NOTES ON THE PREALPINE FLORA OF THE PICOS DE EUROPA, SPAIN

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INTRODUCTION

The Cantabrian Mountains, extending along the North Coast of Spain, reach their highest point in the Picos de Europa (Peñas de Europa). The Picos consist of highly folded Lower Carboniferous rocks, are dominated by limestone, and reach an altitude of over 2600 m. Vertical crags of resistant rock, with large areas of loose and fixed screes beneath them, often occur near the summits of the hills. A large flat area at 1700 m., shows signs of glaciation in the form of huge moraine deposits, and now forms an extensive pasture. This is the site of the former Royal hunting preserve, site of the Royal Chalet and the well known Refugio Aliva. Below are steep-sided valleys, which on the south-east of the range lead down to the lowlands of Liebana. The tree line is at about 1300 m., but varying by as much as 200 m., according to local conditions.

The mean annual rainfall in the region studied is in excess of 200 cm., and precipitation appears to be spread throughout the year. The mean annual temperature at 1000 m. is about 10° C, and above this altitude frosts occur from September to April. Permanent snow patches exist on the high peaks. The climate of the lower northern slopes of the Cantabrian Mountains is similar to that found in Brittany and SW. Ireland.

The general area of the Picos has been visited by several botanists and horticulturists. Leresche and Levier (1879) collected in the gorge of the River Deva near Potes, and in the environs of the Aliva. Gandoger (1895) collected near Potes, at the Aliva, and reached the summit of Peña Vieja. Boubier collected at Potes and in the environs of the Aliva in 1912. The results of all this work was brought together in a paper by Madame Barbey-Gampert (1921), in which species are listed under geographical affinities, but without reference to locality or collector. Many synonyms are listed as separate species. Lacaita (1929), who criticised her paper, visited the range for very short periods in 1925, 1927 and 1928, and spent most of his time on the western side of the range. Stevenson (1927), Pau, Wilmott and Cuatrecasas also visited the range in the period 1925–1929. Arrieu and Lascombes (1944) made a general vegetational survey of the whole region of the Picos, but went into no great detail in the prealpine region. Guinea (1946) visited the range, and concentrated on the interesting species he found on the western slopes. The neighbouring area, near Peña Prieta and Peña Labra, the Cantabro-Leonese Mountains, was extensively studied by Losa and Montserrat (1952 & 1953) and Losa (1955). Specific points of interest raised by any of these authors are discussed in the species list below.

In the summer of 1956 a party of students and staff of Edinburgh University spent six weeks in the Sierra de Gredos. Later, some of the

party* visited the Picos de Europa. The areas were chosen on the advice of Dr. V. H. Heywood.

Two main regions were studied, firstly that surrounding the Refugio Aliva, and secondly the area to the south of Espinama and Pido (Fig. 2). The latter area is, strictly speaking, outside the Picos de Europa, being part of the main ridge of the Cantabrian Mountains. It comes within the general area studied by Losa (1952 *et seq.*). The smaller map (Fig. 1) shows that the Picos de Europa are not in the main line of the Canatabrian Mountains, but form an adjacent area, projecting northwards from the main range.

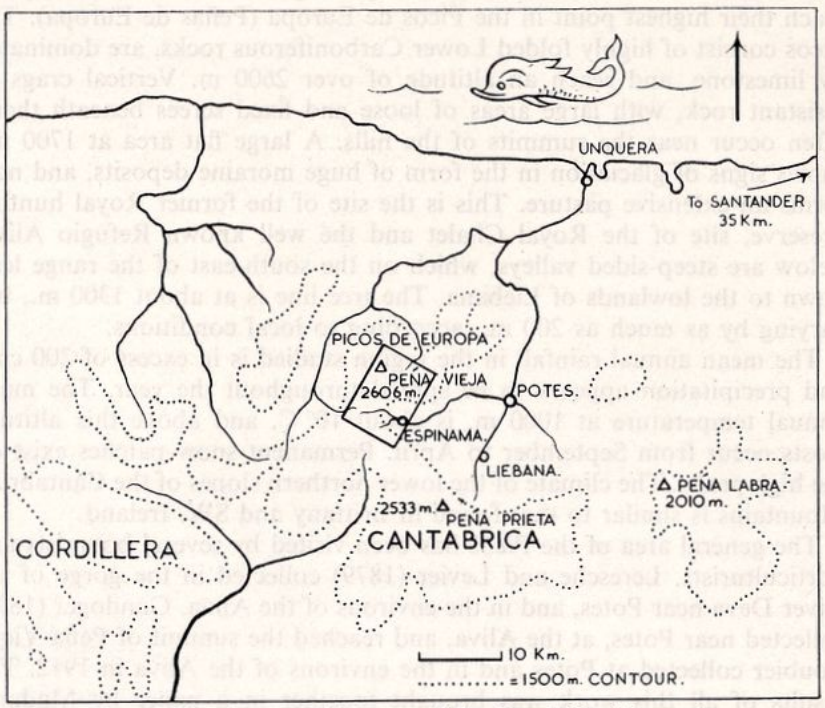

FIG. 1. Sketch map of the area of the Cantabrian Mountains.

In the limited time available (the last fortnight of August 1956), the following procedure was adopted for the study of habitats. A collection of plants was made, and preserved for later identification; extensive field notes were compiled, and as an aid to description many coloured photographs were taken of the habitats, as well as of the plants themselves. The plant collection is now deposited in the herbarium of the Royal Botanic Garden, Edinburgh.

NOTES ON THE VEGETATION

It is stated by Goday (1949) that true *sub-alpine* communities exist, in the Iberian Peninsula, only in parts of the Pyrenees, and this is now generally accepted by botanists interested in the Iberian flora (Heywood, 1958b). Goday suggests the general term alpinoid to describe the flora of

* Six students, B. J. Deverall, B. Flannigan, J. Horsman, I. Robertson, Miss B. J. Dresser and the author. Mr. D. M. Henderson (Royal Botanic Garden, Edinburgh) visited the area at the same time.

