolia L.
Ballota nigra L. subsp. *foetida* Hayek
Bellis perennis L.
Bellis sylvestris Cirillo
Beta maritima L.
Betula celtiberica Rothm. & Vasc.
Biscutella valentina (Samp.) Guinea
Bombycilaena erecta (L.) Smoljan
Brachypodium distachyon (L.) Beauv.
Brachypodium phoenicoides (L.) Roem. & Schult.
Brachypodium pinnatum (L.) P. Beauv. subsp. *rupestre* (Host) Schüb & G. Martens
Brachypodium retusum (Pers.) P. Beauv.
Brachypodium sylvaticum (Huds.) P. Beauv.
Brassica oleracea L.
Briza media L.
Briza minor L.
Bromus diandrus Roth
Bromus erectus Huds.
Bromus hordeaceus L.
Bromus madritensis L.
Bromus ramosus Huds.
Bromus sterilis L.
Bromus willdenowii Kunth.
Bryonia cretica L. subsp. *dioica* (Jacq.) Tutin see *Bryonia dioica*
Bryonia dioica see *Bryonia cretica* subsp *dioica*
Bupleurum baldense Turra
Bupleurum rigidum L.
Bupleurum tenuissimum L.
Buxus sempervirens L.
Cakile maritima Scop. subsp. *integrifolia* (Hornem.) Hyl.
Calamintha sylvatica Bromf. subsp. *ascendens* (Jordan) P. W. Ball
Calluna vulgaris (L.) Hull
Calystegia soldanella (L.) R. Br.
Campanula glomerata L.
Campanula hispanica Willk.
Campanula patula L.
Campanula rapunculoides L.
Campanula rapunculus L.
Carduncellus mitissimus (L.) DC.
Carduncellus monspelliensium All.

Carduus defloratus L. subsp. *medius* (Gouan) Bonnier
Carduus nutans L.
Carduus pycnocephalus L.
Carduus tenuiflorus Curtis
Carduus tenuiflorus Curtis
Carex arenaria L.
Carex caryophyllea Latourr.
Carex cuprina (I. Sándor ex Heuff.) Nendtv. ex A. Kern.
Carex distans L.
Carex divisa Hudson
Carex divulsa Stokes
Carex echinata J. A. Murray
Carex extensa Gooden.
Carex flacca Schreb.
Carex hallerana Asso
Carex hirta L.
Carex humilis Leyss.
Carex lepidocarpa Tausch
Carex ornithopoda Willd.
Carex panicea L.
Carex pendula Huds.
Carex punctata Gaudin
Carex sylvatica Huds.
Carlina corymbosa L.
Carlina vulgaris L.
Centaurea calcitrapa L.
Centaurea nigra L.
Centranthus calcitrapae (L.) Dufresne
Centranthus lecoqii Jord.
Centranthus ruber (L.) DC.
Cephalanthera damasonium (Mill.) Druce
Cerastium diffusum Pers.
Cerastium glomeratum Thuill.
Cerastium pumilum Curtis
Cerastium semidecandrum L.
Ceterach officinarum Willd.
Chaenorhinum origanifolium (L.) Kostel.
Chamaemelum nobile (L.) All.
Chenopodium album L.
Chenopodium ambrosioides L.
Chenopodium murale L.

Chiliadenus glutinosus (L.) Fourr.
Cirsium arvense (L.) Scop.
Cirsium filipendulum Lange
Cirsium palustre (L.) Scop.
Cirsium pyrenaicum (Jacq.) All.
Cirsium richterianum Gillot
Cirsium vulgare (Savi) Ten.
Cistus salviifolius L.
Clematis vitalba L.
Cochlearia aestuaria (Lloyd) Heywood
Convolvulus arvensis L.
Convolvulus cantabrica L.
Conyza bilbaoana E.J. Rémy
Conyza bonariensis (L.) Cronq.
Conyza canadensis (L.) Cronq.
Conyza sumatrensis (Retz) E. Walker
Coris monspeliensis L.
Cornus sanguinea L.
Coronilla minima L.
Cortaderia selloana (Schult & Schult. f.) Asch. & Graebn.
Corylus avellana L.
Cotula coronopifolia L.
Crataegus monogyna Jacq.
Crepis albida Vill.
Crepis lampsanoides (Gouan) Tausch
Crepis pulchra L.
Crepis vesicaria L. subsp. *taraxacifolia* (Thuill.) Thell.
Crithmum maritimum L.
Cruciata glabra (L.) Ehrend.
Cruciata laevipes Opiz
Cruciata laevipes Opiz
Cymbalaria muralis P. Gaertner, B. Meyer & Scherb.
Cynodon dactylon (L.) Pers.
Cynoglossum officinale L.
Cynosurus cristatus L.
Cynosurus echinatus L.
Cyperus eragrostis Lam.
Cystopteris viridula (Desv.) Desv.
Daboecia cantabrica (Huds.) C. Koch
Dactylis glomerata L.
Dactylis glomerata L. subsp. *hispanica* (Roth) Nyman

