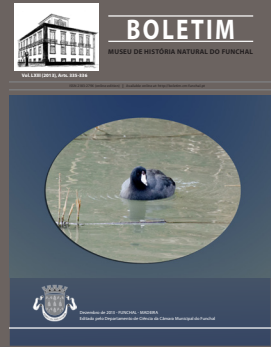




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The vascular flora of Porto Santo: a catalogue of its islets

JOSÉ AUGUSTO CARVALHO ^{1*}, FRANCISCO FERNANDES ¹ & ARNOLDO SANTOS-GUERRA ²

With 4 figures, 3 tables and 2 appendixes

¹ Jardim Botânico da Madeira Eng.º Rui Vieira, Caminho do Meio, 9064-512 Funchal, Madeira, Portugal.

* Corresponding author: josecarvalho.sra@gov-madeira.pt

² Unidad de Botánica (ICIA), Calle Retama, 2, 38400 Puerto de La Cruz, Tenerife, Islas Canarias, España.

ABSTRACT: The present paper presents a new catalogue for Porto Santo's Islets with 173 taxa listed, of which 138 (65 new citations) occur on Ilhéu de Cima, 97 (34 new citations) on Ilhéu da Cal, 94 (61 new citations) on Ilhéu de Ferro, 8 (no new citations) on Ilhéu da Fonte da Areia, 29 (no new citations) on Ilhéu das Cenouras, and 15 (1 new citation) on Ilhéu de Fora. Endemism is absent on the islets but 4 endemics are shared with the main island of Porto Santo.

Keywords: Porto Santo, Madeira, Macaronesia.

RESUMO: O atual artigo apresenta um novo catálogo dos ilhéus do Porto Santo com 173 taxa, dos quais 138 (65 novas citações) ocorrem no Ilhéu de Cima, 97 (34 novas citações) no Ilhéu da Cal, 94 (61 novas citações) no Ilhéu de Ferro, 8 (nenhuma nova citação) no Ilhéu da Fonte de Areia, 29 (nenhuma nova citação) no Ilhéu das Cenouras, e 15 (1 nova citação) no Ilhéu de Fora. Os ilhéus não possuem quaisquer plantas endémicas, mas partilham com a ilha de Porto Santo 4 táxones endémicos.

Palavras-chave: Porto Santo, Madeira, Macaronésia.

INTRODUCTION

Porto Santo generally presents a dry climate in almost the entire island, but temperate in some places at the highest altitudes (BARCELÓ & NUNES, 2011). The landscape is intensely shaped by erosion that began much earlier and with effects much more deeply felt than in the island of Madeira. This is the result of a much older geological age of about 14 Ma when compared with its neighbouring islands of Madeira (5 Ma) and Desertas (3.2-3.6 Ma) (GELDMACHER *et al.*, 2000). Its highest peak is at 517 m *a.s.l.* in contrast with the much younger neighbouring island of Madeira that shows the highest elevation point at 1,860 m *a.s.l.* (GELDMACHER *et al.*, 2000).

The erosion processes were responsible for the marine abrasion platform (between 50 and 100 m depth) that surrounds the island of Porto Santo and its islets (RIBEIRO & RAMALHO, 2010), namely Ilhéu de Cima or Ilhéu do Farol, Ilhéu da Cal or Ilhéu de Baixo, Ilhéu de Ferro, Ilhéu da Fonte da Areia, Ilhéu das Cenouras and Ilhéu de Fora (Fig. 1). The bathymetric level of 100 m limits the abrasion platform produced until the end of the Würm glaciation period, 18,000 years ago, when sea level was approximately 130 m below the present level, and the island was considerably larger than it currently is, more than doubling its present day area (RIBEIRO & RAMALHO, 2010).

The geology of Porto Santo shows two main rock types, the igneous rocks, mainly basalts, directly linked to the volcanic origin of the island itself, and sedimentary rocks (RIBEIRO & RAMALHO, 2010). The geology of the islets is similar to that of the main island of Porto Santo (CARVALHO & BRANDÃO, 1991). Altitudes above sea level of Porto Santo islets are significantly lower than at the main island (Table 1), which influences directly their type of potential flora and type of vegetation.

Islands, such as Porto Santo, are globally recognized for their importance in biological diversity and uniqueness of ecosystems. On this, BRAMWELL & CAUJAPÉ-CASTELLS (2011) pin point that islands represent only 5% of the Earth's land surface but hold approximately one quarter of all extant terrestrial plant species. This biological diversity has been heavily affected by human activities and there have been numerous conservation assessments on the major causes of extinction, threatening processes and conservation policies (*e.g.* KINGSFORD *et al.*, 2009; CAUJAPÉ-CASTELLS *et al.*, 2010). Historical knowledge based on old texts plays an important role in the making of the global picture of original floras, and in assessing changes and impacts in natural landscapes following human settlements.

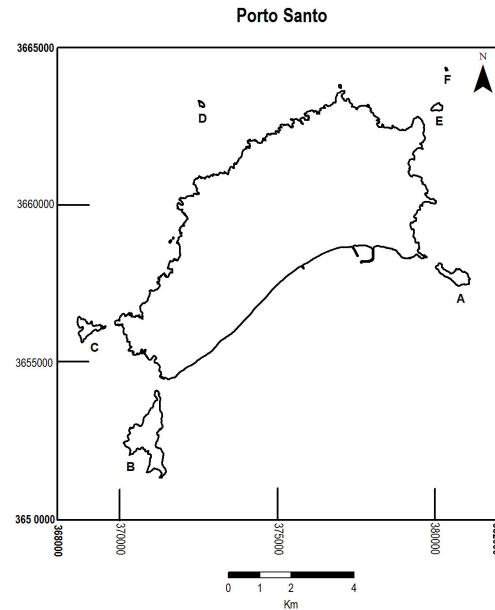


Fig. 1 – Map showing the location of islets and the main island of Porto Santo: A – Ilhéu de Cima or Ilhéu do Farol; B – Ilhéu da Cal or Ilhéu de Baixo; C – Ilhéu de Ferro; D – Ilhéu da Fonte da Areia; E – Ilhéu das Cenouras; F – Ilhéu de Fora.

Table 1 – Altitude levels of each one of Porto Santo's islets and of the main island of Porto Santo.

	Ilhéu de Cima	Ilhéu da Cal	Ilhéu de Ferro	Ilhéu da Fonte da Areia	Ilhéu das Cenouras	Ilhéu de Fora	Porto Santo (main island)
Highest point (m)	124	178	115	80	106	68	517
Information extracted from the Instituto Geográfico do Exército Carta Militar de Portugal - Série P821 - 1/25000 (Madeira)							

The accounts of Luiz de Cadamosto who visited the island of Porto Santo in 1445 are the first known records on the original flora of Porto Santo and key elements in the landscape (BOWDICH, 1825) and were fully published only in 1867 by the Royal Portuguese Academy of Sciences (CADAMOSTO, 1867). Cadamosto mentions the presence of trees from which dragon's blood (the sap of *Dracaena draco* L.) is extracted and the yellow fruits eaten. On this he wrote as follows: "...acha-se tambem nella sangue de Drago, que se cria em algumas arvores, e he huma gomma, que ellas estilão em certo tempo do anno (c), e se colhe por esta maneira: fazem alguns golpes com hum cutello no pé da arvore, e no anno seguinte em certo tempo, as ditas cortaduras estilão a gomma, que cosem, e purificação, e assim se faz o sangue. Esta arvore produz hum certo fruto, que no mez de Março está maduro, e he muito bom para comer, á semelhança de cerejas, mas amarello...". This description indicates the presence on the island of several specimens of this species along with its traditional uses.