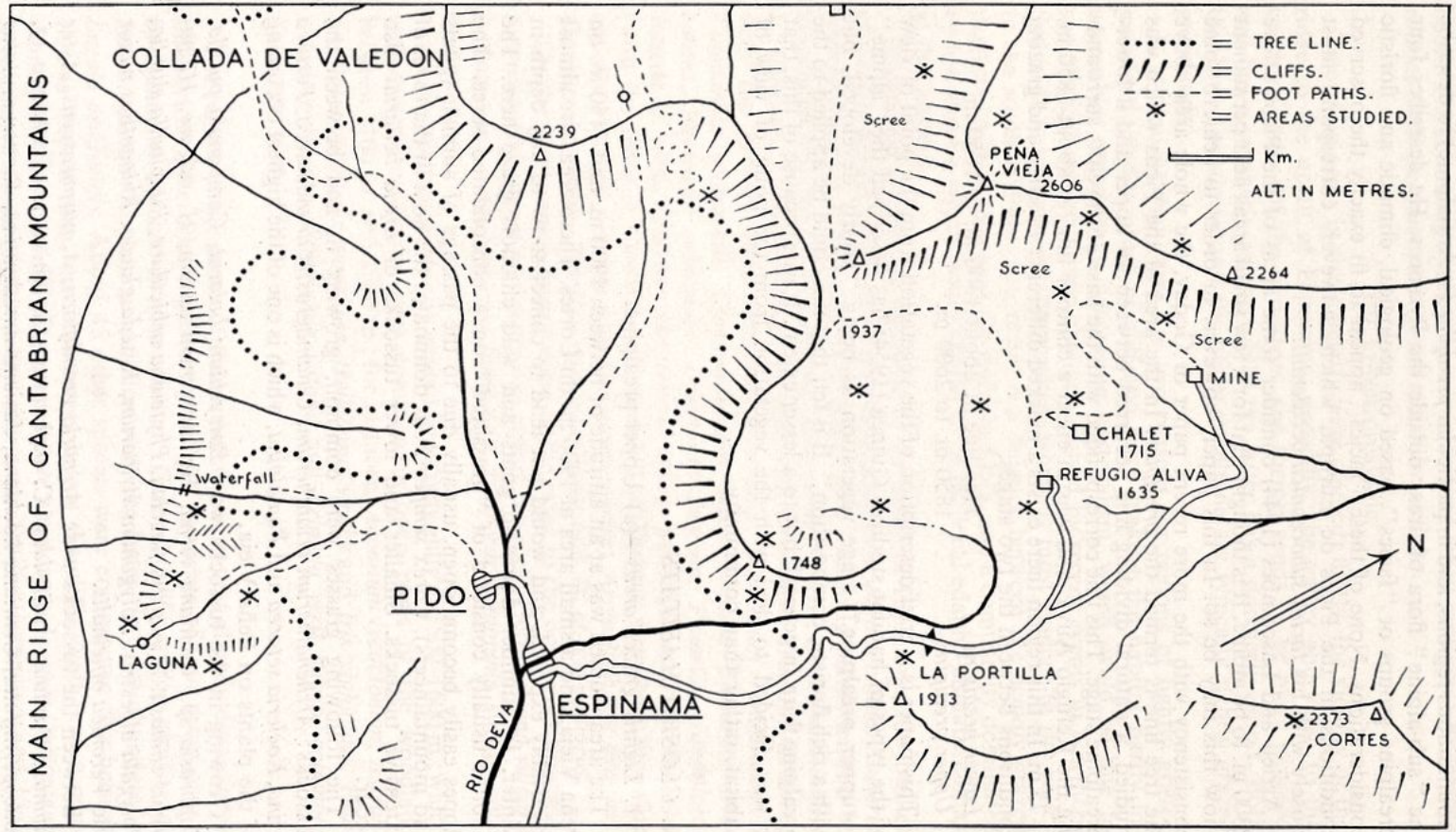

FIG. 2. Sketch map of the area of the Picos de Europa and neighbourhood visited.

mountainous regions, and in particular *prealpine* (=Antialpine) to describe the "sub-alpine" flora of areas outside the Pyrenees. He describes four prealpine groups or "facies", based on geological, climatic and floristic considerations. None of these "facies" appear to fit exactly the observed conditions in the Picos de Europa, which, however, correspond most closely with his *facies suboceanica occidental.*

Arrieu and Lascombes (1944) consider some areas of the Picos above 2300 m. to be alpine. It is thought that for a few small areas near permanent snow this may be so. In this paper, however, in order to achieve some consistency with the more recent paper of Goday, the whole area above the tree line is termed the *prealpine.* In the area of the Picos which was studied, a natural dividing line occurred between an upper and a lower-prealpine stage. This line corresponded with the base of the cliffs surrounding the Refugio Aliva, and was in effect a contour line, at about 1850 m. ±75 m. In this region there exists a marked difference in slope and grazing conditions between the two stages.

Lower prealpine . . Tree line at about 1300 m. to 1850 m.
Upper prealpine . . 1850 m. to 2600 m.

This paper is a brief description of the vegetation from the point of view of the types of habitat studied. Guinea (1954) has described the "alpine" (=upper prealpine?) stage vegetation as being "poorly developed, but with a rich floristic composition". It is felt that this could be applied to the prealpine flora in general, but to a lesser extent. It was because of this, that it was decided to deal with the vegetation from the point of view of habitat, rather than community.

A. *CLOSED HABITATS*

1. *Lightly grazed areas*—(a) Upper prealpine.

The area studied was at an altitude of between 1900 m. and 2150 m. on Peña Vieja, and a small area at 1900 m. on Cortes. These areas are almost invariably exposed, and would not tend to collect snow to any depth in winter. In summer domestic goats and wild chamois graze here. The habitat usually consisted of "grassland" on a consolidated scree. The slopes easily become open, usually due to the passage of animals (goats and mountaineers). *Carex sempervirens* dominates the area in the form of extensive tussocks. Smaller and lower tussocks of *Elyna bellardii* also occur.

The following grasses were common, growing in and between the tussocks: *Arrhenatherum eriantherum*, *Calamagrostis arundinacea*, *Festuca ovina*, *Koeleria setacea* and *Poa alpina*, which is one of the highest occurring of the plants on Peña Vieja.

Growing in the tussocks were *Botrychium lunaria*, *Campanula pusilla*, *Euphrasia sp.*, *Gentiana verna*, *Helianthemum canum*, *H. vulgare*, *Hippocrepis comosa*, *Minuartia flaccida*, *Phyteuma orbiculare*, *Pimpinella siifolia*, *Polygala alpestris*, *Polygonum viviparum*, *Reseda glauca*, *Rhinanthus major* and *Veronica officinalis.*

Between the tussocks were *Arenaria grandiflora*, *A. purpurascens*, *Aster alpinus*, *Carduus carlinoides*, *C. defloratus*, *Carum carvi*, *Centaurea cf. podospermifolia*, *Gentiana kochiana*, *Jasione amethystina*, *Rumex scutatus* and *Thymus serpyllum*, all having a scattered distribution or a trailing

habit. The following species, however, formed small cushions: *Androsace villosa*, *Lithospermum prostratum* and *Silene ciliata*.

(b) Lower prealpine.

Two main areas in this category were studied: firstly, the vicinity of the ridge to the north of Espinama; secondly, the valley and ridge to the south of Pido. Of the two areas, the former tends to be more exposed and has a southerly aspect, whilst the latter has a northerly aspect. Both this lower prealpine and the upper prealpine are typically lightly grazed grasslands.

It is thought that there are two reasons for regions of lightly grazed grassland: firstly, areas of cliff and scree making the habitat partly inaccessible; secondly, a decreasing pastoralism, which could be due to sociological and economic changes, caused by recent events in Northern Spain. It is a decreasing pastoralism which is most evident in the valley to the south of Pido. The result is a balance between the heavily grazed pastures (A2), as seen near the Refugio Aliva, and a community dominated by low shrubs, which would appear to be the local edapho-climatic climax at this altitude.

In exposed places near the ridge to the north of Espinama, low bushes of *Genista hystrix* are co-dominant with tussocks of *Melica ciliata*. *Koeleria setacea* becomes sub-dominant in places. The following plants tend to be associated with the Genista bushes: *Leontodon hispidus*, *Linum salsoloides*, *L. viscosum*, *Lithospermum prostratum* and *Orobanche cruenta*. Growing with the grasses were *Anthyllis vulneraria*, *Bupleurum ranunculoides*, *Campanula glomerata*, *Chrysanthemum leucanthemum*, *Epipactis atrorubens*, *Phyteuma orbiculare*, *Pimpinella tragium*, *Prunella grandiflora*, *Reseda cf. alba*, *Teucrium chamaedrys* subsp. *pinnatifidum*, *T. pyrenaicum* (with the parasite *Cuscuta epithymum*), and *Thymus serpyllum*. Growing equally amongst Genista and the grasses were: *Arctostaphylos uva-ursi*, *Carduus defloratus*, *Dianthus monspessulanus* and *D. cf. geminiflorus*.

On the gentle north-facing slope of the ridge to the north of Espinama, a considerable deposit of peaty soil covers the rock. Here *Calluna vulgaris* is dominant, with *Gentiana lutea* and *Juniperus communis* subsp. *nana* co-dominant.

