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Bioclimatology and climatophilous vegetation of Gomera (Canary Islands)

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The bioclimatic belts of Gomera are established and the potential distribution of its climatophilous vegetation series mapped accordingly. PCA and DCA analyses explain the significance of thermic factors related to altitude, and rainfall or humidity conditions (mist precipitation) in the distribution of bioclimatic belts and vegetation series. A map of potential natural vegetation is produced by considering several additional abiotic environmental factors, and the current distribution of potential vegetation remnants or their substitute communities. Three new climatophilous associations (*Neochamaeleo pulverulentae–Euphorbietum balsamiferae*, *Violo rivinianae–Myricetum fayae*, *Cisto gomerae–Pinetum canariensis*), one new climatophilous subassociation (*Brachypodio arbusculae–Juniperetum canariensis* subass. *ericetosum arboreae*), two potential edaphophilous new associations (*Euphorbietum aphyllae*, *Euphorbio berthelotii-Retamatetum rhodorhizoidis*), one new potential edaphophilous subassociation (*Cisto gomerae–Pinetum canariensis* subass. *juniperetosum canariensis*) and two serial new associations (*Micromerio gomerensis–Cistetum monspeliensis*, *Adenocarpo foliolosi-Chamaecytisetum angustifolii*) are described. Commentaries and phytosociological tables of the potential natural vegetation communities and the other communities described are given.

Key words: bioclimatology, Canary Islands, ecology, Gomera, phytosociology, syntaxonomy, vegetation series

Introduction

This is one of a series of papers dealing with the bioclimatology and vegetation of the Canary Islands: Tenerife (Del-Arco *et al*. 2006a), Hierro and La Palma (Del-Arco *et al*. 1996, 1999a), Gran Canaria, (Del-Arco *et al*. 2002), Lanzarote (Reyes-Betancort *et al*. 2001), and Fuerteventura (Rodríguez-Delgado *et al*. 2005). This paper establishes a relationship between the bioclimatic belts and climatophilous vegetation series of Gomera.