However, in the nineteenth century, BOWDICH (1825) mentions the almost complete extinction of *Dracaena draco* ssp. *draco* on Porto Santo, on which he wrote the following: "A solitary dragon tree (*Dracaena draco*) presented itself (with some remarkably tall cacti) just above the Fonte dos Anjos, near Pico Facho". Amazingly, this same author mentions the presence of remarkably tall cacti, but there is neither a living or herbarium specimen nor even later known references to attest to their former presence on this group of islands. One may only be speculated that the taxon mentioned could be of a species of *Opuntia*.

The first references on the flora of Porto Santo's islets came with Gaspar Frutuoso (1522-1591). In a recent facsimile edition (FRUTUOSO, 2007) of the first publication of his work, Frutuoso states that Ilhéu de Cima was known as "Ilheu dos Dragoeiros", *i.e.* the islet of dragon trees, due to abundance of *Dracaena draco* L. ssp. *draco*. On this islet, he also mentions the presence of another tree locally named "zambujos", which corresponds to the species *Olea maderensis* (Lowe) Rivas Mart. & del Arco. On Ilhéu da Cal, he documents the presence of a "zimbro" woodland, *i.e.* *Juniperus turbinata* Guss. ssp. *canariensis* (Guyot) Rivas Mart., Wildpret & P. Pérez, and the presence of "cenouras" on Ilhéu de Ferro, *i.e.* carrots that possibly corresponds to *Monizia edulis* Lowe. Neither *J. turbinata* ssp. *canariensis* nor *M. edulis* are cited for any of Porto Santo's islets in any of the known published scientific works on Porto Santo (LOWE, 1868; MENEZES, 1914; COCKERELL, 1922; COSTA, 1946, 1948; PICKERING, 1962; READ, 1987; PRESS & SHORT, 1994; FONTINHA & JARDIM, 1999).

Table 2 – Number of taxa per islet according to FONTINHA & JARDIM (1999).

	Ilhéu de Cima	Ilhéu da Cal	Ilhéu de Ferro	Ilhéu da Fonte da Areia	Ilhéu das Cenouras	Ilhéu de Fora	TOTAL No. of taxa
No. of taxa	62	55	33	7	28	13	94

Scientific publications are lacking in information on the flora of the islets of Porto Santo until the second half of the nineteenth century. LOWE (1868) refers 5 taxa to these islets. Later on, MENEZES (1914) records 8 taxa to Ilhéu de Cima. COCKERELL (1922) writes only a few lines on previous records: "The most barren locality I found was the top of the Lime Island (Baixo), where even the xerophytic *Artemisia argentea* L' Herit, so characteristic to the I. de Cima, seems to be wholly absent." This author also mentions *Anagallis arvensis* L. and *Nicotiana glauca* Graham on Ilhéu da Cal, and *Sideroxylon marmulano* Banks ex Lowe, a synonym of the accepted name *S. mirmulans* R. Br., on Ilhéu de Cima. COSTA (1946, 1948) was the first to publish an extensive

list of species for Porto Santo. However, data on the islets were scarce as his efforts were made largely on the main island. This author only ascribes 1 single taxon to the islets, *i.e.* a new species of *Sonchus* recently acknowledged (JARDIM & SEQUEIRA, 2011). PICKERING (1962) lists 2 taxa to Ilhéu das Cenouras, 1 taxon to the Ilhéu da Cal and 6 to Ilhéu de Cima. Later on, READ (1987) refers 11 taxa to Ilhéu da Cal and 23 to Ilhéu de Cima. PRESS & SHORT (1994), in their *Flora of Madeira*, compiled a great amount of information on the flora of Madeira, including that of Porto Santo's islets, listing 22 taxa to Ilhéu de Cima and 10 taxa to Ilhéu da Cal. These authors mention the occurrence of some taxa on the islets but do not specify the exact islet and therefore those taxa are not accounted in our catalogue of taxa per islet (Table 2). The last account on the flora of the islets of Porto Santo produced by FONTINHA & JARDIM (1999) increased up the total number of taxa to 94 (Table 2).

The flora and vegetation of Porto Santo's islets were subject to many human pressures as early as the sixteen century as mentioned by FRUTUOSO (2007), namely those derived from the presence of rabbits on Ilhéu da Cal and the presence of goats and rabbits on Ilhéu de Cima. From this, one can assume human activities had a strong impact on the flora and vegetation of Porto Santo dating from the earliest settlements. More recently, VIEIRA & RIBEIRO (1989) in the annals of the municipality of Porto Santo also mention that the main profits from Ilhéu de Cima were derived from cattle and that Ilhéu de Ferro was exclusively used for grazing. An additional set of pressures on Ilhéu da Cal was mentioned by these latter authors, namely cultivation of 'barrila' (*Mesembryanthemum* cf. *crystallinum*) for commercial purposes since 1824, but also exploitation of natural resources such as the lichens 'urzela' (*Rocella* spp.), the plant 'dormideira' or 'papoila' (*Papaver somniferum* L.) and lime.

The recent designation of Porto Santo's islets as natural reserves and their inclusion in the European network Natura 2000 sites called for a reevaluation of their flora, conservation needs and future perspectives.

MATERIALS AND METHODS

Fieldwork was conducted during October 2010, March, April and May 2011, and March 2012. Taxonomy and nomenclature generically follows JARDIM & SEQUEIRA (2008). CASTROVIEJO (1986-2012), PRESS & SHORT (1994), HÄFLIGER & SCHOLZ (1980-1981), VALDÉS *et al.* (1987) were used in taxonomic determinations. The complete catalogue of vascular plants of Porto Santo's islets is presented in

Appendix 1. Herbarium specimens are held at the MADJ, Jardim Botânico da Madeira Eng.º Rui Vieira, Madeira, and at ORT, Jardín de Aclimatación de La Orotava, Tenerife. A list of vouchers for each new citation is presented at the end of this paper in Appendix 2. All islets were visited with exception of Ilhéu da Fonte da Areia due to weather constraints.

RESULTS AND DISCUSSION

The islets of Porto Santo are of difficult access and for many years were little surveyed which is expressed by the trend of taxonomic knowledge for the islets (Fig. 2). This trend shows a slow increasing curve from the sixteen century with FRUTUOSO (2007) up to the second half of the twentieth century. Only at the turn of the twentieth century, with FONTINHA & JARDIM (1999), can a clear increase in the number of new citations to the islets be seen. Our work has increased even further the floristic knowledge on the flora of Porto Santo islets as demonstrated by the trend of new citations (Fig. 2).

