A LIST OF PLANTS OBSERVED DURING THE FIELDWORK FOR A DIPLOMA-THESIS ON AN ANALYSIS OF THE VEGETATION OF THE MADEIRAN LAUREL WOOD

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With 1 plate, 1 figure and 2 tables

RESUMO. Nalgumas das áreas mais remotas da Ilha da Madeira subsiste ainda uma vegetação natural ou quase natural, rica em espécies endémicas, cujo arranjo sistemático foi tentado no presente trabalho. Na região da Encumeada foram analisadas fitosociologicamente 56 áreas-teste, complementadas com medições do microclima e análise de solos. Os valores da humidade do ar são, em condições atmosféricas normais, acima dos 80%. A temperatura é amena e raramente se afasta da média anual de 12 a 13° C, na Encumeada. O solo típico da Laurisilva é um "ranker" de basalto castanho escuro a castanho avermelhado, com um pH bastante ácido. Na área investigada, três comunidades de plantas podem ser distinguidas: uma quase natural, de *Laurus-Ocotea*, com vários estados de desenvolvimento, de acordo com a influência humana, uma de *Erica arborea - Erica scoparia* formando uma floresta de arbustos de copa aberta e uma de *Phyllis nobla*, das levadas, que faz de zona marginal de floresta. Em vista do facto de que a Laurisilva da Madeira é geralmente ameaçada, seria altamente desejável que as zonas de floresta da Encumeada fossem incluídas na ára de Reserva Integral.

1. INTRODUCTION

The idea to present a thesis on the Madeiran laurel wood to obtain a diploma at the Faculty of Biology was conceived in 1982 during a botanical excursion organized by the University of Tübigen, Federal Republic of Germany.

To this end it was decided to spend several months on the island where during some four months (July - October 1983) the vegetation in the area of the Encumeada pass was examined (see fig. 1). To characterize the plant communities observed more closely several methods of vegetation ecology were applied.

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Measurements of the local climatic conditions (temperature and relative humidity) as well as soil analyses were carried out with the object to ascertain the condition of localization of a laurel forest more exactly. While only to a limited extent, certain tendencies could be demonstrated, respectively confirmed.

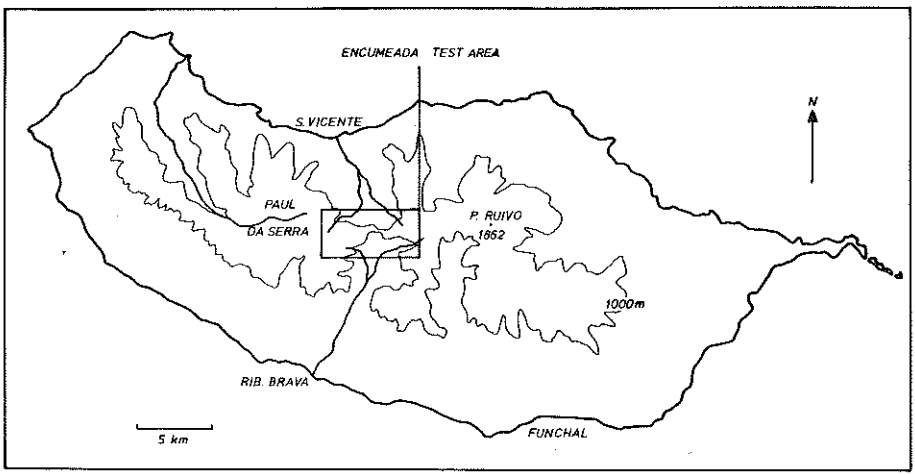

Fig. 1. — Map of Madeira with 1000 m contour. Rectangle in centre shows the test area in the Encumeada region. Site V (levadas) covers records from both sides of the Encumeada pass. Sites I - IV and VI are situated on the northern slope.

The natural or nearly natural laurel woodland with its large amount of endemics is endangered by man's activities. The law to establish a "Natural Park of Madeira" (of October 1982) will certainly contribute to its protection. However, the area prescribed as "Reserva natural integral" (Strict Nature Reserve) does not include the laurel forest in the region of Encumeada. The investigations were also carried out to determine whether protection also for the forest of the Encumeada area is needed.

2. METHODS

In the Encumeada region six different sites with 56 test areas of 25 square metres each were determined. Relevé records were carried out in accordance with the method of Braun-Blanquet (1964). Pteridophyta and Spermatophyta were registered, the field-, shrub- and tree-layers taken into consideration and the Braun-Blanquet Cover-Abundance Scale, modified by Knapp (1971), was used.

Considerations concerning size and final choice of the test areas were made with the aid of species-area curves, constancy diagrams and

scatter curves of species. Spectra of the plant life-forms were made in accordance with occurrence and under consideration of species abundance. The division of the species was based on one hand on literature on the other hand on field observations using the key to the Raunkiaerian plant life forms by Ellenberg and Mueller-Dombois (1967). The plant records were checked for similarity with the aid of the presence-community coefficient (Jaccard 1912). A classification of the plant communities by tabular comparison was attempted.

Records of temperature and relative humidity were made with a thermohydrograph (Lambrecht). Soil samples fresh from the field were evaluated by diagnostic principles.