An interesting community existed in a shady gully at 1500–1600 m., which included many species very common in open parts of the woodland between 1100 m. and 1300 m., for instance, *Aconitum lycoctonum*, *Astrantia major*, *Digitalis parviflora*, *Helleborus viridis* and *Iris xiphioides*. *Pedicularis pyrenaica*, *Pimpinella siifolia* and *Primula veris* subsp. *columnae* also grew here.

The region to the south of Pido contrasts with that already discussed in this section. The drier exposed "grassland" consists of four more or less co-dominant species, *Bromus erectus*, *Carex pilulifera*, *Poa alpina* and *Luzula spicata*. In close association with the latter, but not abundant, is *Luzula pediformis*. About 45 other species were common in this habitat. In one limited area, on fixed screes below the cliffs, there was a community in which the following species were abundant: *Anemone pavoniana*, *A. alpina*, *Primula elatior* subsp. *intricata*, *Trollius europaeus* and *Viola biflora*.

2. *Heavily grazed areas.*

This area surrounds the Refugio Aliva, and varies in altitude from 1500 m. to 1800 m. In general the habitat tends to be flatter than that which is lightly grazed. Areas of wet flush, rocky outcrop, and semi-fixed slopes of moraine deposits, in the vicinity of the Refugio Aliva, are dealt with under the appropriate heading. Herds of sheep, goats, cattle and horses are grazed on the lawn-like turf during the summer months.

The dominant species appear to be *Agrostis tenuis*, *Merendera montana*, with *Phleum commutatum* co-dominant in places. Abundant species include *Hieracium pilosella*, *Jasione carpetana*, *Taraxacum vulgare* and *Trifolium repens*. *Potentilla aurea* occurs in trampled areas.

At La Portilla the pasture was heavily overgrazed, as all herds moving to or from the pasture converged on this one small area. The result was a dense community of "thistles", eight species in all, with *Eryngium bourgatii* also present. (See the systematic list for details.)

3. *Wet flush.*

Two main areas of wet flush were studied, the first in the vicinity of the Refugio Aliva, and the second in the valley to the south of Pido, at 1550 m. and 1800 m.

The following species tend to be dominant in the heavily grazed area near the Refugio Aliva; *Carex flava*, *Catabrosa aquatica*, with *Carex ovalis*, *Festuca ovina* and *Juncus articulatus* sub-dominant in places. Common in this habitat were *Parnassia palustris*, *Pinguicula vulgaris*, *Senecio aquaticus* and *Trifolium pratense*.

In the flat water-logged ground beside the "laguna", at 1800 m. in the valley to the south of Pido, the following species form an extensive mat of vegetation: *Carex flava*, *C. nigra*, *C. ovalis*, *Festuca ovina*, *Juncus articulatus*, *J. squarrosus*, *Luzula pediformis*, *L. sudetica*, *Phleum commutatum*, *Poa alpina* and *Scirpus cespitosus*. Growing scattered in this mat of vegetation were: *Astrantia major*, *Fritillaria pyrenaica*, *Pedicularis palustris*, *Plantago media*, *Polygonum bistorta*, *P. viviparum*, *Potentilla alpestris*, *Poterium sanguisorba*, *Saxifraga stellaris*, *Swertia perennis* and *Veratrum album*. Small patches of *Rhinanthus major* and *Sedum album* also occurred.

Between 1550 m. and 1650 m. the stream runs down a steep-sided gully. The area at the bottom, beside the stream, was very wet and shaded. Here *Carex ovalis* was dominant, with *Nardus stricta* co-dominant in places. About 35 other species were fairly common in this habitat.

B. *OPEN AND SEMI-OPEN HABITATS.*

1. *Screes*—(a) Upper prealpine.

Erodium macradenum forms large cushions, scattered on areas of rocky scree at 2100–2250 m. *Carum carvi* and *Hutchinsia auerswaldii* were present, but much less frequent.

On an exposed slope of 10° to 15°, at 2300–2400 m. on Peña Vieja, there was evidence of extreme solifluction phenomena. *Ranunculus alpestris* was the only species in flower (27 Aug. 1956) and at all plentiful. *Saxifraga ajugifolia* and *Armeria sp.* also occurred.

(b) Lower prealpine.

On the screes above the Refugio Aliva, between 1700 m. and 1850 m., the following plants with a cushion habit, were common: *Arabis alpina*, *Galium pyrenaicum*, *Iberis tenoreana*, *Silene acaulis*, *Chaenorrhinum origanifolium* and *Linaria filicaulis*. These plants tend to stabilise small areas of scree, which can then support several other species. *Sempervivum cantabricum* and *S. giuseppii* occurred in areas of scree on the ridge above Espinama, and on Cortes.

2. *Semi-fixed slopes.*—(a) Upper prealpine.

On the eastern face of Peña Vieja there are small flat loamy areas on an otherwise steep rocky slope. These small areas gave the impression of having been under a recently melted snow patch (26–28 Aug. 1956). The community has 40–60% bare ground. The plants are all exceedingly stunted, none being more than 9 cm. in height, and all having a more or less rosette habit. *Carex atrata*, and *Poa alpina* were co-dominant. The other common species were *Gentiana verna*, *Jasione amethystina*, *Plantago alpina*, *Ranunculus sp.* (No. 158), *Saxifraga conifera*, *Scilla verna* and *Viola sp.* (*? V. arenaria*), only one plant of which was found in flower.

(b) Lower prealpine.

In the area surrounding the Refugio Aliva, and at the base of Peña Vieja, the following species were common at the edge of tracks: *Alchemilla cf. lapeyrousii*, *Bromus mollis*, *Echium vulgare*, *Erodium cicutarium*, *Gnaphalium silvaticum*, *Helianthemum vulgare*, *Lotus corniculatus*, *Poa nemoralis* var. *vulgaris*, *Rumex scutatus*, *Sideritis scordioides*, *Sisymbrium contortum* and *Thymus serpyllum*.

In several places where the tracks crossed the steep-sided moraines there were areas of loose soil slopes, in which the chief species were *Malva moschata* and *Petasites albus*.

Other areas of semi-fixed scree slopes occurred on the ridge to the north of Espinama, and in the valley to the south of Pido, just above the waterfall.

3. *Dried-up stream bed.*

At an altitude of about 1675 m. the stream in the valley to the south of Pido flows underground, through the limestone rock, for a distance of about 150 m. The underground channel, being of limited capacity, is insufficient to carry the full volume of the stream in spate. It is thought that the worst spate would occur in the spring, when the snow melts. The overflow channel, dry for much of the year, consists of boulders and deep shingle, with a damp coarse grit at a depth of 40–50 cm. Most of the plants in this habitat had either long tap roots, or grew in the shelter of large boulders. Thirty-two species were found in this habitat, of which the following shrubs were the most noticeable: *Calluna vulgaris*, *Erica arborea*, *Juniper communis* subsp. *nana*, and *Sarothamnus cantabricus*.

C. RUPICOLOUS HABITAT.

1. *Ledges and deep clefts.*—(a) Upper prealpine.

The following species grew on ledges on Peña Vieja, at an altitude of 1800–2300 m. Protection from grazing appeared to be one of the chief

factors in the difference between the species listed from this habitat, and the lightly grazed grassland (Ala): *Alchemilla glomerata*, *Androsace villosa*, *Arenaria grandiflora*, *A. purpurascens*, *Biscutella laevigata*, *Festuca ovina* (–2550 m.), *Hieracium cerinthoides*, *Iberis tenoreana*, *Jasione amethystina*, *Linaria supina*, *Hutchinsia auerswaldii* (–2400 m.), *Poa alpina* (–2550 m.), *Potentilla nivalis*, *Saxifraga aizoides* and *Teucrium pyrenaicum*.

Chrysanthemum leucanthemum and *Doronicum glaciale* grew in deep clefts in the rock face, affording a damp and shaded habitat.