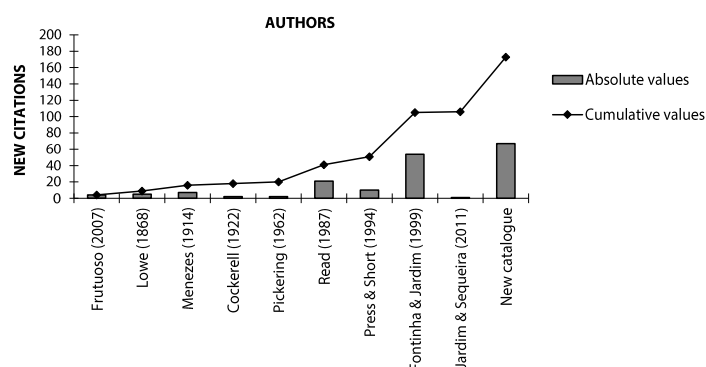


Fig. 2 – Trend of new citations to Porto Santo's Islets, and cumulative values.

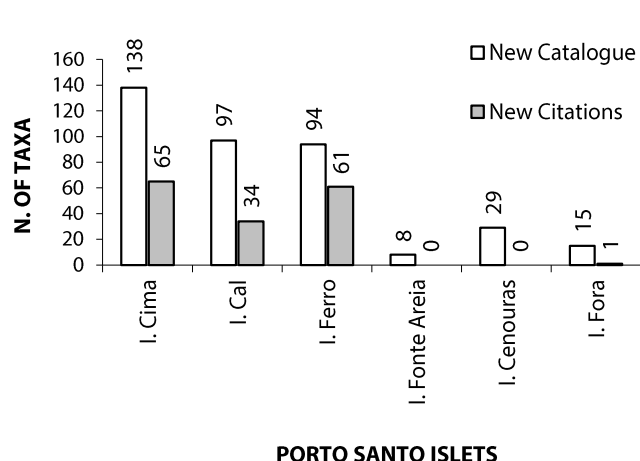


Fig. 3 – Total number of taxa in the new catalogue given to each islet along with new citations.

The present catalogue for Porto Santo's islets (Appendix 1) includes 173 taxa, of which 67 are new citations. The distribution of taxa per islet (Fig. 3) accounts for 138 taxa on Ilhéu de Cima, the largest number among all the islets, of which 65 are new citations, it is followed by Ilhéu da Cal with 97 taxa and 34 new citations and Ilhéu de Ferro with 94 taxa and 61 new citations. Due to logistical setbacks and weather conditions, the remaining islets, *i.e.*, Ilhéu de Fora and Ilhéu das Cenouras, were partially surveyed and Ilhéu da Fonte da Areia was not visited. Despite that, the new catalogue presented here shows 29 taxa on Ilhéu das Cenouras with no new citations, 8 on Ilhéu da Fonte da Areia with no new citations and 15 on Ilhéu de Fora with 1 new citation. Ilhéu de Cima is clearly the most diverse in number of taxa despite not being the largest. It presents a geographical orientation that favours the intake of the humidity transported by the predominant colder northeastern winds (Fig. 1). In contrast, Ilhéu da Cal is the largest but only is second in plant taxa diversity. However, differences in plant diversity between islets could also be the result of different past histories as different selective pressures were imposed on each islet according to each type of land use or resource exploitation. On the other hand, Ilhéu de Cima presents better conditions for landing than any other islet favouring visitation, and therefore many plants, mostly nitrophylous, might have been introduced.

Table 3 – Absolute and relative numbers of taxa listed for the islets of Porto Santo accordingly to their biogeographical affinities: Porto Santo – Endemic to Porto Santo; Madeira – Endemic to Porto Santo and at least one other island of the Madeira or Selvagens archipelagos; Macaronesia – Endemic to the Madeira and Selvagens archipelagos and at least one other Macaronesian archipelago; Native – Naturally occurring in the Madeira and the Selvagens archipelagos but with a wider distribution than Macaronesia; Introduced – Non native, *i.e.* introduced by man.

Biogeographical distribution	Number / Percentage of taxa per islet											
	I. Cima		I. Cal		I. Ferro		I. Fonte Areia		I. Cenouras		I. Fora	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Porto Santo	4	2.9	2	2.1	2	2.1	1	12.5	2	6.9	1	6.7
Madeira	18	13.0	15	15.5	10	10.6	2	25.0	3	10.3	3	20.0
Macaronesia	10	7.2	9	9.3	9	9.6	2	25.0	4	13.8	4	26.7
Native	92	66.7	65	67.0	66	70.2	2	25.0	16	55.2	6	40.0
Introduced	13	9.4	5	5.2	7	7.4	1	12.5	4	13.8	1	6.7
Extinct	1	0.7	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	138	100	97	100	94	100	8	100	29	100	15	100

JARDIM & SEQUEIRA (2008) reported 8 taxa endemic to Porto Santo, and 2 other species were recently described (CARVALHO *et al.*, 2010; JARDIM & SEQUEIRA, 2011), which gives a total number of 10 endemics. Endemism on the islets is

absent as expected due to geographical proximity to the main island (Table 3) and only 4 taxa endemic to Porto Santo occur in its islets, *i.e.* *Echium portosanctense*, *Vicia costae*, *Lotus loweanus*, *Sonchus parathalassius* (Appendix 1). On this latter new species a note should be given on its distribution. JARDIM & SEQUEIRA (2011) mentioned this species as occurring on the surrounding islets of Porto Santo, namely on Ilhéu da Cal, Ilhéu das Cenouras, Ilhéu de Cima, Ilhéu de Fora and Ilhéu da Fonte da Areia. However, the only specimens seen by these authors were collected on Ilhéu da Cal and Ilhéu das Cenouras, and no further references were given in respect to specimens collected in the other islets. The present work records the presence of *Sonchus parathalassius* only on Ilhéu de Cima, Ilhéu da Cal and Ilhéu das Cenouras; and its absence on Ilhéu de Ferro and Ilhéu de Fora. The presence of *S. parathalassius* on Ilhéu da Fonte da Areia could not be confirmed as any fieldwork was done on this islet as mentioned previously. In opposition to FONTINHA & JARDIM (1999), no specimens of *Sonchus ustulatus* were observed on Ilhéu de Cima and Ilhéu da Cal and therefore we can only assume this to be a misidentification as the single species that is present on these two islets is the recently described species *S. parathalassius* (JARDIM & SEQUEIRA, 2011).

Despite of the known vegetation disturbances the islets of Porto Santo have suffered, non native species are present at very low rates, varying from 5.2% to 13.8% of the total number of taxa surveyed (Table 3), when compared with the 33.3% of non native species reported for the Madeira and Selvagens archipelagos (JARDIM & SEQUEIRA, 2008).