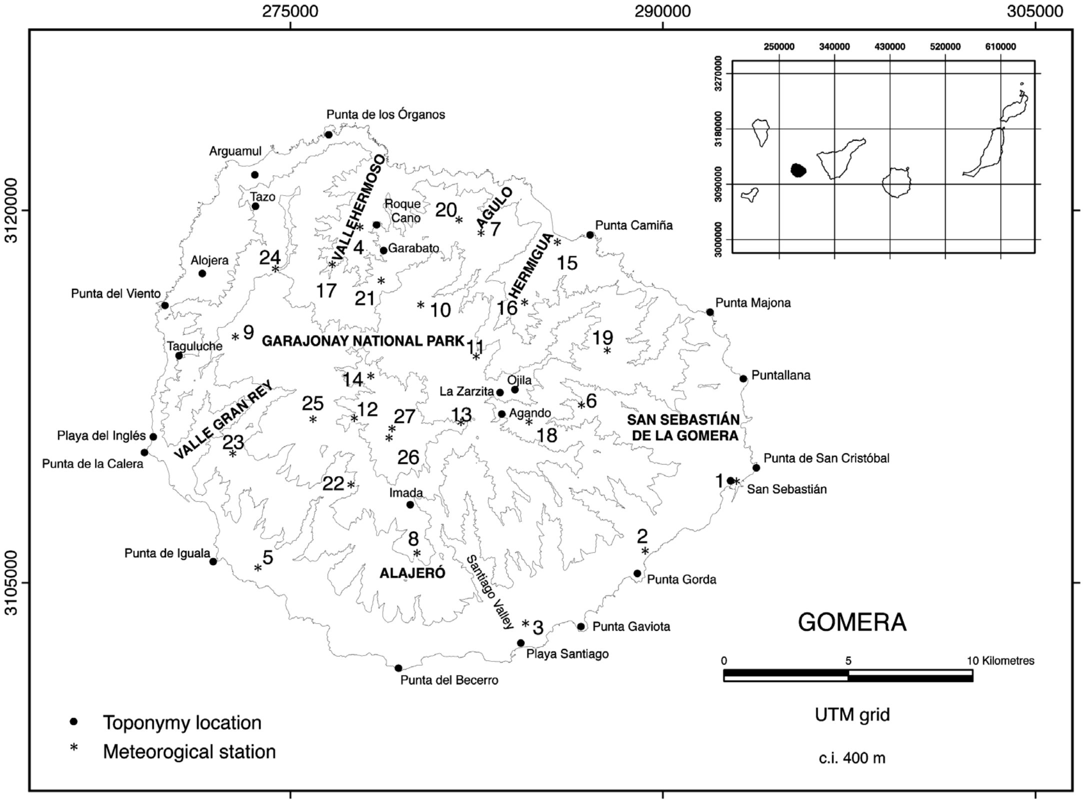


Fig. 1. Toponymic map and location of meteorological stations.

Several phytosociological studies of the island have been made (Fernández-Galván 1983, Mester 1987, Oberdorfer 1965), Fernández-Galván (1983) being the most general. Despite this we describe several new potential and substitutional syntaxa and, based on bioclimatic and phytocoenotic information we map the climatophilous vegetation series. Additionally, we provide a more complete map of the potential natural vegetation.

Study site

Gomera is situated at 28°01´–28°13´N and 17°06´–17°21´W, in a central western position within the Canary archipelago, off the African continent (Fig. 1). Like the rest of the Canaries, it is a volcanic oceanic island; the datings for its subaerial volcanic phases range from 9.4–8.4 Ma for its shield volcano, and the subsequent lava flows extend up to 1.9 Ma. The island is highly eroded and there has been no recent volcanic activity (Paris *et al*. 2005). It is the second smallest island of the seven, with a surface area of 373 km^2 and rises to 1487 m a.s.l. near its centre (Garajonay). It has a more or less circular shape flattened in the NE quadrant, and its main axes are 22 km (N–S) between Punta de Los Órganos (N) and Punta del Becerro (S) and 25 km (W–E) between Punta de La Calera (W) and Punta de San Cristóbal (E). The relatively flat centre of the island is the highest part: the central plateau, with an undulating relief descending to around 800 m a.s.l. The generally deep ravines have a radial arrangement, with sharp ridges in the north and more or less flat ridges in the south. The heads of the main ravines have extensive erosion basins, and their mouths usually open into valleys, where the main human settlements are situated. Most of the island has a basaltic composition and the Basal Complex crops out in the north. All the island is spotted by intrusive acidic volcanic formations: salic plugs and "fortalezas" exposed by erosion. The coast is mainly rocky and only a few dark grey volcanic sand beaches have developed at the mouth of some ravines; other beaches are formed of basaltic pebbles and boulders. The only organogenic whitish sand spot of the island is at Puntallana, in the E (Niebla *et al*. 1985). The island is subject to a trade-wind regime generating clouds over its windward slopes, which extend to the summit and even overflow it (Ceballos & Ortuño 1951, Huetz de Lemps 1969, Arozena 1991).

The current vascular plant flora has a high degree of Canary endemism (over 24%), though the Mediterranean influence is dominant (La-Roche & Rodríguez-Piñero 1994, Wells & Lindacher 1994, Marrero & Pérez-de-Paz 1998, Acebes *et al*. 2004). The different zonal vegetation belts of the island, in order of altitude, are: *Euphorbia* scrub (African Rand Flora origin), juniper woodland (Mediterranean origin), evergreen laurel forest (only on trade-winds facing slopes; Thetian-Tertiary origin), and pine woodland (Mediterranean origin) (Del-Arco & Rodríguez-Delgado 1999). From a biogeographical point of view, Gomera is a Sector of the Western Canary Subprovince, Canary Province, Canary Subregion, Mediterranean Region (Rivas-Martínez 2002).