On broad ledges used as shelters by sheep and goats, between 1600 and 2200 m., there occurred the following species: *Crepis lapsanoides*, *Myosotis alpestris* and *Urtica dioica*.

(b) Lower prealpine.

In the area surrounding the Refugio Aliva, on rocky outcrops in the pasture, at the base of Peña Vieja and Cortes, and on the ridge to the north of Espinama, the ledges studied could arbitrarily be divided into dry exposed and damp shaded. The following species tended to grow on dry exposed ledges: *Antirrhinum graniticum*, *Arabis alpina*, *Arenaria grandiflora*, *Armeria cantabrica*, *Calamintha acinos*, *Campanula pusilla*, *Dianthus monspessulanus*, *Erica vagans*, *Eryngium bourgatii*, *Gentiana kochiana*, *Globularia nudicaulis*, *Hypericum nummularium*, *Juniperus communis* subsp. *nana*, *Linum salsoloides*, *Minuartia flaccida*, *Saxifraga aizoon*, *Sedum cf. atratum*, *Silene maritima*, *Solidago virgaurea* and *Teucrium chamaedrys* subsp. *pinnatifidum*. On damp or shady ledges the following species were common: *Alchemilla hoppeana*, *Asperula hirta*, *Carex sempervirens*, *Crepis albida*, *Cystopteris fragilis*, *Genista hystrix*, *Gymnadenia conopsea*, *Hieracium cerinthoides*, *Poa alpina*, *Polygonum viviparum*, *Rhamnus alpina*, *Saxifraga aizoon*, *S. hirsuta*, *Teucrium pyrenaicum* and *Veronica ponae*.

In the valley to the south of Pido the ledges tend to have a northerly aspect; the soil was more loamy and damper than on ledges studied elsewhere. In this area the rock is a shale, and appeared to be more acidic than the nearby limestones. *Asperula hirta*, *Botrychium lunaria*, *Gentiana kochiana*, *Gentiana verna*, *Hypericum richeri*, *Lycopodium selago*, *Selaginella selaginoides* and *Scilla verna* were seen in this habitat.

2. *Rock cracks.*—(a) Upper prealpine.

The following species occurring between 1800 and 2300 m. tend to be confined to this habitat. (Species growing also on ledges are not included): *Asplenium viride* (–2400 m.), *Draba dedeana*, *Erinus alpinus*, *Euphorbia chamaebuxus*, *Globularia nana*, *Linaria filicaulis*, *Phyteuma orbiculare*, *Potentilla nivalis* (–2350 m.), *Salix reticulata*, *Saxifraga aizoon*, *S. aretioides*, *S. canaliculata*, *S. oppositifolia*, *Silene ciliata* and *Valeriana globulariifolia*.

(b) Lower prealpine.

Over thirty species were found in this habitat. The following list is, however, of species more or less confined to this habitat: *Allium sphaerocephalon*, *Asplenium trichomanes*, *Aquilegia pyrenaica*, *Daphne cantabrica*, *Erinus alpinus*, *Globularia nudicaulis*, *Gypsophila repens*, *Oreochloa disticha*, *Saxifraga canaliculata*, *Sedum nicaeense*, *Silene ciliata*, *Sorbus aria*, *Thesium alpinum* and *Petrocoptis lagascae*.

Summary of Habitats

A. CLOSED.

1. Lightly grazed.
2. Heavily grazed.
3. Wet flush.

B. OPEN AND SEMI-OPEN.

1. Scree.
2. Semi-fixed slopes.
3. Dried-up stream bed.

C. RUPICOLOUS.

1. Ledges and deep clefts.
2. Rock cracks.

Plant List

In general the nomenclature of Wilkomm & Lange (1861–80) is used, except where more recent work indicates a change of name, in which case their epithets are included as bracketed synonyms. The following abbreviations are used for localities. (See Fig. 2):

C — Cortes.
LP — La Portilla.
PV — Peña Vieja.
RA — Refugio Aliva and environs.
RE — Ridge to the north of Espinama.
RP — Ridge to the NW. of Pido. (Beside the zig-zag path).
V — Valley to the south of Pido.

The habitat is indicated for each species by a letter and number referring to the Summary of Habitats. The altitude is given in metres.

Collection numbers are included only when confusion might arise, and also, when prefixed by the letter E, when referring to the host plants of a collection of Microscopic Fungi, collected by D. M. Henderson (see Henderson, 1958).

LYCOPODIACEAE

Lycopodium selago L. V, 1800, Cl.

SELAGINELLACEAE

Selaginella selaginoides (L.) Link V, 1800, Cl.

POLYPODIACEAE

Pteridium aquilinum (L.) Kuhn (*Pteris aquilina* L.) V, 1600–1700, A1.
Asplenium viride Huds. PV, 1800, B1; 2400, C2.
Asplenium trichomanes L. PV, 1800, B1; RE, 1600, C2.
Cystopteris fragilis Bernh. PV, 1800, Cl; V, 1550, A3.
Polystichum setiferum (Forsk.) Woynar (*Aspidium aculeatum* Koch var. *angulare* Gren.) V, 1675, B3.
Polystichum lonchitis (L.) Roth (*Aspidium lonchitis* (L.) Sw.) RE, 1550, A1; V, 1675, B3.

OPHIOGLOSSACEAE

Botrychium lunaria (L.) Sw. PV, 2200, A1; V, 1700, C1.

CUPRESSACEAE

Juniperus communis L. subsp. **nana** (Willd.) Syme. (*J. nana* Willd.) RE, 1550, C1; V, 1675, B3.

RANUNCULACEAE

Caltha palustris L. RA, 1700, A3.
Trollius europaeus L. V, 1800, A1.
Helleborus viridis L. No. E2008. RA, RE, 1400–1650, A1.
Aconitum lycoctonum L. RE, 1500, A1.
Anemone alpina L. V, 1800, A1.
Anemone pavoniana Boiss. V, 1800, A1.
Ranunculus alpestris L. PV, 2200–2350, B1–2. Arrieu and Lascombes (1944) record only *R. seguieri* Vill. from the Picos. Freyn in Willkomm & Lange (1880) lists only *R. alpestris* L. This collection corresponds to herbarium material of the latter, from the western Pyrenees.
Ranunculus parnassifolius L. PV, 1800, B1.
Ranunculus castellanus Boiss. & Reut. No. 269. PV, 2200, B2 (a very dwarf variety). No. 345. V, 1750, A1 (normal size).
Ranunculus stevenii Andrz. var. RA, 1750, A3.
Ranunculus repens L. RA, 1750, A3.
Ranunculus sp. No. 158. PV, 2200, B2 (a very dwarf plant).
Aquilegia pyrenaica DC. var. **discolor** Ler. et Lev. C, V, 1700–1800, A1, C2.
Thalictrum minus L. var. RE, 1500, B2.

CRUCIFERAE

Biscutella laevigata L. PV, 2100–2300, C1; V, 1700, A1, B3.
Iberis tenoreana DC. PV, 1800, B1–2.
Iberis tenoreana DC. (s. lat.) cf. **Iberis carnosa** Lap. (*I. spathulata* Berg.) PV, 2200, C1.
Hutchinsia auerswaldii Willk. (*Noccaea auerswaldii* (Willk.) Willk.) PV, 2200–2600, B1–2; V, 1750, B2.
Sisymbrium contorta Cav. PV, RE, RP, 1500–1800, B2–3.
Erysimum australe J. Gay PV, 1700–1800, B1.
Arabis alpina L. PV, 1800, B1, C1.
Arabis alpina L. var. **cantabrica** (Ler. et Lev.) Beauverd PV, 1800, B1. Corresponds with *A. cantabrica* collected and named by Leresche and Levier, from the same area, in 1879. Dwarf cushion habit on screes.
Cardamine latifolia Vahl V, 1550, A3.
Alyssum montanum L. RE, 1500, B2.
Draba dedeana Boiss. & Reut. Identical herbarium material collected by Leresche and Levier in 1879 was named *D. cantabrica* Willk., which, however, is included in *D. dedeana* Boiss. by Willkomm himself (1880).
Brassica sp. No. 111. RE, 1500, B2.