Dactylorhiza elata (Poir.) Soó subsp. *sesquipedalis* (Willd.) Soó
Daphne laureola L.
Daucus carota L.
Daucus carota subsp. *gummifer* (Syme) Hook. fil.
Deschampsia flexuosa (L.) Trin.
Desmazeria marina (L.) Druce
Desmazeria rigida (L.) Tutin
Dianthus hyssopifolius L.
Dianthus hyssopifolius L. subsp. *gallicus* (Pers.) M. Laínz & Muñoz Garm.
Dianthus pungens subsp. *brachyanthus* (Boiss.) M. Bernal, Fern. Casas, G. López, M. Laínz & Muñoz Garm.
Digitaria sanguinalis (L.) Scop.
Dipsacus fullonum L.
Dittrichia viscosa (L.) W. Greuter
Dorycnium hirsutum (L.) Ser.
Dorycnium pentaphyllum Scop.
Dorycnium rectum (L.) Ser.
Dryopteris affinis (Lowe) Fraser-Jenk.
Dryopteris affinis (Lowe) Fraser-Jenkins subsp. *borreri* (Newman) Fraser-Jenkins
Dryopteris dilatata (Hoffm.) Gray
Dryopteris filix-mas (L.) Schott
Echinochloa crus-galli (L.) Beauv
Echium vulgare L.
Elymus caninus (L.) L.
Elymus farctus (Viv.) Runemark ex Melderis subsp. *boreali-atlanticus* (Simonet & Guin.) Melderis
Elytrigia atherica (Link) Kerguélen *ex* Carreras
Epipactis helleborine (L.) Crantz
Epipactis palustris (L.) Crantz
Equisetum arvense L.
Equisetum palustre L.
Equisetum ramosissimum Desf.
Equisetum telmateia Ehrh.
Erica arborea L.
Erica ciliaris Loefl. ex L.
Erica cinerea L.
Erica scoparia L.
Erica vagans L.
Erigeron karvinskianus DC.
Erinus alpinus L.
Eriophorum latifolium Hoppe

Erodium cicutarium (L.) L'Hér.
Erodium glandulosum (Cav.) Willd.
Erodium moschatum (L.) L'Hér.
Erophila verna (Cav.) Willd.
Eryngium campestre L.
Eryngium maritimum L.
Erysimum gorbeanum Polatschek
Eucalyptus globulus Labill.
Euonymus europaeus L.
Euphorbia amygdaloides L.
Euphorbia dulcis L.
Euphorbia exigua L.
Euphorbia flavicoma DC. subsp. *occidentalis* M. Laínz
Euphorbia helioscopia L.
Euphorbia paralias L.
Euphorbia peplus L.
Euphorbia portlandica L.
Euphorbia pubescens Vahl.
Evax carpetana Lange
Fagus sylvatica L.
Fallopia japonica (Houtt.) Ronse Decr.
Festuca arundinacea Schreb.
Festuca hystrix Boiss.
Festuca nigrescens Lam. subsp. *microphylla* (St.-Yves) Markgr.-Dann.
Festuca rivas-martinezii Fuente & Ortúñez subsp. *rectifolia* Fuente, Ortúñez & Ferrero Lom.
Festuca rubra L.
Festuca rubra L. subsp. *pruinosa* (Hack.) Piper
Festuca vasconcensis (Markgraf-Dannenb.) Auquier
Filipendula ulmaria (L.) Maxim.
Filipendula vulgaris Moench
Fragaria vesca L.
Frangula alnus Mill.
Frankenia laevis L.
Fraxinus angustifolia Vahl
Fraxinus excelsior L.
Fumana ericifolia Wallr.
Fumana procumbens (Dunal) Gren. & Godr.
Fumana thymifolia (L.) Spach ex Webb
Fumaria capreolata L.
Fumaria muralis Sonder ex Koch