Material and methods

Data and bioclimatic classification system

This bioclimatic study was performed using data from 14 thermopluviometric meteorological stations and 13 additional pluviometric stations operated by the National Meteorological Institute (Fig. 1 and Table 1). Thermopluviometric diagrams (Rivas-Martínez 2007) were drawn for some stations selected as representative of the different bioclimatic combinations (Fig. 2).

According to the World Bioclimatic Classification System (Rivas-Martínez 1995), the Canary Islands fit within the Mediterranean macrobioclimate, which is an extratropical macrobioclimate characterized by aridity ($P < 2T$) for at least two months after the summer solstice, among other features. Only three of its seven constituent bioclimates can be recognized in the Canary Islands: oceanic-desertic, oceanic-xeric and oceanic-pluviseasonal. Ic (continentality index), Io (ombrothermic index) and $P > 2T$ are used to define them. This classification provides a basis for establishing the bioclimatic belts of any territory by using a combination of thermotype, bioclimate, and ombrotype.

Thermotypes are the spaces within an Itc (compensated thermicity index) gradient. Ombrotypes are the spaces within an Io gradient. Bioclimatic belts are defined as the successive types or groups of physical media along an altitudinal or latitudinal cliseries. They are not the same as vegetation belts, which are the plant community complexes or vegetation series ascending up an altitudinal cliseries.

In addition to the above combination used in the bioclimatic formula, we include the presence or absence of clouds (Peinado *et al*. 1997, Del-Arco *et al*. 1999a, 2002, 2006a) to refine the characterization of bioclimatic belts. This allows apparently similar belts on north-facing slopes under the influence of trade-wind clouds (t.w.c. hereafter) to be differentiated from those on dry south-facing slopes.

Indices are used to establish thermotypes, bioclimates, and ombrotypes. Itc, used to establish thermotypes, is defined as follows: Itc = It ± C, given that It (thermicity index) = $(T + M + m) \times 10$, where T = mean annual temperature, and M and m are the mean maximum and minimum temperatures of the coldest month. C is the compensation value: when the continentality index (Ic = difference between mean temperatures of the warmest and coldest months of the year) is < 9 (oceanic) or > 18 (continental), a compensation value (C) is subtracted or added to It to obtain Itc. This value is used in the extratropical territories of the Earth (north of 27°N and south of 27°S) to compensate for the extra winter cold of highly continental territories or the extra winter warmth in highly oceanic ones, so that the resulting compensated thermicity index (Itc) is comparable all around the Earth. In the territory studied, only compensations for Ic values < 9 are needed. This compensation value is obtained from:

$$C = (9.0 - \text{Ic}) \times 10.$$

Io, used to establish bioclimates and ombrotypes, is defined as follows: Io = (Pp/Tp) × 10,

Table 1. Climatic and bioclimatic data from the stations studied.