RESEDACEAE

Reseda glauca L. PV, 1800–2100, B1, A1.

Reseda cf. **alba** L. RE, 1500, A1. Boubier records *R. baetica* J. Gay ex Müller, which is, however, a species apparently centred in southern Spain, and is in any case a var. of *R. fruticulosa* L. (Heywood, 1958b).

CISTACEAE

Helianthemum vulgare Gaertn. var. PV, RE, 1400–1700, B2.

Helianthemum canum (L.) Baumg. var. **cantabricum** Font Quer & Rothm. The nomenclature in Willkomm & Lange appears to be rather confused.

VIOLACEAE

Viola biflora L. var. V, 1800, A1.

Viola sp. No. 164. PV, 2200, B2. Possibly *V. arenaria* DC. but only one specimen was found in flower.

POLYGALACEAE

Polygala alpestris Rchb. PV, 2200, A1.

Polygala depressa Wend. V, 1775, A1.

CARYOPHYLLACEAE

Dianthus monspessulanus L. RE, V, 1500–1700, A1, B3.

Dianthus cf. **geminiflorus** Lois. RE, 1500, A1; PV, 1400–1800, C1. Differs from *D. monspessulanus* L. in only minor respects. Grows with, and appears to be a variety of, *D. monspessulanus*. Arrieu and Lascombes, as well as these two species, also record *D. requenii* Godr. and *D. gallicus* Pers. All four species appear, from the available herbarium material, to be very closely related.

Cerastium alpinum L. V, 1550, 1700, A1.

Cerastium vulgatum L. PV, 1880, B1.

(*Arenaria* and *Minuartia* det. J. McNeill, Edinburgh University*).

Arenaria purpurascens Ram. ex DC. PV, 2100–2400, A1 ; V, 1750, A3.

Arenaria grandiflora L. (s. lat.) PV, 1600–2200, A1, C1–2.

Arenaria ciliata L. C, 1700, C2.

Arenaria montana L. V, 1800, A1.

Minuartia flaccida (All.) Schinz & Thell. PV, C, 1600–2100, A1, C1–2.

Stellaria alsine Grimm. RA, 1750, A3.

(*Petrocoptis*, *Gypsophila* and *Silene* det. P. K. Chowdhuri, Edinburgh University†).

Petrocoptis lagascae Willk. PV, 1800, C2.

Gypsophila repens L. RE, 1500–1700, C2.

Silene ciliata Pourr. 1550–2250, A1, C2.

Silene maritima With. PV, 1650–1880, C1.

Silene italica (L.) Pers. var. V, 1700, B1.

Silene acaulis (L.) Jacq. PV, 1800–2250, B1–2.

* Now of Reading University.

† Now of Cotton College, Gauhati, Assam.

HYPERICACEAE

Hypericum richeri Vill. (*H. fimbriatum* Lam.) V, 1700, B1.
Hypericum nummularium L. RE, 1500, C1.

MALVACEAE

Malva moschata L. var. **geraniifolia** (J. Gay) Willk. (*M. geraniifolia* J. Gay) PV, 1650, B2; V, 1700, A1, B3.

LINACEAE

Linum catharticum L. V, 1550, A3.
Linum viscosum L. RE, 1450, A1.
Linum salsoloides Lam. RE, 1500, A1 ; PV, 1800, C1.

GERANIACEAE

Geranium cinereum Cav. var. V, 1675–1800, B2–3. Lacaita (1929) states that specimens of *G. cinereum* from Puerto de Ponton should be named *G. subargenteum* Lange. For a description of *G. subargenteum* see Borja Carbonell (1953).
Geranium molle L. No. E2012. PV, 1800, B2.
Geranium pyrenaicum L. 1550–1700, A1, B2.
Erodium macradenum L'Hérit. PV, 2200, B1.
Erodium cicutarium (L.) L'Hérit. PV, 1650, B2.

RHAMNACEAE

Rhamnus alpina L. PV, 1800–2000, C1–2.

PAPILIONACEAE

Genista hystrix Lange (probably var. **villosa** Lainz (1954, p. 219)) RE, RA, PV, 1400–1800, A1–3, C1–2. Barbey-Gampert (1921) and others record *G. lobelii* DC. and Lacaita (1929) stated that in fact this should have been *G. aspalathoides* Poir. var. *legionensis* Pau. Heywood (1958a) states that the latter is apparently a grazed form of *G. hystrix* Lange, and also points out that *G. lobelii* DC. does not occur in N. Spain.
Genista hispanica L. No. E2002. PV, RA, 1600–1700, A2, B2.
Sarothamnus cantabricus Willk. V, 1675, B3. Differs from *S. scoparius* (L.) Koch in having hairs all over the legume. Retained as a distinct species by Rothmaler, and by C. Vicioso (1955). Heywood (1958b) states that it is probably a geographical subspecies.
(*Trifolium* det. M. Hossain, Edinburgh University*).
Trifolium pratense L. RA, V, 1550–1750, A1, A3.
Trifolium repens L. RA, V, 1700, A1, A2.
Anthyllis vulneraria L. (s. lat.) cf. **A. dillenii** Schult. (*A. vulneraria* f. *rubrifolia* (DC.) Willk.) RE, 1450, A1; PV, 1800, B1–2.
Lotus corniculatus L. (s. lat.) PV, 1800, B1–2; V, 1700, A1, B3.
Hippocrepis comosa L. var. PV, 2100, A1. See Bellot Rodriguez (1946, p. 284).
Vicia pyrenaica Pourr. V, 1600–1750, A1, B3.

* Now of Dacca University.

ROSACEAE

Sorbus aria (L.) Crantz (s. lat.) RE, 1650, C2.
(*Alchemilla* Det. S. M. Walters, Cambridge University)
Alchemilla sp. cf. **A. lapeyrousii** Buser PV, 1750, B2.
Alchemilla glabra Neyg. RA, 1750, A3.
Alchemilla sp. cf. **A. glabra** Neyg. V, 1675, B3.
Alchemilla alpina L. (s. lat.) RA, 1650, A3.
Alchemilla glomerata Tausch. (*A. alpina* L. (s. str.)) PV, 2000–2400, C1–2.
Alchemilla hoppeana Buser (s. lat.) cf. **A. asterophylla** Tausch. PV, 1800, C2.
Alchemilla hoppeana Buser (s. lat.) RE, 1650, C1.
Poterium sanguisorba L. (*P. dictyocarpum* Spach) V, 1600–1800, A3.
Rosa sp. cf. **R. alpina** L. V, 1550, B2. *Rosa alpina* L. is recorded from the Picos by Arrieu (1944) and Barbey-Gampert (1921).
Potentilla nivalis Lap. var. PV, C, 1900–2350, C1–2. Identical specimens from the Picos, in the Edinburgh Herbarium, are referred to this species, but have an added note by Gandoger, 1894,—"forma ad *P. petrophilum* β *vergens*". Recorded as *P. boubieri* by Barbey-Gampert (1921), but stated to be only a geographical variety of *P. nivalis* Lap. by Lacaita (1929).
Potentilla erecta (L.) Rausch. (*P. tormentilla* Sibth.) V, 1800, A1.
Potentilla aurea L. RA, 1600–1700, A2.
Potentilla alpestris Hall. V, 1750–1800, A1, A3.
Potentilla sp. cf. **P. alpestris** Hall. RA, 1650, A2.
Geum rivale L. V, 1550, A3.