Galactites tomentosa Moench.
Galinsoga ciliata (Rafin) S.F. Blake
Galium album Mill.
Galium aparine L.
Galium estebanii Sennen
Galium fruticescens (Cav.) O. Bolòs & Vigo
Galium mollugo L.
Galium palustre L.
Galium papillosum Lapeyr.
Galium pinetorum Ehrend. See *G. estebanii*
Galium verum L.
Genista eliassennenii Uribe-Ech. & Urrutia
Genista occidentalis (Rouy) H.J. Coste
Genista pilosa L.
Genista sagittalis L.
Genista scorpius (L.) DC.
Genista tinctoria L.
Gentiana occidentalis Jakow.
Geranium columbinum L.
Geranium dissectum L.
Geranium lucidum L.
Geranium purpureum L.
Geranium pyrenaicum Burm. f.
Geranium robertianum L.
Geranium sanguineum L.
Geum sylvaticum Pourr.
Geum urbanum L.
Glandora diffusa (Lag.) D.C. Thomas
Glaux maritima L.
Glechoma hederacea L.
Globularia nudicaulis L.
Globularia vulgaris L.
Gnaphalium luteo-album L.
Gymnadenia conopsea (L.) R. Br.
Halimione portulacoides (L.) Aellen
Halimium umbellatum (L.) Spach
Hedera helix L. subsp. *hybernica* (G. Kirchn.) D.C. McClint.
Helianthemum apenninum (L.) Mill.
Helianthemum canum subsp. *incanum* see *H. oelandicum* subsp. *incanum*
Helianthemum nummularium
Helianthemum oelandicum (L.) Dum. Cours. subsp. *incanum* (Willk.) G. López

Helianthemum violaceum (Cav.) Pers.
Helichrysum stoechas (L.) Moench
Helictotrichon cantabricum (Lag.) Gervais
Helleborus foetidus L.
Helleborus occidentalis see *H. viridis* subsp. *occidentalis*
Helleborus viridis L. subsp. *occidentalis* (Reut.) Schiffn.
Hepatica nobilis Schreb.
Heracleum sphondylium L.
Herniaria ciliolata Melderis
Hieracium gymnocerinthe Arv.-Touv & Gaut.
Hieracium murorum L.
Hippocrepis comosa L.
Hirschfeldia incana (L.) Lagrëze-Fossat
Holcus lanatus L.
Holcus mollis L.
Honckenya peploides (L.) Ehrh.
Hordeum murinum L.
Hornungia petraea (L.) Rchb.
Humulus lupulus L.
Hydrocotyle vulgaris L.
Hypericum androsaemum L.
Hypericum caprifolium Boiss.
Hypericum humifusum L.
Hypericum montanum L.
Hypericum perfoliatum L.
Hypericum perforatum L.
Hypericum pulchrum L.
Hypericum tetrapterum Fr.
Hypericum tomentosum L.
Hypochoeris radicata L.
Ilex aquifolium L.
Inula conyza DC.
Inula crithmoides L.
Inula montana L.
Iris foetidissima L.
Iris pseudacorus L.
Jasonia glutinosa (L.) DC. see *Chiliadenus glutinosus*
Juncus acutus L.
Juncus articulatus L.
Juncus bufonius L.
Juncus bulbosus L.