3. LOCALITY OF THE TEST AREAS

The chosen sites belong to the upper uniformly wall-like areas which form the southern border of a large basin of a valley formed by erosion ("Erosionskesseltal", Wirthmann, 1970) of São Vicente (see fig. 1). The sites I, II and IV are to be reached by the Levada do Norte. Site III is situated east of the Casa dos Serviços Florestais of the Encumeada above the western branch of the Ribeira do Monte Trigo. Site IV is below the Pico do Ferreiro. Site V covers records along the 30 years old Levada do Norte.

The altitude ranges from 875 to 1020 m. The sites I, II, III and VI are slopes in east-, northeast- and north-exposure with an inclination between 35° and 50°. Site IV is northeasterly exposed in a basin of a valley with little inclination.

4. RESULTS

The relative air-humidity of the laurel forest is generally above 80%. Dry desert winds (Leste) sometimes cause a sharp decrease in humidity and temperature. The temperatures are generally very uniform and rarely vary from the annual mean temperature of 12 to 13° C in the Encumeada (Kämmer, 1982).

The typical soil in the laurel forest is a more or less shallow to deep basaltic ranker with dark-brown to reddish brown horizons. If it is not too stony, the soil is well rooted. The organic matter content is very high (4-8%, sometimes but rarely as high as 15%). The pH of the soil is extremely acid (pH 4.5-5.5). The humus type is often a mull-like mould. The air- and water-capacity changes from medium to optimum. Soil profile: L-(O)-A_h-mC.

Although a study with a test area size of 25 square metres (Sjögren, 1972) is practible, it is suggested that botanists work with an area comprising 100 square metres.

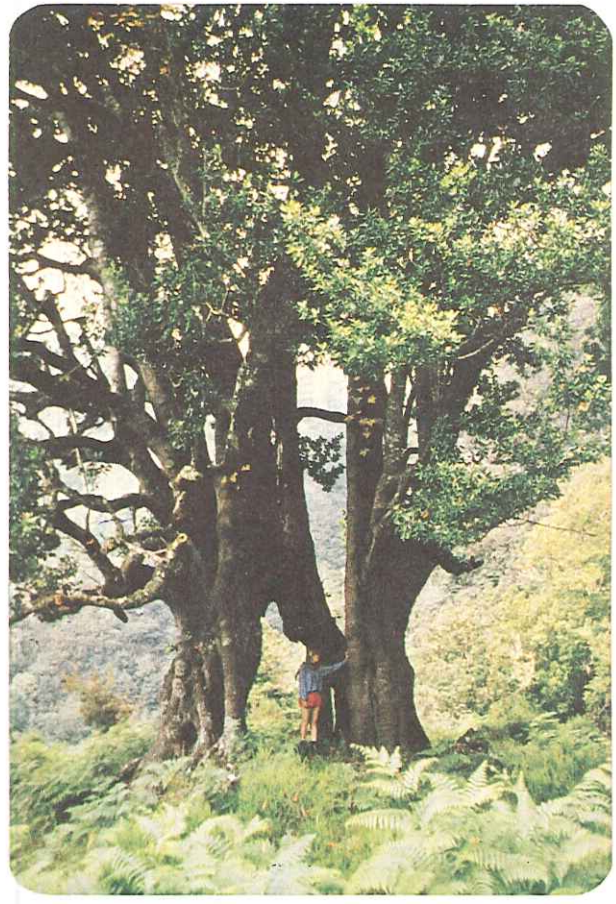

Plate I. — Left: An *Erica arborea - Erica scoparia* - Community of Site IV influenced by man showing shrub-like forest with an open canopy; in the foreground *Euphorbia mellifera, Woodwardia radicans,* in the central area *Erica scoparia, E. arborea, Clethra arborea* and in the background on the steep slopes *Laurus azorica* and *Ocotea foetens.* Right: A very old specimen of a Til tree (*Ocotea foetens*) in the area of Fajã da Ovelha.

By using the methods of vegetation ecology three plant communities were determined in the Encumeada region. The sites I, II, III and VI revealed an almost natural *Laurus-Ocotea* community with different stages of succession caused by the influence of man. Site IV covers an *Erica scoparia - Erica arborea* community, a shrub-like forest with an open canopy gradually being replaced by laurel forest (see plate I). A *Phyllis nobla* community constitutes the vegetation of the levada (site V) and acts as a woodland margin.

A systematic classification has been attempted in comparison with the associations and alliances known from the Canary Islands. The *Laurus-Ocotea* community can be assigned to the *Laurion macaronesium* (Rübel, 1930), the *Erica scoparia - Erica arborea* community to the *Fayo - Ericion arborea* (Oberdorfer, 1965), the *Phyllis nobla* community most likely to the latter as well.

Trees with a high degree of cover and hemicryptophytes with lower percentage cover values dominate in the life form spectra of the *Laurus-Ocotea* community. Nanophanerophytes, chamaephytes, geophytes, and therophytes constitute only a minor component. In the heath community hemicryptophytes provide more abundant covering than the macrophanerophytes. Nanophanerophytes are in evidence, but not to the degree as in the spectrum of the *Phyllis nobla* community.