No.	Stations	Elev.	*T*	*M*	*m*	It	Ic	Itc	Tp	Tv	Fp_1	Fp_2	Fs
	Thermopluviometric												
1	San Sebastián-Ayudantía de Marina	15	20.7	20.2	15.2	561	6.7	538	2484	713	0	0	0
2	San Sebastián-Playa Cabrito	15	20.8	21.1	13.2	551	7.7	538	2496	724	0	0	0
3	Alajeró-Playa Santiago	160	19.7	20.2	14	539	5.4	503	2364	679	0	0	0
4	Vallehermoso	212	18.8	19.2	13.3	513	6	483	2256	656	0	0	0
5	Vallehermoso-Dama	225	20.4	20.6	14.3	553	6.2	525	2448	696	0	0	0
6	San Sebastián-Chejelipes Presa	280	19.4	19	12.8	512	7.8	500	2328	683	0	0	0
7	Agulo-Juego Bolas	730	15.5	15.1	10.2	408	6.5	383	1860	561	0	0	0
8	Alajeró	810	17.7	16.1	10.6	444	10.4	444	2124	686	0	0	0
9	Valle Gran Rey-Arure Acardece	840	14.9	13.6	7.5	360	11.1	360	1788	609	0	0	0
10	Agulo-Meriga Vivero	840	13.7	13.2	5.8	327	9	327	1644	528	0	0	0
11	Hermigua-Cedro Icona	960	13.9	13.3	7.8	350	7.8	338	1668	532	0	0	0
12	Vallehermoso-Chipude C.F.	1215	14.5	12.5	6.6	336	12.7	336	1740	622	0	2	0
13	San Sebastián-Montaña Tajaqué	1225	13.3	10.9	5.4	296	12.5	296	1596	573	0	1	0
14	Vallehermoso-Laguna Grande	1275	13.1	12.3	4.4	298	12.6	298	1572	586	2	7	0
	Pluviometric												
15	Hermigua-Playa	40	*19.9*	*20.6*	*14.3*	*548*	*5.8*	*516*	*2388*	*688*	0	0	0
16	Hermigua-Casas	215	*18.8*	*19.2*	*13.3*	*513*	*6*	*483*	*2256*	*657*	0	0	0
17	Vallehermoso-Macayo Roquillo	410	*17.2*	*17.3*	*10.9*	*454*	*6.9*	*433*	*2064*	*615*	0	0	0
18	San Sebastián-Laja	520	*17.9*	*16.9*	*10.9*	*457*	*9*	*457*	*2148*	*655*	0	0	0
19	San Sebastián-Inchereda	560	*16.6*	*16.4*	*11.2*	*442*	*6.3*	*415*	*1992*	*592*	0	0	0
20	Agulo-Rosas	580	*16.5*	*16.3*	*11.1*	*439*	*6.4*	*413*	*1980*	*588*	0	0	0
21	Vallehermoso-Cañada Toril	600	*15.6*	*15.5*	*8.7*	*398*	*7.8*	*386*	*1872*	*576*	0	0	0
22	Vallehermoso-Erques	700	*18.2*	*16.9*	*11.3*	*464*	*9.6*	*464*	*2184*	*688*	0	0	0
23	Vallehermoso-Gerián	720	*18.1*	*16.8*	*11.2*	*461*	*9.8*	*461*	*2172*	*688*	0	0	0
24	Vallehermoso-Chorros de Epina	825	*13.8*	*13.3*	*6*	*331*	*8.9*	*330*	*1656*	*531*	0	0	0
25	Vallehermoso-Temocodá Chipude	1070	*14.6*	*13.4*	*6.9*	*349*	*11.9*	*349*	*1756*	*617*	0	0	0
26	Vallehermoso-Igualero	1340	*12.9*	*12.2*	*4.2*	*293*	*12.8*	*293*	*1551*	*585*	3	7	0
27	Vallehermoso-Garajonay	1450	*12.6*	*11.9*	*3.8*	*277*	*13.3*	*277*	*1513*	*583*	4	8	0

Elev. = elevation (m a.s.l.); *T* = mean annual temperature (°C); *M* = mean maximum temperature of the coldest month (°C); *m* = mean minimum temperature of the coldest month (°C); It = thermicity index; Ic = continentality index; Itc = compensated thermicity index; Tp = positive temperature; Tv = summer temperature; Fp_1 and Fp_2 = probable frost period (months): Fp_1 = number of months with mean absolute minimum temperature ≤ 0 °C (Rivas-Martínez *et al.* 2007); Fp_2 = number of months with absolute minimum temperatures < 0 °C (Walter & Lieth 1967); Fs = frost period: number of months with mean daily minimum temperature ≤ 0 °C; P = annual rainfall (mm); Pp = positive rainfall (mm); Pv = summer rainfall (mm); $P > 4T$ = number of months when rainfall (in mm) is greater than four times the temperature; $4T > P > 2T$ = number of months when the rainfall (in mm) value is between twice and four times the temperature value; $2T > P > T$ = number of months when the rainfall value is greater than temperature value but smaller than twice this value; $P < T$ = number of months when the rainfall is smaller than the temperature; Io = Ombrothermic index; Iov = summer ombrothermic index; Mist = area with trade-wind clouds; B.B. and V.S. = bioclimatic belts and vegetation series according to Table 5; Years T-P = Periods with available *T* and *P* data, number of years with complete T-P data in parentheses. *T* and *P* values are obtained from all monthly data, even when they come from incomplete periods. R.S. = Reference stations. Figures in italics (missing thermometric data for rainfall stations) were obtained by extrapolation from the appropriate gradients between the indicated reference stations. Source: National Meteorological Institute (Spain).