Juncus compressus Jacq.
Juncus conglomeratus L.
Juncus effusus L.
Juncus foliosus Desf.
Juncus gerardi Loisel.
Juncus inflexus L.
Juncus maritimus Lam.
Juncus subnodulosus Schrank
Juniperus alpina see *J. communis* subsp. *alpina*
Juniperus communis L.
Juniperus communis L. subsp. *alpina* (Suter) Čelak.
Juniperus oxycedrus L.
Juniperus phoenicea L.
Jurinea humilis (Desf.) DC.
Knautia arvensis (L.) Coult.
Knautia arvernensis (Briq.) Szabó see *K. nevadensis*
Knautia nevadensis (M. Winkl. ex Szabó) Szabó
Koeleria glauca (Schrader) DC.
Koeleria splendens C. Presl
Koeleria vallesiana (Honck.) Gaudin
Lactuca perennis L.
Lactuca tenerrima Pourret
Lagurus ovatus L.
Lamium hybridum Vill.
Laserpitium eliasii Sennen & Pau
Lastrea limbosperma (All.) J. Holub & Pouzar
Lathyrus linifolius (Reichard) Bässler
Lathyrus niger (L.) Bernh.
Laurus nobilis L.
Lavandula latifolia Medik.
Lavatera cretica L.
Lemna minor L.
Leontodon taraxacoides (Vill.) Mérat
Lepidium virginicum L.
Leucanthemum crassifolium (Lange) Willk.
Leucanthemum pallens (Perreym.) DC.
Leuzea conifera (L.) DC.
Ligustrum vulgare L.
Limonium binervosum (G.E.Sm.) Salmon
Limonium humile Mill.
Limonium ovalifolium (Poiret) O. Kuntze

Limonium vulgare Mill. subsp. *vulgare*
Linaria maritima DC.
Linaria propinqua Boiss & Reuter
Linaria proxima Coincy
Linum milleti Sennen & Barrau see *L. suffruticosum* subsp. *appressum*
Linum suffruticosum L. subsp. *appressum* (A. Caballero) Rivas Martínez
Linum trigynum L.
Lobularia maritima (L.) Desv.
Logfia minima (Sm.) Dumort.
Lolium multiflorum Lam.
Lolium perenne L.
Lonicera etrusca Santi
Lonicera implexa Aiton
Lonicera periclymenum L.
Lonicera xylosteum L.
Lophochloa cristata (L.) Hyl.
Lotus corniculatus L.
Lotus pedunculatus Cav.
Lotus tenuis Waldst.& Kit. ex Willd.
Luzula campestris (L.) DC.
Luzula forsteri (Sm.) Lam. & DC.
Luzula multiflora (Ehrh.) Lej.
Lychnis flos-cuculi L.
Lycopus europaeus L.
Lysimachia ephemerum L.
Lysimachia nemorum L.
Lythrum hyssopifolia L.
Malva moschata L.
Matricaria maritima L.
Matthiola incana (L.) R.Br. in W.T. Aiton
Medicago arabica (L.) Hudson
Medicago littoralis Loisel.
Medicago lupulina L.
Melampyrum pratense L.
Melica ciliata L. subsp. *magnolii* (Gren. & Godron) Husnot
Melica uniflora Retz.
Melilotus alba Medicus
Melilotus indica (L.) All.
Melittis melissophyllum L.
Mentha aquatica L.
Mentha longifolia (L.) Huds.

Mentha suaveolens Ehrh.
Mercurialis annua L.
Mercurialis perennis L.
Minuartia hybrida (Vill.) Schischk.
Molinia caerulea (L.) Moench
Muscari comosum (L.) Mill.
Muscari neglectum Guss. ex Ten.
Myosotis lamottiana (Br.-Bl.) Grau
Narcissus pallidiflorus Pugsley
Nasturtium officinale R.Br.
Odontites vernus (Bellardi) Dumort. subsp. *serotinus* (Dumort.) Corb.
Oenanthe crocata L.
Oenothera biennis L.
Oenothera glazioviana Micheli
Olea europaea L. var. *sylvestris* Brot.
Onobrichys reuteri Leresche
Onobrychis argentea Boiss. *hispanica* (Širj.) P.W. Ball
Ononis ramosissima Desf.
Ononis reclinata L.
Ononis spinosa L.
Ononis striata Gouan
Ophrys apifera Hudson
Ophrys fusca Link. subsp. fusca
Ophrys scolopax Cav.
Ophrys sphegodes Mill.
Ophrys tenthredinifera Willd.
Orchis purpurea Huds.
Oreochloa confusa (Coincy) Rouy
Origanum vulgare L.
Osyris alba L.
Oxalis acetosella L.
Oxalis corniculata L.
Oxalis latifolia Kunth
Pallenis spinosa (L.) Cass. subsp. *spinosa*
Pancratium maritimum L.
Panicum repens L.
Papaver rhoeas L.
Parapholis strigosa (Dumort.) C.E. Hubbard
Parentucellia latifolia (L.) Caruel
Parentucellia viscosa (L.) Caruel
Parietaria judaica L.