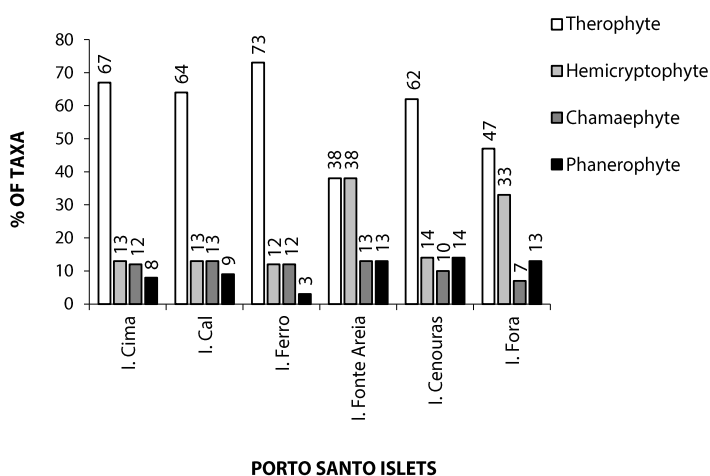


Fig. 4 – Percentage of taxa grouped accordingly to Raunkiaer's life form classification system.

Classification of taxa following Raunkiaer's classification system (1934) shows the presence of four life forms in the studied islets, *i.e.* therophytes,

hemicryptophytes, chamaephytes, phanerophytes (Fig. 4). Therophytes, which complete their entire life cycle during the favourable seasons and survive unfavourable season as a seed, are the most common in all the islets, varying from 38% to 73%, and includes all annual herbs. As expressed by CAIN (1950), annuals are particularly abundant in desert climates and in weed communities where native vegetation is disturbed. On one hand, Porto Santo is considered to have a dry climate in low altitudes, which includes all of the islets (BARCELÓ & NUNES, 2011), and therefore, the abundant presence of annuals is clearly as expected. On the other hand, Porto Santo's islets also suffered intense human pressures that have led to deep changes in their landscape, extinction and profound alteration of species density and frequency. On this, historical data indicates a much stronger presence of trees or small shrubs in the past than at the present day that would have an effect on the relative weight of each life form. Therefore, the results seen in Figure 4 express at a certain level the relation between life forms and the type of climate, but also express in some degree a strong disturbance of the native vegetation in most of the islets as postulated by CAIN (1950).

Conservation

Human pressures on the natural flora and vegetation of the islets have been decreasing since the last quarter of the twentieth century. This enabled vegetation to recover as much as the continued presence of rodents and herbivores allowed. During the first decade of the twenty first century, the islets were designated as a natural reserve and a management program to eradicate all rodents and herbivores from all the islets has been conducted since the year of 2010 by the Serviço do Parque Natural da Madeira (OLIVEIRA, *pers. com.*). This will push conservation in Porto Santo to a new level, as the islets will be left free from pressures that limit the recover of native vegetation. This presents new opportunities to implement conservation programs on critically endangered taxa. One of these is *Monizia edulis* Lowe, a Madeiran endemic species that in Porto Santo only occurs on Ilhéu de Cima. This species shows signs of population increase on Ilhéu de Cima, and, therefore, calls for conservation measures directed towards population monitoring as the islet where it occurs is presently free from herbivores and rodents (OLIVEIRA, *pers. com.*). Other conservation programs should include reintroduction of species that have become extinct on the islets, *e.g.* *Dracaena draco* L. *ssp. draco* to Ilhéu de Cima

and *Juniperus turbinata* Guss. ssp. *canariensis* (Guyot) Rivas Mart., Wildpret & P. Pérez to Ilhéu da Cal; or reinforcement of populations with genetic material of extant populations from the main island of Porto Santo, e.g. *Olea maderensis* (Lowe) Rivas Mart. & del Arco with a single individual on Ilhéu de Cima; and *Sideroxylon mirmulans* R. Br., that is represented on the islets by a single individual on Ilhéu de Cima and by a small population of less than 30 individuals on the sea cliffs of Ilhéu da Cal (SILVA & GOMES, pers. com.).

The importance of implementing conservation programs for the above mentioned species is enhanced by the fact that either of them is represented in the main island of Porto Santo by small populations on the fringe of extinction.

The inclusion of these islets in the European network of natural reserves (Natura 2000) along with the specific measures taken by the Serviço do Parque Natural da Madeira, namely the eradication of herbivores and rodents, but also control of invasive plants, opens a window of opportunity for the effective conservation of low altitudinal vegetation types that are still threatened on the main island of Porto Santo due to existing human pressures.

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Appendix 1 (continued).

Family	Taxon	Life-forms	Origin	Ilhéu de Cima		Ilhéu da Cal		Ilhéu de Ferro		Ilhéu de Fora		Ilhéu das Cenouras		Ilhéu da Fonte da Areia	
				Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.
Asteraceae	<i>Sonchus oleraceus</i> L.	therophyte	n	[2] [4]	x	obs	[2]	x				[2]			
Asteraceae	<i>Sonchus parathalassius</i> J. G. Costa ex R. Jardim & M. Seq. (*)	phanerophyte	PS	[1]	x	[1]	obs			[1]		[1]	x	[1]	
Asteraceae	<i>Sonchus ustulatus</i> Lowe	chamaephyte	M	[2] #		[2] #		x		[2]	x				[2]
Asteraceae	<i>Tolpis succulenta</i> (Dryand. in Ait.) Lowe	chamaephyte	M	[2] [4]	x	[2]	x	[2]	x						
Asteraceae	<i>Urospermum picroides</i> (L.) Scop. ex F. W.- Schmidt	therophyte	n		x		x		x						
Boraginaceae	<i>Echium plantagineum</i> L.	therophyte	n	[2]	x										
Boraginaceae	<i>Echium portosanctense</i> J. A. Carvalho, Pontes, Batista-Marques & R. Jardim	chamaephyte	PS		obs										
Boraginaceae	<i>Heliotropium europaeum</i> L.	therophyte	n	[3]											
Boraginaceae	<i>Heliotropium ramosissimum</i> (Lehm.) DC.	hemicryptophyte	n						x						
Brassicaceae	<i>Coronopus didymus</i> (L.) Sm.	therophyte	i	[2]	x										
Brassicaceae	<i>Crambe fruticosa</i> L. f. var. <i>brevifolia</i> Lowe	chamaephyte	M	[2] [3] [4]	x	[2]	x								
Brassicaceae	<i>Eruca vesicaria</i> (L.) Cav. ssp. <i>sativa</i> (Mill.) Thell.	therophyte	n		x	[8]	obs	[2]	obs						
Brassicaceae	<i>Lobularia libyca</i> (Viv.) Meisn.	chamaephyte	n		x										
Brassicaceae	<i>Mathiola maderensis</i> Lowe	hemicryptophyte	M	[2] [3] [4]	x	[2]	x	[2]	x	[2]	x	[2]			[2]
Brassicaceae	<i>Rapistrum rugosum</i> (L.) All. ssp. <i>rugosum</i>	therophyte	n	[2]	x		x								
Brassicaceae	<i>Teesdalia coronopifolia</i> (J. P. Bergeret) Thell.	therophyte	n	[2] [3] [5] [7]	x										obs
Campanulaceae	<i>Campanula erinus</i> L.	therophyte	n				x	[2]							
Campanulaceae	<i>Whalenbergia lobelioides</i> (L. f.) Link ssp. <i>lobelioides</i>	therophyte	Mac	[2]	x		x								
Caryophyllaceae	<i>Arenaria leptoclados</i> (Rchb.) Guss.	therophyte	n		obs		obs								
Caryophyllaceae	<i>Herniaria cinerea</i> DC.	therophyte	n	[3] [8]	x	[3]	x								
Caryophyllaceae	<i>Polycarpon tetraphyllum</i> (L.) L.	therophyte	n	[2]	x	[2]	x		x						
Caryophyllaceae	<i>Silene uniflora</i> Roth	hemicryptophyte	n	[3]	x		x		x						
Caryophyllaceae	<i>Silene vulgaris</i> (Moench) Garcke	hemicryptophyte	n	[2] [4]	obs	[2]	obs								
Caryophyllaceae	<i>Spergularia marina</i> (L.) Besser	therophyte	n		x				obs						
Chenopodiaceae	<i>Atriplex halimus</i> L.	phanerophyte	i	[2]		[2]						[2]			
Chenopodiaceae	<i>Bassia tomentosa</i> (Lowe) Maire & Weiller [Syn. <i>Chenoleoides tomentosa</i> (Lowe) Botsch.]	hemicryptophyte	n	[3] [5] [7]						[2]	x				
Chenopodiaceae	<i>Beta</i> aff. <i>patula</i>	hemicryptophyte	M							[2]					
Chenopodiaceae	<i>Beta maritima</i> L.	therophyte	n		x		x	[2]	x	[2]					
Chenopodiaceae	<i>Chenopodium murale</i> L.	therophyte	n	[2]	x	[2]	x		obs			[2]			
Chenopodiaceae	<i>Patellifolia patellaris</i> (Moq.) A. J. Scott, Ford-Lloyd & J. T. Williams	therophyte	n		x	[4]			x						