where Pp (positive rainfall) is the annual rainfall in mm, taking into account only the months with mean temperature higher than 0 °C. Since this is the case for all the thermopluviometric weather stations on the island, Pp has the same value as *P*; Tp (positive temperature) is the value in tenths of degrees resulting from the sum of the monthly means above 0 °C. The Io is one of the indices that best fit the altitudinal limits of the vegetation series. Further explanation can be found in Rivas-Martínez (1995, 1997, 2007) and Del-Arco *et al.* (1996, 1999a, 2002, 2006a).

P (= Pp)	Pv	*P* > 4*T*	4*T* > *P* > 2*T*	2*T* > *P* > *T*	*P* < *T*	Io	Iov	Mist	B.B.	V.S.	Years T-P	R.S.
209	4.5	0	2	2	8	0.84	0.06	•	2	1	1960–2002 (12)/1961–2002 (14)	
180	2.7	0	1	3	8	0.72	0.04	•	2	1	1960–2002 (7)/1961–2002 (15)	
160	4.9	0	1	3	8	0.68	0.07	•	2	1	1960–2002 (15)/1961–2002 (29)	
369	16	1	5	1	5	1.64	0.24	•	4	3	1960–2002 (30)/1961–2002 (30)	
149	2.1	0	0	3	9	0.61	0.03	•	2	1	1960–2002 (21)/1961–2002 (23)	
385	5.3	3	2	3	5	1.65	0.08	•	4	3	1960–2002 (10)/1961–2002 (13)	
451	22.6	3	4	1	4	2.42	0.40	+	10	4	1960–2002 (13)/1961–2002 (18)	
340	9.6	2	3	2	5	1.60	0.14	•	7	3	1960–2002 (19)/1961–2002 (31)	
481	17.8	5	2	0	5	2.69	0.29	+	11	4	1960–2002 (6)/1961–2002 (17)	
683	23.9	7	0	1	4	4.15	0.45	+	18	5	1960–2002 (10)/1961–2002 (30)	
758	35.9	6	1	1	4	4.55	0.67	+	18	5	1960–2002 (12)/1961–2002 (12)	
643	17.2	5	2	1	4	3.70	0.28	+	19	6	1960–2002 (14)/1961–2002 (28)	
650	24	6	1	1	4	4.07	0.42	+	19	6	1960–2002 (9)/1961–2002 (16)	
676	19	5	2	0	5	4.30	0.32	+	19	6	1960–2002 (11)/1961–2002 (14)	
294	8.3	*0*	*5*	*1*	*6*	*1.23*	*0.12*	•	3	2	1981–2002 (10)	4–7
477	11.9	*3*	*4*	*0*	*5*	*2.11*	*0.18*	•	5	3	1972–1985 (12)	4–7
376	13.8	*2*	*3*	*2*	*5*	*1.82*	*0.22*	•	7	3	1972–2002 (20)	4–10
603	14	*5*	*2*	*0*	*5*	*2.80*	*0.21*	+	6	4	1985–2002 (4)	6–13
407	8.9	*3*	*2*	*2*	*5*	*2.04*	*0.15*	•	9	3	1980–1992 (6)	4–7
465	24	*3*	*4*	*0*	*5*	*2.35*	*0.41*	+	10	4	1972–2002 (16)	4–7
449	20.3	*4*	*2*	*1*	*5*	*2.40*	*0.35*	+	10	4	1985–2002 (14)	4–10
380	2.2	*3*	*2*	*1*	*6*	*1.74*	*0.03*	•	4	3	1985–2002 (7)	5–8
266	4.7	*2*	*2*	*2*	*6*	*1.22*	*0.07*	•	3	2	1986–2002 (11)	5–8
368	25.9	*3*	*2*	*3*	*4*	*2.22*	*0.49*	+	15	4	1984–2001 (13)	21–10
430	7.2	*4*	*2*	*1*	*5*	*2.45*	*0.12*	•	14	7	1980–2002 (12)	9–12
626	11.5	*7*	*0*	*1*	*4*	*4.04*	*0.20*	+	19	6	1972–2002 (26)	10–14
592	11.1	*6*	*1*	*0*	*5*	*3.92*	*0.19*	+	19	6	1985–2001 (14)	14–26