Paronychia kapela (Hacq.) A. Kern.
Paspalum dilatatum Poiret
Paspalum paspalodes (Michx) Scribner
Paspalum vaginatum Swartz
Pedicularis sylvatica L.
Petrorhagia nanteulii (Burnat) P.W. Ball & Heywood
Phagnalon saxatile (L.) Cass.
Phagnalon sordidum (L.) Rchb.
Phalaris canariensis L.
Phillyrea angustifolia L.
Phillyrea latifolia L.
Phleum arenarium L.
Phleum phleoides (L.) H.Karst.
Phleum pratense L. subsp. *bertolonii* (DC.) Bornm.
Phlomis lychnitis L.
Phragmites australis (Cav.) Steudel
Phyllitis scolopendrium (L.) Newman
Physospermum cornubiense (L.) DC.
Picris echioides L.
Picris hieracioides L.
Pilosella officinarum F.W. Sch. & Sch. Bip.
Pimpinella saxifraga L.
Pinguicula grandiflora Lam.
Pinus pinaster Aiton
Pinus radiata D. Don
Pinus sylvestris L. var. *iberica* Svoboda
Piptatherum miliaceum (L.) Cosson
Piptatherum paradoxum (L.) P. Beauv.
Pistacia terebinthus L.
Plantago coronopus L.
Plantago discolor Gand. see*, P. monosperma* subsp. *discolor*
Plantago lanceolata L.
Plantago major L.
Plantago maritima L.
Plantago maritima L. subsp. *serpentina* (All.) Arcang.
Plantago media L.
Plantago monosperma Pourr. subsp. *discolor* (Gand.) M. Laínz
Poa annua L.
Poa bulbosa L.
Poa ligulata Boiss.
Poa nemoralis L.

Poa pratensis L.
Poa trivialis L.
Polycarpon diphyllum Cav.
Polycarpon tetraphyllum (L.) L.
Polygala serpyllifolia Hosé
Polygala vulgaris L.
Polygonum maritimum L.
Polypodium cambricum L.
Polypodium interjectum Shivas
Polypodium vulgare L.
Polypogon monspeliensis (L. Desf.
Polystichum aculeatum (L.) Roth
Polystichum setiferum (Forskal) Woynar
Populus alba L.
Populus nigra L.
Populus tremula L.
Portulaca oleracea L.
Potamogeton berchtoldii Fieber
Potamogeton pectinatus L.
Potentilla erecta (L.) Raeusch.
Potentilla montana Brot.
Potentilla reptans L.
Potentilla sterilis (L.) Garcke
Potentilla verna L.
Primula acaulis (L.) L.
Primula elatior (L.) Hill
Primula veris L. subsp. *columnae* (Ten.) Maire & Petitm.
Prunella grandiflora (L.) Scholler
Prunella vulgaris L.
Prunus avium L.
Prunus insititia L.
Prunus mahaleb L.
Prunus spinosa L.
Pseudarrhenatherum longifolium (Thore) Rouy
Pteridium aquilinum (L.) Kuhn
Pulmonaria longifolia (Bastard) Boreau
Quercus coccifera L.
Quercus faginea Lam.
Quercus ilex L.
Quercus petraea (Matt.) Liebl.
Quercus pyrenaica Willd.