Appendix 1 (continued).

Family	Taxon	Life-forms	Origin	Ilhéu de Cima		Ilhéu da Cal		Ilhéu de Ferro		Ilhéu de Fora		Ilhéu das Cenouras		Ilhéu da Fonte da Areia	
				Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.
Chenopodiaceae	<i>Suaeda vera</i> Forssk. ex J. F. Gmel	chamaephyte	n			[2]	obs	[2]	obs						
Convolvulaceae	<i>Convolvulus althaeoides</i> L.	hemicryptophyte	n						x						
Convolvulaceae	<i>Cuscuta planiflora</i> Ten.	therophyte	n						x						
Crassulaceae	<i>Aeonium glandulosum</i> (Aiton) Webb & Berthel.	hemicryptophyte	M		x		obs								
Crassulaceae	<i>Aeonium cf. glutinosum</i> (Aiton) Webb & Berthel.	chamaephyte	M			[2]	x								
Crassulaceae	<i>Aichryson villosum</i> (Aiton) Webb & Berthel.	therophyte	Mac		x				x						
Crassulaceae	<i>Sedum nudum</i> Aiton	hemicryptophyte	M			[2]	x								
Cupressaceae	<i>Juniperus turbinata</i> Guss. ssp. <i>canariensis</i> (Guyot) Rivas Mart., Wildpret & P. Pérez	phanerophyte	Ex			[9]									
Dracaenaceae	<i>Dracaena draco</i> (L.) L. ssp. <i>draco</i>	phanerophyte	Ex	[9]											
Euphorbiaceae	<i>Chamaesyce prostrata</i> (Aiton) Small [Syn. <i>Euphorbia prostrata</i> Aiton]	therophyte	i		x				obs						
Euphorbiaceae	<i>Euphorbia paralias</i> L.	chamaephyte	n			[2] [3] [4]	x								
Euphorbiaceae	<i>Euphorbia peplus</i> L.	therophyte	n	[2] [3]	x		x				[2]				
Euphorbiaceae	<i>Euphorbia piscatoria</i> Aiton	phanerophyte	M	[2] [3]	x	[2]	obs								
Euphorbiaceae	<i>Euphorbia terracina</i> L.	hemicryptophyte	n	[2]	x	[2]	x		x						
Euphorbiaceae	<i>Mercurialis annua</i> L.	therophyte	n	[2] [3]	x	[2] [3]	x	[2]	x						
Fabaceae	<i>Astragalus boeticus</i> L.	therophyte	n		x		obs		obs						
Fabaceae	<i>Astragalus pelecinus</i> (L.) Barneby [Syn. <i>Bisserula pelecinus</i> L.]	therophyte	n	[2]	x		x		x						
Fabaceae	<i>Astragalus solandri</i> Lowe	therophyte	n		x			[2]	x						
Fabaceae	<i>Hippocrepis multisiliquosa</i> L.	therophyte	n		x				x						
Fabaceae	<i>Lotus argyroides</i> R. P. Murray	chamaephyte	M		x				x						
Fabaceae	<i>Lotus glaucus</i> Aiton	therophyte	Mac	[2] [4]	x	[2]	x	[2]	x	[2]	x	[2]		[2]	
Fabaceae	<i>Lotus loweanus</i> Webb & Berthel.	therophyte	PS		x	[2]	x	[2]	x			[2]			
Fabaceae	<i>Lotus macranthus</i> Lowe	chamaephyte	M		x										
Fabaceae	<i>Lotus</i> sp.	chamaephyte	M		x										
Fabaceae	<i>Medicago italica</i> (Mill.) Fiori	therophyte	n		x										
Fabaceae	<i>Medicago littoralis</i> Rhode ex Loisel.	therophyte	n	[7]	x										
Fabaceae	<i>Medicago minima</i> (L.) L. var. <i>minima</i>	therophyte	n		x				x						
Fabaceae	<i>Medicago polymorpha</i> L.	therophyte	n	[2]	x				obs						
Fabaceae	<i>Melilotus indicus</i> (L.) All.	therophyte	n	[2]	x	[2]	x								
Fabaceae	<i>Ononis dentata</i> Sol. ex Lowe	therophyte	n		x				x						
Fabaceae	<i>Ononis diffusa</i> Ten.	therophyte	n		x	[2]			x						
Fabaceae	<i>Ononis mitissima</i> L.	therophyte	n	[2] [4]	obs										
Fabaceae	<i>Ononis serrata</i> Forssk.	therophyte	n	[2]	x	[2]									
Fabaceae	<i>Scorpiurus sulcatus</i> L. [Syn. <i>Scorpiurus muricatus</i> L.]	therophyte	n		x		x		x						
Fabaceae	<i>Trifolium angustifolium</i> L.	therophyte	n						x						

Appendix 1 (continued).