The bioclimatic maps (Figs. 3–5) were drawn according to the indices obtained for the meteorological stations, and the threshold values of the indices which delimit thermotype, bioclimate and ombrotype (Table 2).

The curves showing the key values of change in these were then traced from the appropriate gradients on the different slopes (Tables 3 and 4). The bioclimatic-belt map was made by overlapping the thermotype, bioclimate and ombrotype maps, and considering the area influenced by t.w.c. (Huetz de Lemps 1969, Arozena 1991). In any subsequent colouring of the maps the criteria of Del-Arco *et al*. (1999b) should preferably be followed.

To identify the potential and other vegetation units we have used the phytosociological method of Braun-Blanquet (1979), and consequently phytosociological tables have been constructed using his abundance-cover scale [(+) = species not in the sampled area but present in the surrounding, + = species sparsely or very sparsely present; cover very small, 1 = plentiful but small cover value, 2 = very numerous, or covering at least 5% of the area, 3 = any number of individuals covering 25%–50% of the area, 4 = any number of individuals covering 50%–75% of the area, 5 = covering more than 75% of the area]. Vegetation series were characterized according to the criteria laid down by Géhu and Rivas-Martínez (1981). The terms climatophilous, edaphoxerophilous, and edaphohygrophilous are used throughout the text according to definitions by Rivas-Martínez (1995).

Statistical analysis

Ordination techniques aid in explaining community variation (Gauch 1982), and they can be used