CRASSULACEAE

(*Sempervivum* det. Miss C. W. Muirhead, Edinburgh.)
Sempervivum cantabricum Huber RE, 1500, B2; PV, 2000, C1.
Sempervivum giuseppii Wale C, 1900, C1.
All three collections of *Sempervivum* are now in cultivation in the Royal Botanic Garden, Edinburgh. Boubier collected specimens as *S. tectorum* L. Barbey-Gampert also lists *S. montanum* L.
(*Sedum* det. L. A. Lauener, Edinburgh.)
Sedum rupestre L. (*S. reflexum* L.) V, 1675, B3.
Sedum nicaeense All. (*S. altissimum* Poir.; & *S. sediforme* (Jacq.) Poir. in Fröderström (1932)) RP, 1800, C2.
Sedum acre L. RE, 1700, B2.
Sedum album L. RE, 1500, B2; V, 1800, A3.
Sedum sp. cf. **S. hirsutum** All. V, 1775, A3.
Sedum sp. cf. **S. villosum** L. V, 1800, A3.
Sedum sp. cf. **S. annuum** L. PV, 1800, B1–2.
Sedum sp. cf. **S. atratum** L. PV, 1800, C1.
Sedum sp. No. 484(1). V, 1800, A3.
Sedum sp. No. 298 (1). PV, 1800, B1.

SAXIFRAGACEAE

(*Saxifragaceae* det. Prof. D. A. Webb, Trinity College, Dublin).
Saxifraga oppositifolia L. PV, 2300, C2.
Saxifraga aizoides L. RA, 1750, A3; PV, 2200, C1.

Saxifraga aizoon Jacq. 1600–2200, C1–2.
Saxifraga aretioides Lap. var. PV, 2300, C2. Very dwarf specimens. Leaves less than half the normal length. Otherwise possessing all the characters of this species.
Saxifraga ajugifolia L. RA, 1750, A3; PV, 1800–2350, B1.
Saxifraga conifera Coss. PV, 2200, B2.
Saxifraga stellaris L. V, 1800, A3.
Saxifraga hirsuta L. RE, 1600, C1; V, 1700, A1.
Saxifraga hirsuta L. var. **paucicrenata** Leresche (*S. geoides* Lacaita) V, 1550, A3.
Saxifraga spathularis Brot. (*S. umbrosa* L. var. *serratifolia* (Mackay) Don.) V, 1550, 1700, A1, A3.
Saxifraga canaliculata Boiss. & Reut. C, 1700, C2: PV, 2300, C2.

PARNASSIACEAE

Parnassia palustris L. RA, 1500–1750, A3.

ONAGRACEAE

Epilobium alpinum L. RA, 1750, A3; PV, 1800, B1–2; V, 1550. A3.

UMBELLIFERAE

Astrantia major L. RE, 1800, A1; V, 1800, A3.
Eryngium bourgatii Gouan RE, 1550, C1; LP, 1500, A2.
Laserpitium nestleri Soy-Will. RE, 1500, B2.
Seseli cantabricum Lange. RE, 1500, A1.
Meum athamanticum Jacq. V, 1550, A1.
Bupleurum ranunculoides L. RE, 1450, A1.
Chaerophyllum hirsutum L. V, 1550, A3.
Myrrhis sulcata Lag. V, 1550–1750, A3, B2. No material in the Edinburgh Herbarium. Named from the description in Willkomm & Lange (1861–1880), and by comparison with specimens of *M. odorata* Scop.
Carum carvi L. PV, 1800–2200, A1, B1–2.
Pimpinella tragium Vill. RE, 1400–1500, A1.
Pimpinella magna L. RE, 1500, B2 ; V, 1675, A1.
Pimpinella siifolia Leresche (*Sisonopsis cantabrica* Levier) RE, PV, C, 1500–2000, A1, A3.

RUBIACEAE

Asperula hirta Ram. PV, 1800, C1; V, 1750, A3, C1.
Galium mollugo L. No. E2032. PV, 1700, A3.
Galium verum L. RE, 1500, A1; V, 1675, B2.
Galium anisophyllum Vill. var. V, 1550, A3.
Galium pyrenaicum Gouan. PV, 1800, B1.
Galium sp. Nos. 66, 295. PV, 1800, B1; RE, 1600, B2.

DIPSACACEAE

Scabiosa columbaria L. (s. lat.) RE, 1450, A1; V, 1700, A1.

VALERIANACEAE

Valeriana globulariifolia Ram. PV, 2300, B2. A much smaller and stouter plant than any of the herbarium specimens I have seen.

COMPOSITAE

(Compositae det. A. J. C. Grierson, Edinburgh).
Adenostyles albifrons Rchb. V, 1650–1750, A3.
Petasites albus Gärtn. RA, 1650, B2.
Homogyne alpina (L.) Cass. V, 1800, A1.
Bellis perennis L. RA, 1450–1750, A3.
Erigeron acer L. RA, 1650, B2.
Erigeron alpinus L. V, 1550–1700, A1.
Aster alpinus L. RE, PV, 1550–1950, A1.
Solidago virgaurea L. RE, 1550, C1; V, 1700, A1.
Gnaphalium silvaticum L. RA, 1600–1700, B2.
Achillea millefolium L. RA, 1800, A3; V, 1700, A1.
Chrysanthemum leucanthemum L. (*Leucanthemum vulgare* Lam.) RE, V, 1450–1550, A1, B2; PV, 2000, C1.
Doronicum glaciale Nym. PV, 2300, C1.
Senecio pyrenaicus L. ex. Loefl. PV, 1800, B1; V, 1675, B3.
Senecio aquaticus Hill RA, 1700–1750, A3.
Carlina acaulis L. LP, 1500, A2; V, 1550, A3.
Centaurea cephalariifolia Willk. RE, 1550, B2.
Centaurea nigra L. V, 1650, A1, B1.
Centaurea sp. cf. **C. podospermifolia** Losc. & Pard. PV, 2200, A1; RE, 1450, B2.
Cirsium eriophorum (L.) Scop. subsp. **vulgare** Naeg. var. **oxyonchinum** Wallr. LP, 1500, A2. Possibly the same as *C. chodatii* Barbey-Gampert (1921).
Cirsium giraudiasii Senn. & Pau LP, 1500, A2.
Cirsium vulgare (Savi) Ten. LP, 1500, A2.
Carduus acanthoides L. RA, 1650, B2.
Carduus gayanus Dur. LP, 1500, A2.
Carduus carlinoides Gouan PV, 2000–2200, A1; LP, 1500, A2; V, 1700, B2.
Carduus defloratus L. PV, 1800–2200, A1; RE, 1450, A1; V, 1700, B2.
Carduus nutans L. LP, 1500, A2.
Leontodon pyrenaeus Gouan RA, 1650, A3.
Leontodon hispidus L. RA, 1600, A3; RE, 1450, A1, C1.
Taraxacum vulgare (Lam.) Schrk. (s. lat.) No. E2013. RA, 1600, A2.
Taraxacum alpinum (Hoppe) Heg. & Heer (*T. officinale* Wigg. var. *alpinum* Koch), RA, 1600, C2 (Stone wall).
Crepis pygmaea L. subsp. **pygmaea** (*Omalocline pygmaea* (L.) Rchb. f) PV, 1800, B1.
Crepis albida Vill. subsp. **asturica** (Lacaita & Pau) Babcock PV. 2200, B2; RE, 1500–1600, B2, C1.
Crepis blattaroides (L.) Vill. RE, 1500, A1; V, 1550, B2.
Crepis lapsanoides (Gouan) Tausch PV, 1800, C1; RA, 1600, B2.
Crepis paludosa (L.) Moench RA, 1600, A3.
Crepis conyzifolia (Gouan) Dalla Torre V, 1500–1700, A1.
Hieracium pilosella L. (s. lat.) RA, 1600–1800, A2.