Family	Taxon	Life-forms	Origin	Ilhéu de Cima		Ilhéu da Cal		Ilhéu de Ferro		Ilhéu de Fora		Ilhéu das Cenouras		Ilhéu da Fonte da Areia	
				Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.
Poaceae	<i>Cenchrus ciliaris</i> L.	hemicytrophite	n		x										
Poaceae	<i>Hordeum marinum</i> Huds. ssp. <i>gussoneanum</i> (Parl.) Thell.	therophyte	n						x						
Poaceae	<i>Hordeum murinum</i> L.	therophyte	n	[2]	x			[2]				[2]			
Poaceae	<i>Hyparrhenia sinaica</i> (Delile) Llauradó ex G. López [Syn. <i>Hyparrhenia hirta</i> (L.) Stapf]	hemicytrophite	n	[2]	x	[2]		[2]	obs						
Poaceae	<i>Lagurus ovatus</i> L.	therophyte	n		x				obs						
Poaceae	<i>Lamarckia aurea</i> (L.) Moench	therophyte	n					x							
Poaceae	<i>Lolium canariense</i> Steud.	therophyte	Mac						x						
Poaceae	<i>Lolium multiflorum</i> Lam. (S)	therophyte	i						x						
Poaceae	<i>Lolium rigidum</i> Gaudin	therophyte	i		x				x						
Poaceae	<i>Oryzopsis miliaceae</i> (L.) Asch. & Schweinf.	hemicytrophite	n		x										
Poaceae	<i>Phalaris coerulescens</i> Desf.	hemicytrophite	n		x										
Poaceae	<i>Phalaris paradoxa</i> L.	therophyte	n		x										
Poaceae	<i>Polypogon maritimus</i> Willd.	therophyte	n	[2] [3]	x	[2]									
Poaceae	<i>Polypogon monspeliensis</i> (L.) Desf.	therophyte	n					[3]							
Poaceae	<i>Rostraria cristata</i> (L.) Tzvelev	therophyte	n		x			x							
Poaceae	<i>Schismus barbatus</i> (L.) Thell.	therophyte	n	[3]											
Poaceae	<i>Stipa capensis</i> Thunb.	therophyte	n		x			x				[2]			
Poaceae	<i>Triplachne nitens</i> (Guss.) Link	therophyte	n		x	[2]			x						
Polygonaceae	<i>Emex spinosa</i> (L.) Campd.	therophyte	n	[2]	x			obs	obs			[2]			
Polygonaceae	<i>Rumex bucephalophorus</i> L. ssp. <i>canariensis</i> (Steinh.) Rech. f. var. <i>canariensis</i>	therophyte	Mac	[5] [7]	obs			x	obs						
Primulaceae	<i>Anagallis arvensis</i> L.	therophyte	n					[2] [3] [4] [6]	x			x			
Rubiaceae	<i>Galium aparine</i> L.	therophyte	n		x										
Rubiaceae	<i>Galium geminiflorum</i> Lowe	therophyte	Mac					[3]	x			x			
Rubiaceae	<i>Galium murale</i> (L.) All.	therophyte	n						x						
Rubiaceae	<i>Phyllis nobla</i> L.	phanerophyte	Mac	[2]	x	[2] [3] [8]		x		x	[2]	x	[2]		
Rubiaceae	<i>Rubia fruticosa</i> Aiton	chamaephyte	Mac		x										
Rutaceae	<i>Ruta chalepensis</i> L.	chamaephyte	n	[2] [3]	x								[5]		
Sapotaceae	<i>Sideroxylon mirmulans</i> R. Br. [Syn. <i>Sideroxylon marmulano</i> Banks ex Lowe]	phanerophyte	M	[2] [3] [5] [6] [7]	obs	[2]		x							
Scrophulariaceae	<i>Bartsia trixago</i> L.	therophyte	n						obs						
Scrophulariaceae	<i>Misopates orotium</i> (L.) Raf. ssp. <i>orontium</i>	therophyte	n		x				x						
Scrophulariaceae	<i>Scrophularia lowei</i> Dalgaard	therophyte	M	[2] [3] [4]	x	[2] [3]		x							
Solanaceae	<i>Hyoscyamus albus</i> L.	therophyte	n					[2]							
Solanaceae	<i>Lycopersicon esculentum</i> Mill.	hemicytrophite	i	[2] [3] [4]	obs							[2]			

Appendix 1 (continued).

Family	Taxon	Life-forms	Origin	Ilhéu de Cima		Ilhéu da Cal		Ilhéu de Ferro		Ilhéu de Fora		Ilhéu das Cenouras		Ilhéu da Fonte da Areia	
				Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.	Other ref.	Field obs.
Solanaceae	<i>Solanum nigrum</i> L. ssp. <i>nigrum</i>	therophyte	n	[2] [3] [4] [7]	x								[2]		
Urticaceae	<i>Parietaria debilis</i> G. Forst.	therophyte	n		x										
Urticaceae	<i>Urtica portosanctana</i> Press	therophyte	M	[2]	x	[2]	x								

n Naturally occurring in the Madeira and Selvagens archipelagos but with a wider distribution than Macaronesia.

i Introduced by man, *i.e.* non native.

Mac Endemic to the Madeira and Selvagens archipelagos and at least one other Macaronesian archipelago.

M Endemic to Porto Santo and at least one other island of the Madeira or Selvagens archipelagos.

PS Endemic to Porto Santo.

Ex Extinct in Porto Santo's islets.

x Observed and collected (herbarium specimens held at MADJ).

obs Observed and not collected.

(*) Taxon cited by COSTA (1946) as a new species only recently described by JARDIM & SEQUEIRA (2011) and by FONTINHA & JARDIM (1999) as *Sonchus* sp..

(S) Taxon collected by FONTINHA & JARDIM (1999) as *Lolium* sp..

(#) Taxon mentioned by FONTINHA & JARDIM (1999) as *Sonchus ustulatus*. This was clearly a misidentification as confirmed by our results that show the taxon present on I. Cima and I. Cal to be the recently described *Sonchus parathalassius*. For this reason these records for both islets were discarded in the present catalogue statistics.

[1] JARDIM & SEQUEIRA (2011); [2] FONTINHA & JARDIM (1999); [3] PRESS & SHORT (1994); [4] READ (1987); [5] PICKERING (1962); [6] COCKERELL (1922); [7] MENEZES (1914); [8] LOWE (1868); and [9] FRUTUOSO (2007).

Appendix 2 – List of voucher specimens for new citations.

Abbreviation for authors:

AS – ARNOLDO SANTOS-GUERRA; JC – JOSÉ AUGUSTO CARVALHO; FF – FRANCISCO FERNANDES; LC – LURDES COSTA; CN – CARLOS NÓBREGA; and MG – MARTINHO GOMES.

(*) Specimens included in this list represent the first collection on Ilhéu de Cima of the taxon *Sonchus parathalassius* J. G. Costa ex R. Jardim & M. Seq..

Portugal, Madeira archipelago, Porto Santo:

AIZOACEAE

Tetragonia tetragonoides (Pall.) Kuntze, **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12325); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12539).

APIACEAE

Ammi majus L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12801). *Monizia edulis* Lowe, **Ilhéu de Cima**, 12.IV.2013, FF (MADJ 12983); **Ilhéu de Cima**, 12.IV.2013, FF (MADJ 12984).