The laurel forest is endangered by intensive agriculture, grazing, forestry, tourism, and by the introduction of non indigenous plants. To protect and conserve the described laurel forest in Encumeada it is strongly recommended that the area be designated a nature preserve.

5. PLANT-LIST (NOMENCLATURE ACCORDING TO FLORA OF MACARONESIA, 1985)

Aspidiaceae

Dryopteris aemula (Ait.) O. Kuntze
Hemicryptophyte; high constancy in *Laurus-Ocotea* community

E *Dryopteris aitoniana* Pic.-Serm.
Hemicryptophyte

E *Dryopteris maderensis* Alston
Hemicryptophyte

Dryopteris affinis (Lowe) Fr.-Jenk.
Hemicryptophyte

Polystichum setiferum (Forssk.) Woynar
Hemicryptophyte

Aspleniaceae

Asplenium hemionitis L.
Hemicryptophyte

Asplenium monanthes L.
Hemicryptophyte; high constancy in *Laurus-Ocotea* community.

Asplenium onopteris L. var. *onopteris*
Hemicryptophyte

Asplenium trichomanes L. ssp. *quadrivalens* D. E. Mey.
Hemicryptophyte

Athyriaceae

Athyrium felix-femina (L.) Roth
Hemicryptophyte

Cystopteris viridula (Desv.) Desv. (according to Luz da Rocha Afonso, 1982)
Hemicryptophyte

E *Diplazium caudatum* (Cav.) Jermy
Hemicryptophyte

Blechnaceae

Blechnum spicant (L.) Roth
Hemicryptophyte

Woodwardia radicans (L.) J. E. Sm.
Hemicryptophyte; especially to be found in site V. Very imposing plant, fronds reaching a length of 2-3 metres. The plants are capable of spreading by means of rooting buds produced near the ends of the long fronds when bending down and reaching the ground.

Davalliaceae

Davallia canariensis (L.) J. E. Sm.
Geophyte; often epiphytic.

Hymenophyllaceae

Hymenophyllum tunbrigense (L.) J. E. Sm.
Chamaephyte; very hydrophilous plant, often epixylic and epiphytic on tree-trunks.

Trichomanes speciosum Willd.
Chamaephyte; high constancy in *Laurus-Ocotea* community, very hydrophilous plant, sometimes epiphytic, in sheltered habitats.

Hypolepidaceae

Pteridium aquilinum (L.) Kuhn
Geophyte

Lycopodiaceae

Huperzia selago (L.) Bernh. ex Schrank et Mart. ssp. *selago*
Chamaephyte; recorded along levada.

E *Huperzia selago* ssp. *dentata* (Herter) Valentine
Chamaephyte; recorded along levada.

Ophioglossaceae

Botrychium lunaria (L.) Sw.
Geophyte; first record for Madeira, hitherto only known from one island of Macaronesia (Pico/Azores), three young plants under thick organic litter.

Polypodiaceae

E *Polypodium macaronesium* Bobrov (according to Roberts, 1980)
Geophyte; often epiphytic.

Pteridaceae

Pteris incompleta Cav.
Hemicryptophyte; high constancy in *Laurus-Ocotea* community.

Selaginellaceae

Selaginella denticulata (L.) Link
Chamaephyte

Thelypteridaceae

Stenogramma pozoi (Lag.) K. Iwatsuki
Hemicryptophyte

Apiaceae

Apium nodiflorum (L.) Lag.
Hemicryptophyte; sometimes hydrophyte.

E *Imperatoria lowei* Coss.
Chamaephyte

E *Oenanthe divaricata* (R. Br.) Mabb.
Hemicryptophyte

Aquifoliaceae

E *Ilex perado* Ait. ssp. *perado*
Macrophanerophyte; mesophyll foliage, often together in community with *Vaccinium* and *Erica;* no *Ilex canariensis* in the test areas.

Asteraceae

Ageratina adenophora (Spreng.) King et Robins
Hemicryptophyte; neophyte, but frequent since 1840 (Lowe, 1868).

E *Andryala glandulosa* ssp. *varia* (Lowe ex DC.) R. Fern.
Hemicryptophyte

E *Argyranthemum pinnatifidum* (L. fil.) Lowe
Nanophanerophyte; one of the candelaber-plants, which are typical for the islands of Macaronesia; likes a light situation.

E *Carlina salicifolia* (L. fil.) Cav.
Nanophanerophyte; candelaber-plant.

E *Cirsium latifolium* Lowe
Hemicryptophyte; roots are of some nutritive value (Lowe, 1868).

Erigeron karwinkianus DC.
Hemicryptophyte; neophyte, high frequency on the island since the begining of the 20th century, today leading plant of the laurelwood vegetation (Oberdorfer, 1965).

Hypochoeris radicata L.
Hemicryptophyte

E *Senecio auritus* (L'Hér.) Lowe
Chamaephyte; high constancy along levadas and sites I and II.

E *Sonchus fruticosus* L. fil.
Nanophanerophyte; candelaber-plant, likes light situation and continuous water, often along levadas and in site IV.

E *Tolpis succulenta* (Dryand. in Ait.) Lowe
Chamaephyte; to be found on the south-side of the levada test area; according to Sjögren (1972) differential species of *Aeonio-Lythanthion;* the secretions of the roots are known as "indian rubber".