Quercus robur L.
Quercus rotundifolia Lam.
Quercus x gracilis Lange
Ranunculus acris L.
Ranunculus bulbosus L. subsp. *bulbosus*
Ranunculus ficaria L.
Ranunculus flammula L.
Ranunculus gramineus L.
Ranunculus repens L.
Ranunculus tuberosus Lapeyr.
Raphanus raphanistrum L. subsp. *landra* (Moretti ex DC.) Bonnier & Layens
Reichardia picroides (L.) Roth.
Rhamnus alaternus L.
Rhamnus alpina L.
Rhamnus cathartica L.
Rhamnus infectoria L.
Rhamnus pumila Turra
Rhamnus saxatilis Jacq.
Rhinanthus pumilus (Sterneck) Pau
Ribes petraeum Wulfen
Robinia pseudoacacia L.
Rosa agrestis Savi
Rosa arvensis Huds.
Rosa canina L.
Rosa corymbifera Borkh.
Rosa deseglisei Boreau
Rosa micrantha Borrer ex Sm.
Rosa nitidula Besser
Rosa pimpinellifolia L.
Rosa squarrosa (A. Rau) Boreau
Rubia peregrina L.
Rubus caesius L.
Rubus ulmifolius Schott
Rumex acetosa L.
Rumex acetosella L. subsp. *angiocarpus* (Murb.) Murb.
Rumex bucephalophorus L. subsp. *hispanicus* (Steinh.) Rech. fil.
Rumex conglomeratus Murray
Rumex crispus L.
Rumex obtusifolius L.
Rumex pulcher L.
Rumex scutatus L.

Ruppia marítima L.
Ruscus aculeatus L.
Ruta chalepensis L.
Sagina maritima G. Don
Salicornia dolichostachya Moss.
Salicornia fragilis P. W. Ball & Tutin
Salicornia obscura P. W. Ball & Tutin
Salicornia ramosissima Woods
Salix alba L.
Salix atrocinerea Brot.
Salix caprea L.
Salix eleagnos Scop. subsp. *angustifolia* (Cariot) Rech. fil.
Salix neotricha Goerz
Salix purpurea L. subsp. *lambertiana* (Sm.) W.D.J. Koch
Salix triandra L. supbsp. *discolor* (Koch) Arcangeli
Salix x expectata Rivas Mart. et al.
Salsola kali L.
Salvia verbenaca L.
Sambucus ebulus L.
Sambucus nigra L.
Samolus valerandi L.
Sanguisorba minor Scop.
Sanicula europaea L.
Santolina chamaecyparissus L. see *S. chamacyparissus* subsp.*squarrosa*
Santolina chamaecyparissus L. subsp. *squarrosa* (DC.) Nyman
Saponaria ocymoides L.
Sarcocapnos enneaphylla (L.) DC.
Sarcocornia fruticosa auct. see *S. pruinosa*
Sarcocornia perennis (Miller) A.J. Scott
Sarcocornia pruinosa Fuente, Rufo & Sánchez-Mata
Saxifraga cuneata Willd.
Saxifraga hirsuta L.
Saxifraga tridactylites L.
Saxifraga trifurcata Schrad.
Scabiosa columbaria L.
Schoenus nigricans L.
Scirpus cernuus Vahl
Scrophularia auriculata L.
Scrophularia canina L.
Scrophularia crithmifolia Boiss. subsp. *burundana* L. Villar
Scrophularia scorodonia L.

Sedum acre L.
Sedum album L.
Sedum altissimum Poir. see *Sedum sediforme*
Sedum dasyphyllum L.
Sedum sediforme (Jacq.) Pau
Senecio aquaticus Hill *s.l.*
Senecio helenitis (L.) Schinz & Thell. subsp. *macrochaetus* (Willk.) Brunerye
Serratula nudicauilis (L.) DC.
Serratula tinctoria L.
Seseli cantabricum Lange
Seseli montanum L.
Sesleria argentea (Savi) Savi subsp. *hispanica* (Pau & Sennen) V. Allorge & P. Allorge
Setaria pumila (Poiret) Roemer & Schultes
Setaria verticillata (L.) Beauv.
Sherardia arvensis L.
Sideritis hyssopifolia L.
Sideritis hyssopifolia subsp. *castellana* (Sennen & Pau ex Sennen) Malag.
Silene gallica L.
Silene legionensis Lag.
Silene nutans L.
Silene uniflora Roth
Silene vulgaris (Moench) Garcke
Simethis matiiazzii (Vand.) Sacc.
Sisymbrium austriacum Jacq. subsp. *chrysanthum* (Jord) Rouy & Foucaud
Sisymbrium officinale (L.) Scop.
Smilax aspera L.
Smyrnium olusatrum L.
Solanum dulcamara L.
Solanum sublobatum Willd. *ex* Roemer & Schultes
Solidago virgaurea L.
Sonchus asper (L.) Hill
Sonchus oleraceus L.
Sorbus aria (L.) Crantz
Sorbus aucuparia L.
Sorbus torminalis (L.) Crantz
Sorghum bicolor (L.) Moench
Sparganium erectum L. subsp. *neglectum* (Beeby) Schinz & Thell
Spartina alterniflora Loisel.
Spartina maritima (Curtis) Fernald
Spergularia marina (L.) Besser
Spergularia media (L.) K. Presl