Hieracium amplexicaule L. (s. lat.) V, 1675, B3.
Hieracium cerinthoides L. PV, 1600–2300, C1–2; RE. 1600, C2.
Hieracium sp. cf. **H. cerinthoides** L. RE, 1600, C1, B2.
Hieracium murorum L. V, 1700, A1.
Hieracium sp. No. C63. V, 1750, A1.

CAMPANULACEAE

Wahlenbergia hederacea (L.) Rchb. 1400–1800, B2, C2.
Jasione amethystina Lag. & Rodr. PV, 2000–2300, A1, B2, C1–2.
Jasione carpetana Boiss. & Reut. (*J. perennis* Lam. var. *carpetana* (Boiss & Reut.) Willk.) RA, 1700, A2.
Phyteuma orbiculare L. 1500–2000, A1, B2, C2. Arrieu (1944) records only *P. hemisphaericum* L., but none of these specimens bear any resemblance to that species.
Campanula glomerata L. RE, 1450, A1; V, 1700, A1.
Campanula pusilla Hänke PV, 2000, A1; RE, 1550, C1.
Campanula scheuchzeri Vill. V, 1800, A1.
Campanula rotundifolia L. V, 1750, A1. Lacaita (1929) states that specimens of this species from the Picos are var. *legionensis* Pau.

ERICACEAE

Arctostaphylos uva-ursi (L.) Spreng. RE, 1500–1600, A1.
Erica tetralix L., V, 1800, A1 (Callunetum). Lacaita (1929) records *E. mackaiana* Bab., from the Picos.
Erica arborea L., V, 1675, B3.
Erica vagans L. RE, 1500, C1.
Calluna vulgaris Salisb. RE, 1600, A1 (Callunetum); V, 1675, B3; V, 1800, A1 (Callunetum); V, 1450, A1 (in a community dominated by *Gentiana lutea* L.).

PLUMBAGINACEAE

Armeria allioides Boiss. var. **latifolia** Daveau V, 1675, B3. Bernis (1954, p. 203) names this as *A. maritima* (Mill.) Willd. subsp. *eumaritima* var. *daveaui* (P. Coutinho) Bernis.
Armeria cantabrica Boiss. & Reut. ex Willk. PV, 1800, C1. Bernis (1956, p. 271) names this as *A. maritima* (Mill.) Willd. subsp. *eumaritima* var. *cantabrica* (Boiss. & Reut. ex Willk.) Bernis subvar. *asturica* Bernis.

PRIMULACEAE

(*Primula* det. H. R. Fletcher, Edinburgh.)
Primula elatior (L.) Mill. subsp. **intricata** (Gren. & Godr.) Ludi V, 1800, A1.
Primula veris L. subsp. **columnae** (Ten.) Ludi (*P. suaveolens* Bertol.) RE, 1450–1500, A1.
Androsace villosa L. PV, 2100–2200, A1, C1.

GENTIANACEAE

Swertia perennis L. V, 1800, A3.
Gentianella campestris (L.) H. Sm. (*Gentiana campestris* L.) PV, 2200, A1; V, 1700, A1.

Gentiana verna L. PV, 2200, A1, B2; V, 1800, A1, C1. Barbey-Gampert (1921) records *G. aestivalis* Roem. & Schult. [sic] (*G. verna* L. var. *alata* Griseb.).

Gentiana kochiana Perr. & Song. PV, 2200, A1; RE, 1550, C1; V, 1800, A1, C1.

Gentiana lutea L. RE, 1600, A1; V, 1400–1550, A1, B2.

BORAGINACEAE

Echium asturicum Lacaita (*E. lacaitae* Sennen? *E. vulgare* L.) PV, 1750, B2; RE, 1500, B2. See Lacaita (1929).

Lithospermum prostratum Lois. PV, 2100–2200, A1; RE, 1500, A1.

Myosotis alpestris Schm. (*M. silvatica* Hoffm. var. *alpestris* (Schm.) Koch) PV, 1800, B1; V, 1675, B3.

Myosotis alpestris Schm. cf. **M. pyrenaica** Pourr. PV, 2200, C1; PV, 2200 B2, a dwarf variety.

CONVOLVULACEAE

Cuscuta epithymum (L.) L. (s. lat.) PV, 1600, A1, on *Teucrium pyrenaicum*; RE, 1450, A1, on *Genista hystrix*.

OROBANCHACEAE

Orobanche cruenta Bertol. RE, 1450, A1, near *Genista hystrix*. Most plants had brown flowers, but two had yellow flowers.

SCROPHULARIACEAE

Linaria filicaulis Boiss. (? included in **L. alpina** (L.) DC. sensu Willk. & Lange) PV ,1800–2100, C2 ; RE, 1475, B1. Lacaita (1929) makes the comment that *L. alpina* (L.) DC. collected by Leresche and Levier, and Gandonger, are in fact *L. filicaulis* Boiss.

Linaria supina (L.) Desf. PV, 1650–2000, B2, C1.

Linaria alpina (L.) DC. No. 67. PV, 1800, C1.

Chaenorrhinum origanifolium (L.) Fourr. C, RE, 1450–1600, B1–2; RA, 1600, C1.

Antirrhinum graniticum Rothmaler (A. *hispanicum* var., see Willkomm & Lange (1861–1880), ii, 584). RP, 1500, C1.

Digitalis parviflora Jacq. RE, 1450–1500, A2; V, 1750, A2. Most plants had the normal dusky red flowers, but a few had flowers of a clear yellow colour. It was interesting to note that outside the area of this study, near Potes, *Digitalis parviflora* became dominant in slightly acid areas, on shale, replacing *Gentiana lutea*, etc.

Erinus alpinus L. var. **glabratus** Lange PV, RA, 1600–2200, C2.

Veronica ponae Gouan (*V. gouanii* Moretti in Coste, Flore de France.) Fournier (1946), however, states that *V. gouanii* Moretti is not synonymous with *V. ponae* Gouan. Guinea (1946) lists *V. ponae* from Liordes (RP.) These specimens correspond to *V. gouanii* in the Edinburgh Herbarium.

Veronica officinalis L. PV, 2000, A1.

Veronica beccabunga L. RA, 1725, A3.

Pedicularis palustris L. V, 1800, A3.

Pedicularis pyrenaica J. Gay (*P. mixta* Gren. & Godr.) PV, RE, V, 1450–2100, A1–3, C1.
Pedicularis foliosa L. V, 1650, B1–2.
Rhinanthus major Ehrh. PV, 1900, A1 (stunted specimens); RE, 1500, A1; V, 1550–1800, A3.
Odontites lutea (L.) Rchb. var. RE, 1450, C1.
Euphrasia sp. cf. **E. brevipila** Burn. & Gremli PV, 1900, A1. *E. brevipila* has a wide distribution in Europe, but is not recorded from Spain by Rothmaler (1935).

LENTIBULARIACEAE

Pinguicula vulgaris L. RA, 1450–1750, A3.
Pinguicula grandiflora Lam. V, 1700–1800, A3.

GLOBULARIACEAE

Globularia nana Lam. (*G. cordifolia* L. var. *nana* (Lam.) Camb.) PV, 2200–2300, C2.
Globularia nudicaulis L. RE, 1500, C1–2.