E *Tolpis macrorhiza* (Lowe) Lowe
Chamaephyte; recorded in site IV and along levadas; high drought tolerance.

Boraginaceae

E *Echium candicans* L. fil.
Nanophanerophyte; candelaber-plant.

Brassicaceae

Cardamine hirsuta L.

Therophyte

E *Erysimum bicolor* (Horem.) DC.

Nanophanerophyte; candelaber-plant.

Nasturtium officinale R. Br.

Hemicryptophyte; along levadas, in moist places.

Caprifoliaceae

Sambucus lanceolata R. Br. in Buch

Macrophanerophyte; mesophyll foliage.

Caryophyllaceae

E *Cerastium vagans* Lowe

Hemicryptophyte

Sagina procumbens L.

Hemicryptophyte; moss-like, in moist places.

Clethraceae

E *Clethra arborea* Ait.

Macrophanerophyte; mesophyll foliage; with several sprouts; usual height 4-5 metres, seldom 7-9 metres; high constancy in *Laurus-Ocotea* community; characterizes the lower and middle tree layer in the *Laurus-Ocotea* community, is also found in the *Erica scoparia - Erica arborea* community.

Crassulaceae

E *Aeonium glandulosum* (Ait.) Webb et Berth.

Chamaephyte; recorded along Levada 6 (site V, see table 2); according to Sjögren (1972) differential species of *Aeonio-Lythanthion,* but of lesser value.

E *Aichryson divaricatum* (Ait.) Praeger

Therophyte; high constancy in *Laurus-Ocotea* community; sometimes epiphytic.

E *Aichryson villosum* (Ait.) Webb et Berth.

Therophyte; along levadas.

Ericaceae

Erica arborea L.

Macrophanerophyte; dominates in the tree and shrub layer of the *Erica scoparia - Erica arborea* community of site IV; microphyll foliage; reaches a height of 5 to 7 metres; is characterized by very hard timber.

E *Erica scoparia* ssp. *platicodon* (Webb et Berth.) A. Hans. et Kunk.
Macrophanerophyte; dominates in the tree and shrub layer of the *Erica scoparia - Erica arborea* community of site IV; microphyll foliage.

E *Vaccinium padifolium* J. E. Sm. ex Rees
Macrophanerophyte; recorded in the lower tree layer of site III, *Vaccinium* variant of the *Laurus-Ocotea* community; also in the *Erica* community; microphyll foliage; usually summergreen, sometimes wintergreen.

Euphorbiaceae

E *Euphorbia mellifera* Ait.
Macrophanerophyte; mostly in the shrub layer of a *Laurus-Ocotea* community; needs moist places, to be found in dried up brooks; mesophyll foliage.

Fabaceae

Cytisus scoparius (L.) Link.
Nanophanerophyte

E *Teline maderensis* Webb et Berth.
Nanophanerophyte

Trifolium dubium Sibth.
Therophyte

E *Vicia capreolata* Lowe
Therophyte; rare endemic species.

Geraniaceae

E *Geranium maderense* P. E. Yeo
Hemicryptophyte; site I and IV; only known from very few places.

Hypericaceae

E *Hypericum glandulosum* Ait.
Nanophanerophyte

E *Hypericum inodorum* Mill.
Nanophanerophyte

Hypericum humifusum L.
Chamaephyte

Hypericum undulatum Schousb. ex Willd.
Chamaephyte

Lamiaceae

E *Bystropogon canariensis* (L.) L'Hér.
Nanophanerophyte; recorded along levadas and in site IV; likes light situation.

E *Cedronella canariensis* (L.) Webb et Berth.
Nanophanerophyte; found along levada and in site I (Ribeiro).

Clinopodium vulgare ssp. *arundanum* (Boiss.) Nym.
Hemicryptophyte; very frequent on Madeira.

Origanum virens Hoffm. et Link letswaart
Hemicryptophyte

Prunella vulgaris L.
Hemicryptophyte

Lauraceae

E *Laurus azorica* (Seub.) Franco var. *azorica*
Macrophanerophyte; dominates in the tree layer; high constancy; not found in site IV; mesophyll foliage; shows multifarious leaf-sizes, even on a single plant; average height between 5 and 7 metres, rarely as high as 15 metres.
(*Exobasidium laurii*, a parasitic basidiomycet was very frequent in site III, to be found on *Laurus*)

E *Ocotea foetens* (Ait.) Benth. et Hook. fil.
Macrophanerophyte; dominates in the tree layer; high constancy; not found in site IV; mesophyll foliage; shows multifarious leaf-sizes; even on a single plant; with several sprouts; height from 20 to 25 metres, diameter of trunk 0.3 to 1.5 metres; now fairly rare tree, because timber used to be in great demand for furniture and building.

E *Persea indica* (L.) K. Spreng.
Macrophanerophyte; not in site IV.

Myricaceae

Myrica faya Ait.
Macrophanerophyte; microphyll foliage; is not rare in the tree and shrub layer of the cloud zone vegetation; high drought tolerance.

Myrsinaceae

E *Heberdenia excelsea* (Ait.) Banks ex DC.
Macrophanerophyte; mesophyll foliage.