Spiraea hypericifolia L. subsp. *obovata* (Waldst. & Kit. ex Willd.) H. Huber
Spiranthes aestivalis (L.) Chevall.
Sporobolus indicus (L.) R.Br.
Stachys officinalis (L.) Trevis.
Stachys sylvatica L.
Stegnogramma pozoi (Lag.) K. Iwatsuki
Stellaria holostea L.
Stellaria media (L.) Vill. subsp. media
Stenotaphrum secundatum (Walter) O. Kuntze
Suaeda maritima (L.) Dumort
Succisa pratensis Moench
Symphytum tuberosum L.
Tamarix gallica L.
Tamus communis L.
Tanacetum corymbosum (L.) Sch. Bip.
Taxus baccata L.
Tetragonolobus maritimus (L.) Roth
Teucrium chamaedrys L.
Teucrium expassum Pau
Teucrium pyrenaicum L.
Teucrium scorodonia L.
Thalictrum flavum L.
Thalictrum tuberosum L.
Thelypteris palustris Schott
Thesium divaricatum Jan ex Mert. & W.D.J. Koch
Thymelaea ruizii Loscos
Thymus mastigophorus Lacaita
Thymus praecox Opiz subsp. *britannicus* (Ronniger) Holub
Thymus praecox subsp. *polytrichus* (A. Kern. ex Borbás) Jalas
Thymus vulgaris L.
Tilia cordata Miller
Tilia platyphyllos Scop.
Trifolium angustifolium L.
Trifolium campestre Schreb.
Trifolium dubium Sibth
Trifolium fragiferum L.
Trifolium montanum L.
Trifolium ochroleuchon Huds.
Trifolium pratense L.
Trifolium repens L.
Trifolium repens subsp. *occidentale* (Coombe) Laínz

Trifolium scabrum L.
Triglochin maritima L.
Trinia glauca (L.) Dumort.
Trisetum flavescens (L.) Beauv.
Trisetum paniceum (Lam.) Pers.
Ulex europaeus L.
Ulex gallii Planch.
Ulmus minor Roth
Urtica dioica L.
Urtica membranacea Poiret in Lam.
Urtica urens L.
Vaccinium myrtillus L.
Valeriana dioica L.
Valeriana montana L.
Valerianella carinata Loisel.
Valerianella locusta (L.) Laterrade
Vandenboschia speciosa (Willd.) Kunkel
Veronica agrestis L.
Veronica anagallis-aquatica L.
Veronica arvensis L.
Veronica becabunga L.
Veronica chamaedrys L.
Veronica hederifolia L.
Veronica montana L.
Veronica officinalis L.
Veronica persica Poiret
Veronica sennenii (Pau) Mart. Ort. & E. Rico
Viburnum lantana L.
Viburnum tinus L.
Vicia cracca L.
Vicia hirsuta (L.) S.F. Gray
Vicia sativa L. subsp. *nigra* (L.) Ehrh.
Vicia sepium L.
Vicia tetrasperma (L.) Schreber
Vinca major L.
Vincetoxicum hirundinaria Medicus *s.l.*
Viola alba Besser
Viola hirta L.
Viola reichenbachiana Jord. ex Boreau
Viola rupestris F.W. Schmidt
Viola sylvestris gr.

Viscum album L.
Vulpia ciliata Dumort.
Vulpia fasciculata (Forskal) Samp.
Vulpia myuros (L.) C.C. Gmelin
Woodwardia radicans (L.) Sm.
Xeranthemum inapertum (L.) Mill.
Xolantha tuberaria (L.) Gallego, Muñoz Garm. & C. Navarro
Zannichellia palustris L.
Zostera marina L.
Zostera noltii Hornem.

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