LABIATAE

(Labiatae det. I. C. Hedge, Edinburgh).
Thymus serpyllum L. (s. lat.), 1400–2200, A1, B1–3.
Thymus chamaedrys Fr. (s. lat.), V, 1700, B2, C1.
Calamintha acinos L. RE, 1500, C1.
Calamintha alpina Benth. PV, 2100–2200, A1.
Calamintha clinopodium Benth. PV, RE, 1550–1800, B2.
Sideritis scordioides L. PV, 1700–1800, B1–2.
Prunella grandiflora Jacq. RE, 1550, A1.
Teucrium chamaedrys L. subsp. **pinnatifidum** (Sennen) Rech. f. RE, 1400–1500, A1, C1; PV, 1750, B2.
Teucrium pyrenaicum L. PV, 1500–2000, A1, C1; RE, 1550, C1.

PLANTAGINACEAE

Plantago lanceolata L. V, 1700, A1.
Plantago alpina L. (? var. **incana** Ram.) PV, 2100, B2 ; V, 1675, B3; very dwarf specimens from RE, 1600, A1; and PV, 2200, B2.
Plantago media L. RE, 1600, A1; V, 1800, A3.

ILLECEBRACEAE

Paronychia capitata Lam. PV, 1800, B1.

CHENOPODIACEAE

Chenopodium bonus-henricus L. PV, 1700–2200, C1; V, 1675, B3.

POLYGONACEAE

Rumex scutatus L. PV, RA, RE 1500–2200, A1, B1–3.
Rumex sp. cf. **R. acetosa** L. V, 1550, A3.

Polygonum viviparum L. PV, RA, RE, V 1600–2200, A1, A3, C1.
Polygonum bistorta L. V, 1600–1800, A3, B1.

SANTALACEAE

Thesium alpinum L. C, 1700, C2.
Thesium pratense Ehrh. V, 1800, A1.

THYMELAEACEAE

Daphne cantabrica Willk. PV, RA, 1700–1800, C2; V, 1800, B2. Specimens named *D. philippii* Gren. & Godr. by Leresche and Levier in 1879, were so named in error, according to Willkomm (1890 vol. ii, p. 180). Arrieu and Lascombe record only *D. laureola* L. Losa (1955, p. 262) named specimens he collected as *D. laureola* L. var. *cantabrica* Levier.

EUPHORBIACEAE

Euphorbia chamaebuxus Bern. PV, 2200, C2.

SALICACEAE

Salix reticulata L. var. PV, 2300, C2.

URTICACEAE

Urtica dioica L. RA, PV, 1500–2200, C1.

ORCHIDACEAE

Orchis maculata L. (s. lat.) V, 1550–1800, A1, A3
Gymnadenia conopsea (L.) R. Br. (*Orchis conopsea* L.) RE, 1550, C1; V, 1700–1800, A1.
Coeloglossum viride (L.) Hartm. (*Orchis viridis* (L.) Crantz) V, 1700, A1.
Nigritella angustifolia Rich. V, 1800, A1.
Epipactis atrorubens (Hoffm.) Schultz (*E. helleborine* Crantz var.) RE, 1500, A1, C1.

LILIACEAE

Veratrum album L. V, 1800, A3.
Merendera montana (L.) Lange, RA, 1500–1800, A2.
Asphodelus albus Willd. V, 1500, 1700, A1.
Allium ochroleucum Waldst. & Kit. var. **ericetorum** Lange RE, 1500, B2.
Allium schoenoprasum L. V, 1550, 1800, A3.
Allium sphaerocephalon L. RE, 1500, C2.
Scilla verna Huds. PV, 2200, B2; V, 1800, C1.
Fritillaria pyrenaica L. V, 1800, A3.

JUNCACEAE

Juncus squarrosus L. V, 1800, A3.
Juncus articulatus L. (*J. lamprocarpos* Ehrh.) RA, 1750, A3; V, 1800, A3.
Luzula sudetica DC. V, 1700, A3.
Luzula spicata (L.) DC. V, 1700, A1.
Luzula pediformis DC. V, 1700–1800, A1, A3.

IRIDACEAE

Iris xiphioides Ehrh. RE, 1300–1500, A1.

CYPERACEAE

(Cyperaceae det. D. M. Henderson, Edinburgh.)
Scirpus cespitosus L. V, 1800, A3.
Carex atrata L. PV, 2200, B2.
Carex nigra (L.) Reichard (*C. vulgaris* Fr.; *C. goodenowii* Gay) V, 1800, A3.
Carex ovalis Good. (*C. leporina* L.) RA, 1750, A3; V, 1550, 1800, A3.
Carex pilulifera L. V, 1700, A1, B3.
Carex flava L. (s. lat.) RA, 1750, A3; V, 1800, A3.
Carex sempervirens Vill. (*C. ferruginea* Schk.) PV, 2000–2300, A1; RE. 1400–1550, A1, C1.
Carex atrofusca Schk. (*C. ustulata* Wahlenb.) V, 1550, A3.
Carex sp. No. 379. V, 1800, A3.
Elyna bellardii (All.) K. Koch (*E. spicata* Schrd.) PV, 2000–2300, A1.

GRAMINEAE

(Gramineae det. B. J. Deverall, Edinburgh University*).
Anthoxanthum odoratum L. RE, 1500, B1–2.
Phleum commutatum Gaud. (*P. alpinum* auct.) RA, 1700–1800, A1; V, 1675–1800, A3, B3.
Oreochloa disticha Link cf. **O. pedemontana** Boiss. RE, 1500, C2.
Calamagrostis arundinacea (L.) Roth PV, 1800–2300, A1, B1.
Agrostis tenuis Sibth. (*A. vulgaris* With.) RA, V, 1700–1800, A1–2.
Arrhenatherum elatius (L.) J. & C. Presl var. **bulbosum** (Willd.) Spenner RE, 1400, B1–2.
Arrhenatherum eriantherum Boiss. & Reut. PV, 1950–2200, A1.
Koeleria setacea Pers. PV, RE, 1450–2400, A1.
Catabrosa aquatica (L.) Beauv. RA, 1750, A3.
Poa annua L. RA, 1700, A3.
Poa minor Gaud. PV, 1800, B1.
Poa nemoralis L. RA, 1750, B2.
Poa alpina L. Very common everywhere. Not in A2.
Poa pratensis L. var. **angustifolia** Sm. V, 1550–1675, A3, B3.
Melica ciliata L. RE, 1450–1600, A2.
Dactylis glomerata L. RE, 1400–1540, A1; V, 1550–1700, A1. A3.
Cynosurus cristatus L. V, 1500, A1.
Festuca ovina L. PV, RA, 1650–2200, A1, B1 ; V, 1800, A3.
Festuca rubra L. (s. lat.) cf. **F. heterophylla** Lam. PV, 1800, B1.
Festuca rubra L. Nos. E2027, E2028. PV, 1800, B1.
Bromus erectus Huds. PV, 1650, B2; V, 1750, A1.
Bromus mollis L. (*Serrafalcus mollis* (L.) Parl.) PV, 1650, B2.
Brachypodium pinnatum (L.) Beauv. RE, 1400, B1–2.
Lolium perenne L. RA, 1650, A2.
Nardus stricta L. RE, 1500, B2; V, 1550, A3.

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Whilst the account of some of the " difficult " genera such as *Sorbus* and *Rosa* is possibly over-simplified, the majority of the genera and species receive a full and interesting treatment, the willows being specially well done. Doubtless in a book of this nature it is difficult to draw the line between shrubs and herbs but surely *Dryas octopetala* is a perfectly good undershrub and should be included.

On the credit side, the book is lucidly presented, well printed and well illustrated. On the debit side, the need for another book on such well covered territory, especially when it is linked by name with a national botanical institution, can only be questioned; it is also an expensive little volume.

I. C. HEDGE.

* British Trees and Shrubs, by R. D. Meikle. London, Eyre & Spottiswoode (The Kew Series No. 2). 1958. Pp. 244, 84 figs, 8 coloured plates. Price 25 shillings.