ASTERACEAE

Andryala glandulosa Lam. ssp. *glandulosa*, **Ilhéu da Cal**, 15.VI.2011, JC, IS, MG (MADJ 12533); **Ilhéu de Ferro**, 10.IV.2012, JC (MADJ 12954); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12483). *Artemisia argentea* L'Hér., **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12654). *Calendula arvensis* L., **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12725). *Carduus tenuiflorus* Curt., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12362). *Carlina salicifolia* (L.f.) Cav., **Ilhéu de Cima**, 22.X.2010, FF, JC (MADJ 12714). *Crepis divaricata* (Lowe) F.W. Schultz, **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12574). *Glebionis coronaria* (L.) Tzvelev, **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12392). *Hedypnois cretica* (L.) Dum.-Cours., **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12572). *Hypochoeris glabra* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12541). *Lactuca serriola* L., **Ilhéu de Cima**, 22.X.2010, FF, JC (MADJ 12521); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12352). *Leontodon taraxacoides* (Vill.) Mérat ssp. *longirostris* Finch & P. D. Sell, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12588); **Ilhéu de Cima**, 17.III.2011, LC, FF, JC (MADJ 12908); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12790); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12592). *Nauplius aquaticus* (L.) Cass., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12818). *Senecio incrassatus* Lowe, **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12833); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12778). *Soliva stolonifera* (Brot.) R. Br. ex G. Don, **Ilhéu de Cima**, 13.IV.2011, LC, FF, JC (MADJ 12787). (*) *Sonchus parathalassius* J. G. Costa ex R. Jardim & M. Seq., **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12872); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12873); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12874); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12881); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12882). *Sonchus ustulatus* Lowe, **Ilhéu de Ferro**, 15.VI.2011, JC (MADJ 12870); **Ilhéu de Ferro**, 15.VI.2011, JC (MADJ 12889); **Ilhéu de Ferro**, 31.V.2012, FF (MADJ 12871); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12883); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12884); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12885); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12892); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12886); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12867); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12868); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12869); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12887); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12888); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12890); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12891); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12893); **Ilhéu de Ferro**, 20.XI.2012, FF (MADJ 12894). *Urospermum picroides* (L.) Scop. ex F. W.- Schmidt, **Ilhéu de Cal**, 17.V.2011, LC, FF, JC (MADJ 12784); **Ilhéu de Cima**, 17.III.2011, LC, FF, JC (MADJ 12428); **Ilhéu de Cima**, 17.III.2011, LC, FF, JC (MADJ 12472); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12811); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12848).

BORAGINACEAE

Heliotropium ramosissimum (Lehm.) DC., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12665); **Ilhéu de Ferro**, 10.IV.2012, JC (MADJ 12949); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12776).

BRASSICACEAE

Eruca vesicaria (L.) Cav. ssp. *sativa* (Mill.) Thell., **Ilhéu de Cima**, 12.II.2011, JC, AS (MADJ 12476). *Lobularia libyca* (Viv.) Meisn., **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12548); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12554); **Ilhéu de Cima**, 15.V.2011, FF (MADJ 12496). *Rapistrum rugosum* (L.) All. ssp. *rugosum*, **Ilhéu da Cal**, 16.V.2013, LC, FF, CN (MADJ 13017); **Ilhéu da Cal**, 16.V.2013, LC, FF, CN (MADJ 13018).

CAMPANULACEAE

Campanula erinus L., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12399); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12410); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12797). *Whalenbergia lobelioides* (L.f.) Link ssp. *lobelioides*, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12560); **Ilhéu da Cal**, 13.V.2013, LC, FF, CN (MADJ 13023); **Ilhéu da Cal**, 14.V.2013, LC, FF, CN (MADJ 13010).

CARYOPHYLLACEAE

Polycarpon tetraphyllum (L.) L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12803); *Silene uniflora* Roth, **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12673); **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12674); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12668). *Spergularia marina* (L.) Besser, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12578).

CHENOPODIACEAE

Beta maritima L., **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12562); **Ilhéu de Cima**, 15.III.2011, LC, FF, JC (MADJ 12427). *Patellifolia patellaris* (Moq.) A. J. Scott, Ford-Lloyd & J. T. Williams, **Ilhéu de Cima**, 15.IV.2011, LC, FF, JC, AS (MADJ 12589); **Ilhéu de Cima**, 15.IV.2011, LC, FF, JC, AS (MADJ 12590); **Ilhéu de Cima**, 01.VI.2012, FF (MADJ 12898); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12493); **Ilhéu de Ferro**, 10.IV.2012, JC (MADJ 12469); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12897). *Patellifolia procumbens* (C. Sm.) A. J. Scott, Ford-Lloyd & J. T. Williams, **Ilhéu de Fora**, 31.V.2012, FF (MADJ 12900).

CONVOLVULACEAE

Convolvulus althaeoides L., **Ilhéu de Ferro**, 16.IV.2013, FF (MADJ 13069). *Cuscuta planiflora* Ten., **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12914); **Ilhéu de Ferro**, 16.IV.2013, FF (MADJ 13072).

CRASSULACEAE

Aeonium glandulosum (Aiton) Webb & Berthel., **Ilhéu de Cima**, 16.V.2011, LC, FF, JC (MADJ 12585). *Aichryson villosum* (Aiton) Webb & Berthel., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12582); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12551).

EUPHORBIACEAE

Chamaesyce prostrata (Aiton) Small (Syn. *Euphorbia prostrata* Aiton), **Ilhéu de Cima**, 23.III.2011, LC, FF, JC (MADJ 12838); **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12549). *Euphorbia peplus* L., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12360); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12379); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12398); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12413); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12516). *Euphorbia terracina* L., **Ilhéu de Ferro**, 10.IV.2012, JC (MADJ 12952).

FABACEAE

Astragalus boeticus L., **Ilhéu de Cima**, 15.III.2011, LC, FF, JC (MADJ 12426); **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12584). *Astragalus pelecinus* (L.) Barneby, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12389); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12828); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12504). *Astragalus solandri* Lowe, **Ilhéu de Cima**, 11.IV.2013, FF (MADJ 13059); **Ilhéu de Cima**, 11.IV.2013, FF (MADJ 13074). *Hippocrepis multisiliquosa* L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12821); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12567). *Lotus argyroides* R. P. Murray, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC (MADJ 12795); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12566). *Lotus loweanus* Webb & Berthel., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12793). *Lotus macranthus* Lowe, **Ilhéu de Cima**, 17.III.2011, LC, FF, JC (MADJ 12482); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12794); **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12481). *Lotus* sp., **Ilhéu de Cima**, 9.IV.2011, AS, LC, FF, JC (MADJ 12998). *Medicago italica* (Mill.) Fiori, **Ilhéu de Cima**, 12.II.2011, JC (MADJ 12429). *Medicago minima* (L.) L. var. *minima*, **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12836); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12463); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12571); **Ilhéu de Cima**, 16.V.2011, LC, FF, JC (MADJ 12502); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12557); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12662). *Ononis dentata* Sol. ex Lowe, **Ilhéu de Cima**, 21.III.2011, LC, FF, JC (MADJ 12532); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12657); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12658). *Ononis diffusa* Ten., **Ilhéu de Cima**, 16.III.2011, LC, FF, JC (MADJ 12531); **Ilhéu de Cima**, 23.III.2011, LC, FF, JC (MADJ 12320); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12527); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12528); **Ilhéu de Cima**, 15.V.2011, FF (MADJ 12542); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12529). *Scorpiurus sulcatus* L., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12330); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12384); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12547); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12773). *Trifolium angustifolium* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12699). *Trifolium campestre* Schreb., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12703). *Trifolium dubium* Sibth., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12683). *Trifolium scabrum* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12552). *Vicia costae* A. Hansen, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12695); **Ilhéu de Cima**, 15.IV.2011, LC, FF, JC, AS (MADJ 12546); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12538). *Vicia parviflora* Cav., **Ilhéu de Cima**, 21.III.2011, LC, FF, JC (MADJ 12580); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12550).