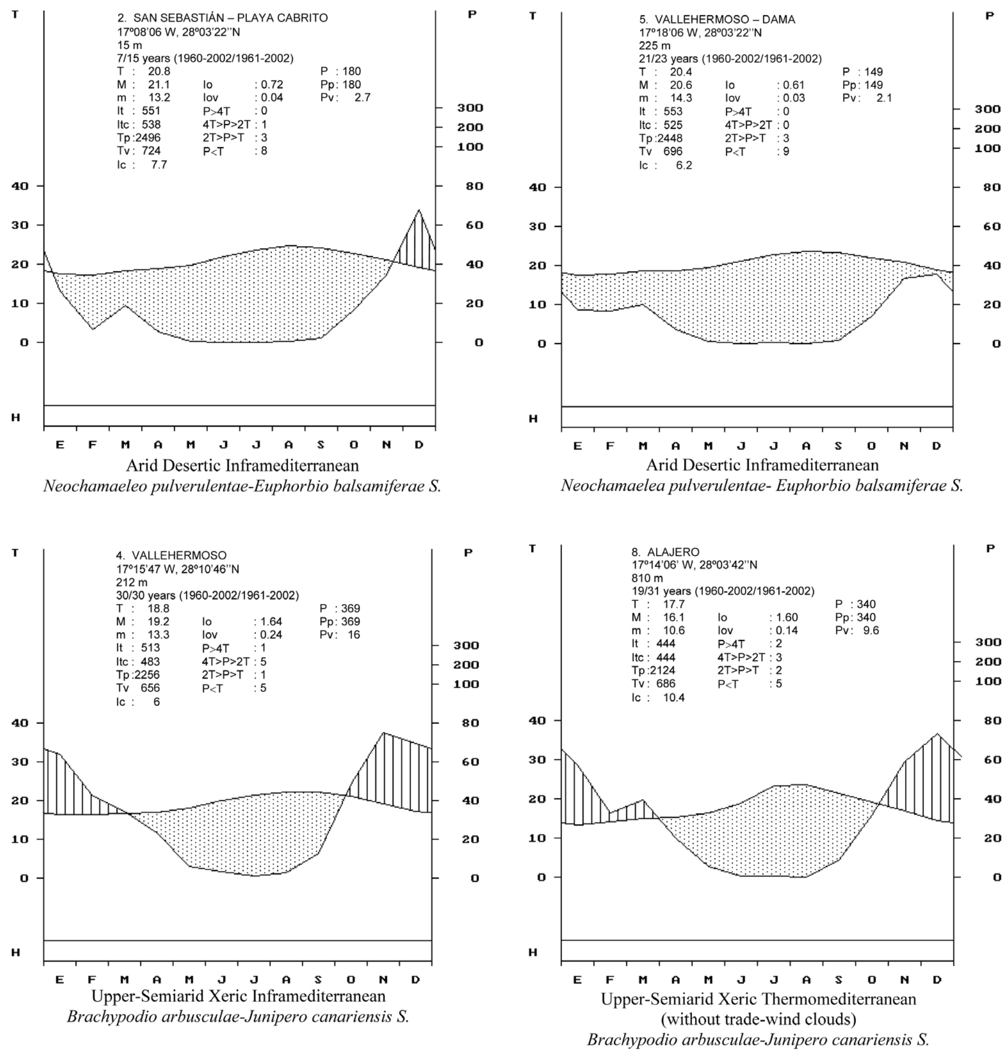
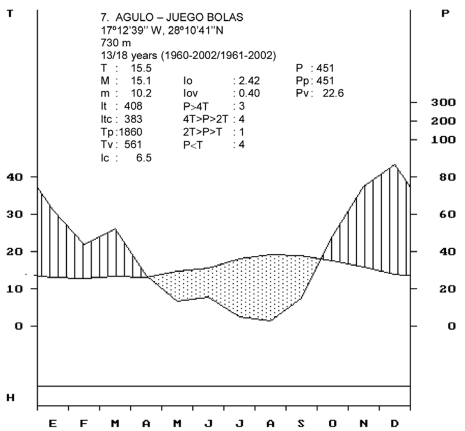


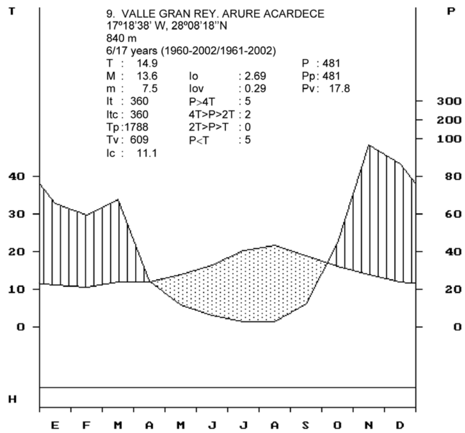
Fig. 2. Climatic, bioclimatic, and symphytosociological data from some representative meteorological stations. Years: periods when temperature and rainfall were recorded. T = Mean annual temperature (°C); M = Mean maximum temperature of the coldest month (°C); m = Mean minimum temperature of the coldest month (°C); It = Thermicity index; Itc = Compensated thermicity index; Tp = Positive temperature; Tv = Summer temperature; Ic = Continentality index; Io = Ombrothermic index; Iov = Summer ombrothermic index; $P > 4T$ = Months in which the rainfall value (in mm) is greater than four times the temperature value; $4T > P > 2T$ = Months in which the rainfall value is between twice and four times the temperature value; $2T > P > T$ = Months in which the rainfall value is greater than temperature value but smaller than two times this value; $P < T$ = Months in which the rainfall value is smaller than the temperature value; P = Annual rainfall in mm; Pp = Positive rainfall; Pv = Summer rainfall; H = Frost period: white = frost-free period ($m_i > 0$ °C); black = frost ($m_i \leq 0$ °C); hatched = probable frost ($m_i' \leq 0$ °C); m_i = monthly mean daily minimum temperature; m_i': monthly mean absolute minimum temperature.

to evaluate trends through time as well as space (ter Braak & Šmilauer 2002). We used Principal Components Analysis (PCA, applying CANOCO; ter Braak & Šmilauer 2002) to examine the relationships among the altitude, climatic and bioclimatic parameters of the meteorological stations, and bioclimatic belts and vegetation series.