Oleaceae

E *Picconia excelsa* (Ait.) DC.

Macrophanerophyte; mesophyll foliage; according to Hartnack (1930) nearly extinct, a rare plant even in the 19th century, because the very hard timber used to be in great demand for the building of ships.

Onagraceae

Epilobium parviflorum Schreb.

Hemicryptophyte

Plantaginaceae

E *Plantago arborescens* ssp. *maderensis* (Dene.) A. Hans. et Kunk.

Nanophanerophyte; according to Sjögren (1972) a differential species of *Aeonio-Lythanthions;* recorded from the south-side of Levada 6; generally below 400 metres, occasionally reaching 1000 metres in the south.

Plantago lanceolata L.

Hemicryptophyte

Polygonaceae

Rumex bucephalophorus L.

Therophyte; in an open *Erica scoparia - Erica arborea* community, which may be named *Digitalis-Rumex* variant; test areas No. 33 and 40, in a Ribeiro, which is dry in summer and has a varying amount of water in winter.

Rumex obtusifolius L. ssp. *obtusifolius*

Hemicryptophyte

Ranunculaceae

E *Ranunculus cortusifolius* Willd.

Hemicryptophyte; recorded in site I and II and along levadas; in habitats with supply of water and enough light.

Ranunculus repens L.

Hemicryptophyte

Rosaceae

Duchesna indica (Andr.) Focke

Hemicryptophyte; neophyte; found in site IV and recorded only from near one single levada.

Fragaria vesca L.

Hemicryptophyte; found in site IV and along levadas; high constancy in site IV.

Potentilla anglica Laich.

Hemicryptophyte; recorded from site IV and near one single levada, high constancy in site IV.

Rosa canina L.

Nanophanerophyte

E *Rubus grandifolius* Lowe

Nanophanerophyte; preferentially in moist, shady habitats.

Rubiaceae

E Phyllis nobla L.

Chamaephyte; found in site IV and along levadas; very high constancy near the levadas for which reason the community is named *Phyllis nobla* community; candelaber-plant; likes light situation.

Rubia peregrina L.

Chamaephyte; high constancy in *Laurus-Ocotea* community.

Salicaceae

E *Salix canariensis* Chr. Sm. ex Link

Macrophanerophyte; mesophyll foliage; recorded from near one single levada; one of the few trees that shed their leaves.

Scrophulariaceae

Digitalis purpurea L.

Therophyte; in an open *Erica scoparia-Erica arborea* community, which may be named a *Digitalis-Rumex* variant.

E *Isoplexis sceptrum* (L. fil) Loud.

Chamaephyte; candelaber-plant; related to *Digitalis.*

Scrophularia socodonia L.

Hemicryptophyte

E *Sibthorpia peregrina* L.

Hemicryptophyte; high constancy in *Laurus-Ocotea* community and along levadas.

Veronica serpyllifolia L.

Hemicryptophyte

Violaceae

Viola riviniana Rchb.
Hemicryptophyte

Cyperaceae

Carex divulsa Stokes ssp. *divulsa*
Hemicryptophyte

E *Carex malato-belizii* Raymond
Hemicryptophyte; recorded from Ribeiros that are dried out periodicalli (site I).

E *Carex peregrina* Link.
Hemicryptophyte; to be found in all test areas, high grade of covering in site IV, high constancy in *Laurus-Ocotea* community.

Scirpus cernuus Vahl
Hemicryptophyte

Juncaceae

E *Luzula seubertii* Lowe
Hemicrytophyte; a very rare species.

Liliaceae

Agapanthus praecox ssp. *orientalis* (Leighton) Leighton
Hemicryptophyte; neophyte; planted along levadas.

E *Ruscus strepthophyllus* P. F. Yeo
Chamaephyte

Orchidaceae

E *Dactylorhiza foliosa* (Verm.) Sóo
Geophyte

Poaceae

Agrostis castellana Boiss. et Reut.
Hemicryptophyte

Anthoxanthum odoratum L.
Hemicryptophyte

E? *Avenula marginata* (Lowe) Holub
Therophyte; may be considered a Madeiran endemic, according to information by Dr. A. Hansen, is however to exist also on the mainland of Portugal.

Brachypodium sylvaticum (Huds.) PB.

Hemicryptophyte; recorded from site IV in an *Erica* community.

Briza maxima L.

Therophyte

Cynosurus elegans Desf.

Therophyte

E *Deschampsia argentea* (Lowe) Lowe

Hemicryptophyte

E *Festuca donax* Lowe

Hemicryptophyte; high grade of covering in site IV; high constancy in *Laurus-Ocotea* community.

Holcus lanatus L.

Hemicryptophyte

Vulpia muralis (Kunth) Nees

Therophyte

Vulpia myurus (L.) C. C. Gmel.

Therophyte

Altogether 115 species, 53 of which are endemics (E). In accordance with «Flora of Macaronesia» (1985) «endemic» is understood as endemic only to the islands of Macaronesia (Azores, Madeira, the Salvage Islands, the Canary and the Cape Verde Islands). Species occurring also in the so-called Macaronesian enclave of the African mainland and in the Iberian Peninsula are excluded.