FRANKENIACEAE

Frankenia laevis L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12911); **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12573).

GERANIACEAE

Erodium botrys (Cav.) Bertol., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12681). *Erodium chium* (L.) Willd. ssp. *chium*, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12386). *Erodium moschatum* (L.) L'Hér., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12689); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12663). *Geranium dissectum* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12467). *Geranium rotundifolium* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12466).

LAMIACEAE

Micromeria thymoides (Sol. ex Lowe) Webb & Berthel. ssp. *thymoides*, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12913); **Ilhéu de Cima**, 16.V.2011, LC, FF, JC (MADJ 12912); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12919). *Prasium majus* L., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12382); **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12491); **Ilhéu da Cal**, 16.VI.2011, JC (MADJ 12495). *Stachys ocymastrum* (L.) Briq., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12664).

LINACEAE

Linum strictum L., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12328); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12388); **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12583); **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12839); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12553).

MALVACEAE

Lavatera cretica L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12692). *Malva parviflora* L., **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12479); **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12480); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12800); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12835). **Ilhéu de Cima**, 16.V.2011, LC, FF, JC (MADJ 12534).

OROBANCHACEAE

Orobanche ramosa L. ssp. *nana* (Reut.) Cout., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12385); **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12917).

PAPAVERACEAE

Fumaria bastardii Boreau, **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12909); **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12322); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12697); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12789).

PLANTAGINACEAE

Plantago coronopus L., **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12693); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12701); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC (MADJ 12806); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12807). *Plantago leiopetala* Lowe, **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12522). *Plantago maderensis* Decne., **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12720). *Plantago ovata* Forssk., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12361); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12686); **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12570); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12729).

POACEAE

Avena barbata Pott ex Link, **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12598); **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12599); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12769); **Ilhéu de Cima**, 15.V.2011, LC, FF, JC (MADJ 12761); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12434); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12450). *Brachypodium distachyum* (L.) P. Beauv., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12617); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12619); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12604); **Ilhéu de Cima**, 15.III.2011, LC, FF, JC (MADJ 12623); **Ilhéu de Cima**, 17.III.2011, LC, FF, JC (MADJ 12624); **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12618); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12747); **Ilhéu de Cima**, 23.III.2011, LC, FF, JC (MADJ 12622); **Ilhéu de Cima**, 23.III.2011, LC, FF, JC (MADJ 12746); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12748); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12756). *Briza maxima* L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12435). *Bromus diandrus* Roth, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12767); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12451); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12454). *Catapodium rigidum* (L.) C. E. Hubb., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12611); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12612); **Ilhéu de Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12614); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12749); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12754); **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12609); **Ilhéu de Cima**, 18.III.2011, LC, FF, JC (MADJ 12610); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12613); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12443); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12440). *Cenchrus ciliaris* L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12758); **Ilhéu de Cima**, 14.V.2011, FF (MADJ 12765). *Hordeum marinum* Huds. ssp. *gussoneanum* (Parl.) Thell., **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12432). *Lagurus ovatus* L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12442). *Lamarckia aurea* (L.) Moench, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12601). *Lolium canariense* Steud., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12453). *Lolium multiflorum* Lam., **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12452); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12508). *Lolium rigidum* Gaudin, **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12752); **Ilhéu de Cima**, 15.V.2011, FF (MADJ 12753); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12444); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12445); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12447); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12446); **Ilhéu de Ferro**, 12.IV.2011, LC, FF, JC, AS (MADJ 12448). *Oryzopsis miliaceae* (L.) Asch. & Schweinf., **Ilhéu de Cima**, 22.X.2010, FF, JC (MADJ 12436); **Ilhéu de Cima**, 14.V.2011, FF (MADJ 12437). *Phalaris coerulescens* Desf., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12438). *Phalaris paradoxa* L., **Ilhéu de Cima**, 13.IV.2011, LC, FF, JC, AS (MADJ 12744). *Rostraria cristata* (L.) Tzvelev, **Ilhéu da Cal**, 15.V.2013, LC, FF, CN (MADJ 13007); **Ilhéu da Cal**, 15.V.2013, LC, FF, CN (MADJ 13039); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12750). *Stipa capensis* Thunb., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12600); **Ilhéu de Cima**, 14.V.2011, FF (MADJ 12770); **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12449). *Triplachne nitens* (Guss.) Link, **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12751); **Ilhéu de Cima**, 10.IV.2011, LC, FF, JC, AS (MADJ 12768); **Ilhéu de Cima**, 14.V.2011, FF (MADJ 12743); **Ilhéu de Ferro**, 02.VI.2012, FF (MADJ 12760).

POLYGONACEAE

Rumex bucephalophorus L. ssp. *canariensis* (Steinh.) Rech. f. var. *canariensis*, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12332); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12383); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12412).

PRIMULACEAE

Anagallis arvensis L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12666).

RUBIACEAE

Galium aparine L., **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12579). *Galium geminiflorum* Lowe, **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12700). *Galium murale* (L.) All., **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12406); **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12796). *Phyllis nobla* L., **Ilhéu de Ferro**, 06.IV.2011, LC, FF, AS (MADJ 12464). *Rubia fruticosa* Aiton, **Ilhéu de Cima**, 12.II.2011, JC, AS (MADJ 12721); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12812); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12813).

SCROPHULARIACEAE

Misopates orotium (L.) Raf. ssp. *orontium*, **Ilhéu da Cal**, 14.IV.2011, LC, FF, JC, AS (MADJ 12404); **Ilhéu da Cal**, 17.V.2011, LC, FF, JC (MADJ 12497); **Ilhéu de Cima**, 19.III.2011, LC, FF, JC (MADJ 12558); **Ilhéu de Cima**, 22.III.2011, LC, FF, JC (MADJ 12716); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12827); **Ilhéu de Cima**, 16.V.2011, LC, FF, JC (MADJ 12498).

URTICACEAE

Parietaria debilis G. Forst., **Ilhéu de Cima**, 21.III.2011, LC, FF, JC (MADJ 12581); **Ilhéu de Cima**, 21.III.2011, LC, FF, JC (MADJ 12815); **Ilhéu de Cima**, 09.IV.2011, LC, FF, JC, AS (MADJ 12792).