Record from near site III:

Campanulaceae

E *Musschia wollastoni* Lowe

9 plants not far from site III, near a Ribeiro, which had hardly any water; Lowe (1868) describes this rare candelaber-plant as «... in stature and in foliage a truly noble plant» (p. 577).

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Table 1: Site I–IV and VI

Relevé No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	Class of Constancy
Site	I																II								III								IV								VI								
Altitude (m)	1000																1020								875								975								950								
Exposure	E																E								NW								NE								N								
Inclination°	40																40								50								slight								35								
Size (m^2)	25																25								25								25								25								
Cover (%)																																																	
Life forms: tree layer	100	60	40	90	80	70	70	40	80	60	60	10	60	50	90	90	60	70	70	80	90	90	80	70	90	80	70	80	90	70	90	90	40	50	60	30	40	25	10	30	80	70	90	90	90	90	90	90	
Life forms: field layer	20	80	90	20	30	60	60	60	40	40	40	30	50	70	30	40	70	80	90	80	60	70	50	70	15	10	15	20	10	10	10	15	60	90	90	90	80	90	50	60	10	30	20	20	15	20	20	10	
Total no. of species	21	30	27	15	16	18	25	19	16	19	22	16	26	19	15	19	21	28	16	15	15	17	19	14	18	21	18	18	13	15	16	17	38	31	23	26	34	30	32	37	14	11	11	10	14	13	15	12	
M Clethra arborea	3	2	1	2	3	2	2	1	2	2	3	2	2	2	2	2	3	2	2	3	3	2	2	2	2	2	2	2	2	3	3	1	2	2	2		1	1			3	3	3	3	3	3	3	3	V
H Sibthorpia peregrina	1	3	2	1	2	2	2	3	2	2	1	2	2	3	2	2	3	2	3	3	3	3	3	3	+	+	+	+			r	1		+		1	+		+	+	1	1	+	+	+	1	r	+	V
T Aichryson divaricatum	r	r		r	r	+	+	+	+	+	+	+	+	1	+	+	+	+	+	+	1	+	+	1	1	+	1	1	1	r	1			1			r	+	1	+	1	+	1	1	1				V
C Rubia peregrina	+	+	2	+	+	+	2	2	+	+	+	2	1	1	+	1	1	+	+	+	1	1	1	+		1		r	1	1	r	1			r		+	1	r	r	r	r		r	r	r	r		V
M Laurus azorica var. azorica	2	2	1	+	+	+	2	1	3	r	2	+	2		2	2	r	1	2	2	1	2	r	1	2	2	2	3	2	2	1	2	r	r	r		1	r		r				r	1				V
H Polystichum setiferum	1	+	1	+	1	+	1	r	1	+	r	1	+	+	r	1	r	+	+	1	1	1	1	1	r	r			r		r		+	1	+	1	+	+	1	+							r	IV
M Ocotea foetens	3	2	2	3	3	3	3	3	3	3	3	r	3	3	4	5	3	4	4	4	3	4	4	4	3	3	3	3	3	3	3	3									3	3	4	3	3	3	3	3	IV
H Carex peregrina		+	+		+	+	+	+	1		+	1	+	+		1	+	2	+	+	+	1	+	1	1	1	1	1	1	+	1	+	1	3	3	2	3	3	2	2								IV
H Pteris incompleta	+	+	+	1	+	2	+	+	1	1	1	+	2		+	+	1	r	r	3	r	2	1	1	1		r									r	r				1	1	2	2	1	2	2	1	IV
H Dryopteris aemula	+	1		r	r	1	1	+	+	1	r	1	+	+	+	+	+	+	+	+	1	+	1	1	+	r				r		1	1	1	1	1	+	1	+		+	2							IV
C Hymenophyllum tunbrigense	1			1			+	1	1	1	+	+	+	1	1	1	r	+	+		1			1	+	1	1	+	+	+	1	r						1		+	+	+	+	+	+	+	+	IV
H Asplenium monanthes	+	1	1	+	+	1	+	+	+	1	+	+	+	+	1	1	1	1	+	+	1	+	1	+	+							1	1				r			r	r	+	r			1	1	1	IV
H Viola riviniana	+	1	r		r	r	+	1		+			+	+		1	r	1	r			r	r	r	1	r		1		1	r	1		1	1	1	+	+	+	1									IV
H Blechnum spicant			1				1	1		r	r		1	1			r	1		r	1	r	1	+	r	r	r	+		+	r	r	r	1			+	1	1	+	r				r	r	1	r	IV
C Trichomanes speciosa	+	r		1	+	1	1	1	+	1	r	1	+	1	1	r		+	1	+	+		1		r				1													+	r	r		r	1	1	+	III
H Festuca donax	+	2	2				1	+	1	1	1		+				1	+				1			+	+	1	2	1	+	1	1	1	3	3	3	2	3	2	r								III
H Geranium maderense	+	+	+		+	+		1	+	+	+	+		r	+	1																	2	+	1	1	+	1	+	1								III
M Erica scoparia ssp. platycodon							r	r			1		r				r	1								r		r	1				2	2	2	2	2	1	1	1								II
M Vaccinium padifolium											r							r							2	1	r	2	r	2	r		r	r	2	r		1	r										II
C Phyllis nobla		r	r				+										r	r										r					r	r	1	1	2	+	r	r									II
G Polypodium macaronesicum		r				1					+			r	r	+	+	+				+				1					r					1				+				1				II
H Athyrium felix-femina		r	2		r			r				r						2		r													r			r	r	r		1								II
H Clinopodium vulgare ssp. arundanum		r	r							r	r							1					1											1	1	1	r	r	1									II
H Dryopteris affinis		r		r																									r	r		r		1	1	2	r	1	2								II
G Pteridium aquilinum																									1	1	r		r		r				1	1	r	r	1	1									II
C Selaginella denticulata	1						1					r	+	+					1				r										+			1		+	+									II
M Heberdenia excelsa	r												r												r	r						r	r	2	2								r					II
H Asplenium onopteris var. onopteris																											r			1	r	1	r	r				+	+									II
Rubus spec.	r	1	1						+			r																					r	+	+	1		+	-									II
H Ageratina adenophora			r								r					r		+	r	+					r	1	1	r																				II
H Prunella vulgaris			r	r	r																												1		1		1	1	1	1									I
H Cystopteris viridula							1																										1						1		1	r	r	r	r	r		I
G Davallia canariensis						1					r					1	1	1			+						+													+									I
H Brachypodium sylvaticum													r																				1	+		+	1	+	+	+									I
H Potentilla anglica																																	1	+	+	+	+	+	+	+									I
N Argyranthemum pinnatifidum		r	1				r	r				r	r			r							r																									I
H Dryopteris aitoniana																		r				r			r		r						r	r			r	r										I

M Erica arborea																								r			r						1	2	r	2	2											I
H Erigeron karwinskianus			1							1			1	+				+																			r			r								I
N Bystropogon canariensis			r				r																										1	r	1		+	r											I
H Fragaria vesca															r			r															1	1		r			r	+									I
H Stegnogramma pozoi		r	r																														r							1	r				r		r		I
M Euphorbia mellifera	r	2	2																																		1		r	2									I
H Asplenium trichomanes ssp. quadriv.							1						1			r																	r							r	r								I
H Dryopteris maderensis																																											+	+	1	+	+	+	I
H Ranunculus cortusifolius							r						r								r		r													r		1											I
M Ilex perado ssp. perado																										r	r	r			r		r																I
C Senecio auritus	r	r							r									r				r																											I
N Rosa canina		r																															2	r						1									I
H Carex divulsa ssp. divulsa																																	1	+	1					+									I
H Deschampsia argentea																																	1	+				+		+									I
C Ruscus streptophyllus																									+		r	r																			r		I
M Sambucus lanceolata																																										r	r			r	r		I
N Cedronella canariensis		1	r																														r																I
H Duchesnea indica																																		1				r	r										I
T Briza maxima																																				+	+		+										I
H Cerastium vagans		r																																			r			r									I
N Erysimum bicolor			r														r																							r									I
H Holcus lanatus					r									r																							r												I
N sonchus fruticosus																																	r	r	r														I
N Rubus grandifolius																																						1		1									I
H Agrostis castellana																																		+			1												I
H Anthoxanthum oderatum																																		+			1												I
H Carex malato-belizii		+	1																																														I
H Andryala glandulosa ssp. varia																																							r	1									I
H Ranunculus repens																																	1							r									I
T Digitalis purpurea																																	r							r									I
H Diplazium caudatum																																											r	r					I
H Hypochoeris radicata																																					r	r											I
C Isoplexis sceptrum																							r																										I
T Rumex bucephalophorus																																																	I
M Picconia excelsa				3																													1																I
T Cynosurus elegans																																	1																I
H Luzula seubertii																																																	I
H Agapanthus praecox ssp. orièntalis						r																																		r									I
H Asplenium hemionitis																																																	I
G Botrychium lunaria	r																																																I
C Dactylorhiza foliosa		r																																															I
C Huperzia selago ssp. selago														r																																			I
H Oenanthe divaricata							r																																										I
N Teline maderensis														r																									r										I
C Tolpis macrorhiza																																							r										I
H Woodwardia radicans																																																	

Mean no. of species/relevé: 20

Total no. of species of the table: 83

Table 2: Site V (Levada)

Life forms										Class of Constancy
	Relevé No.	1	2	3	4	8	7	6	5	
	Altitude (m)	1000							990	
	Exposure	E	SE	NNW	SSE	SE	E	E	SW	
	Length of the relevé (m)	10								
	Heigth of the wall (m)	2,5	2	3	2	3	2,5	2	3	
	Remarks	-- north of Enc.p. --					south of E.p.			
	Total no. of species	37	34	36	44	47	36	29	19	
H	Erigeron karwinskianus	x	x	x	x	x	x	x	x	V
C	Phyllis nobla	x	x	x	x	x	x	x	x	V
H	Athyrium felix-femina	x	x	x	x	x	x	x		V
M	Erica scoparia ssp. platycodon	x	x	x		x	x	x	x	V
H	Hypochoeris radicata		x	x	x	x	x	x	x	V
C	Senecio auritus	x		x	x	x	x	x	x	V
H	Sibthorpia peregrina	x	x	x	x	x	x	x		V
H	Ageratina adenophora	x	x	x	x		x	x		IV
H	Blechnum spicant	x	x	x	x	x	x			IV
H	Festuca donax	x	x	x	x	x			x	IV
H	Prunella vulgaris	x	x	x	x	x	x			IV
C	Selaginella denticulata	x		x	x	x	x	x		IV
H	Stegnogramma pozoi	x	x	x	x	x	x			IV
H	Andryala glandulosa ssp. varia		x	x		x		x	x	IV
N	Bystropogon canariensis	x	x	x	x	x				IV
H	Cystopteris viridula	x			x	x	x	x		IV
H	Deschampsia argentea	x	x	x	x		x			IV
H	Holcus lanatus		x	x		x	x	x		IV
N	Hypericum grandifolium	x	x	x		x	x			IV
H	Oenanthe divaricata		x	x	x		x	x		IV
	Rubus spec.		x	x		x	x	x		IV
H	Viola riviniana	x	x	x	x	x				IV
H	Agrostis castellana		x			x	x	x		III
T	Aichryson divaricatum	x			x	x			x	III
N	Argyranthemum pinnatifidum	x		x	x	x				III
H	Clinopodium vulgare ssp. arundanum	x	x		x	x				III
T	Cynosurus elegans	x	x		x	x				III
H	Dryopteris aemula	x				x	x	x		III
H	Epilobium parviflorum		x		x	x		x		III
H	Woodwardia radicans	x		x		x	x			III
H	Asplenium monanthes	x			x	x				II
H	Asplenium onopteris		x				x		x	II
H	Asplenium trichomanes ssp. quadriv.	x				x	x			II
H	Brachipodium sylvaticum		x	x			x			II
T	Briza maxima		x				x		x	II
H	Carex divulsa ssp. divulsa	x			x		x			II
H	Carex peregrina	x			x	x				II
H	Cerastium vagans	x			x	x				II
M	Clethra arborea			x	x	x				II
H	Dryopteris affinis	x		x		x				II
H	Fragaria vesca				x	x	x			II
H	Geranium maderense	x			x	x				II
C	Huperzia selago ssp. selago	x		x		x				II
H	Nasturtium officinale	x	x				x			II
H	Origanum virens		x				x	x		II
H	Pteris incompleta			x			x	x		II
H	Sagina procumbens				x	x		x		II
C	Tolpis macrorhiza			x	x	x				II
T	Aichryson villosum						x	x		II
N	Cedronella canariensis	x						x		II

Table 2: Site V (Continued)

Life forms										Class of Constancy
	Relevé No.	1	2	3	4	8	7	6	5	
	Altitude (m)	----------	----------	----------	1000	----------	----------	----------	990	
	Exposure	E	SE	NNW	SSE	SE	E	E	SW	
	Length of the relevé (m)	----------	----------	----------	10	----------	----------	----------	----------	
	Heigth of the wall (m)	2,5	2	3	2	3	2,5	2	3	
	Remarks	--	north of Enc.p.			--	south of E.p.			
	Total no. of species	37	34	36	44	47	36	29	19	
G	Dactylorhiza foliosa				x	x				II
N	Echium candicans							x	x	II
M	Euphorbia mellifera				x	x				II
C	Imperatoria lowei			x				x		II
C	Isoplexis sceptrum			x		x				II
H	Plantago lanceolata		x						x	II
G	Polypodium macaronesicum						x		x	II
H	Polystichum setiferum				x		x			II
H	Ranunculus cortusifolius				x	x				II
T	Rumex bucephalophorus	x							x	II
H	Rumex obtusifolius ssp. obtusifolius		x		x					II
N	Sonchus fruticosus				x	x				II
N	Teline maderensis		x	x						II
C	Aeonium glandulosum							x		I
H	Apium nodiflorum	x								I
T	Avenula marginata								x	I
T	Cardamine hirsuta				x					I
N	Carlina salicifolia								x	I
H	Cirsium latifolium				x					I
N	Cytisus scoparius								x	I
G	Davallia canariensis								x	I
H	Duchesna indica		x							I
N	Erysimum bicolor				x					I
C	Huperzia selago ssp. dentata		x							I
N	Hypericum glandulosum						x			I
C	Hypericum humifusum	x								I
C	Hypericum undulatum							x		I
M	Ilex perado ssp. perado					x				I
M	Laurus azorica var. azorica				x					I
M	Myrica faya			x						I
M	Ocotea foetens				x					I
M	Persea indica						x			I
N	Plantago arborescens ssp. maderensis							x		I
H	Potentilla anglica					x				I
G	Pteridium aquilinum		x							I
C	Rubia peregrina				x					I
M	Salix canariensis						x			I
M	Sambucus lanceolata					x				I
H	Scirpus cernuus	x								I
H	Scrophularia scorodonia			x						I
C	Tolpis fruticosa								x	I
H	Trifolium dubium		x							I
M	Vaccinium padifolium					x				I
H	Veronica serpyllifolia				x					I
T	Vicia capreolata			x						I
T	Vulpia muralis							x		I
T	Vulpia myuros							x		I

Mean no. of species/relevé: 38
Total no. of species of the table: 97

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