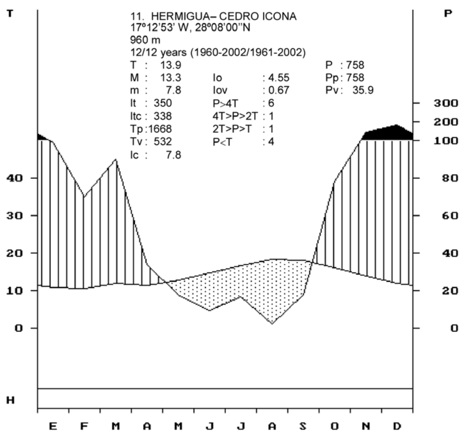
We used Detrended Correspondence Analysis (DCA; Hill & Gauch 1980) to examine how sample plots are grouped into the main gradients, in accordance with the different bioclimatic belts.



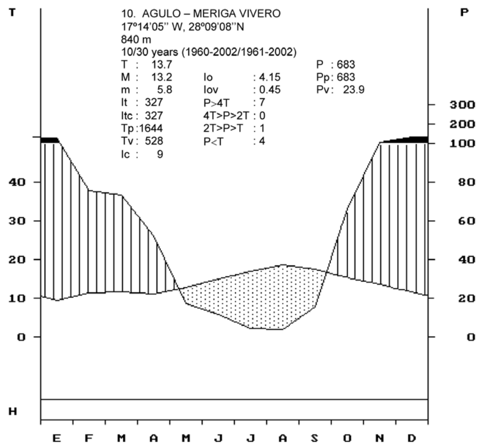
Dry Pluviseasonal Inframediterranean
(with trade-wind clouds)
Visneo mocanerae-Arbuto canariensis S.



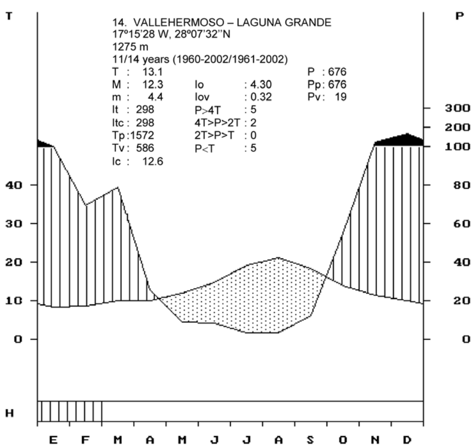
Dry Pluviseasonal Thermomediterranean
(with overflowing trade-wind clouds)
Visneo mocanerae –Arbuto canariensis S.



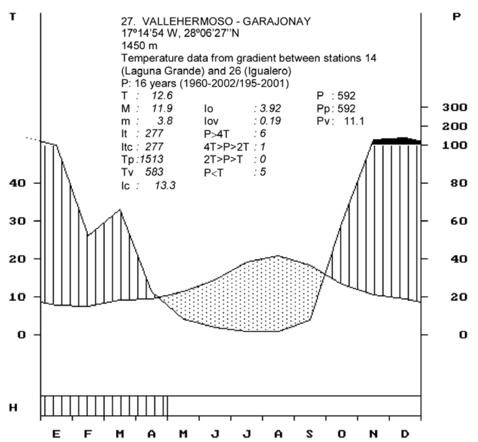
Subhumid Pluviseasonal Lower-Mesomediterranean
(with trade-wind clouds; Ic < 11)
Lauro novocanariensis-Perseo indicae S.



Subhumid Pluviseasonal Lower-Mesomediterranean
(with trade-wind clouds; Ic < 11)
Lauro novocanariensis-Perseo indicae S.

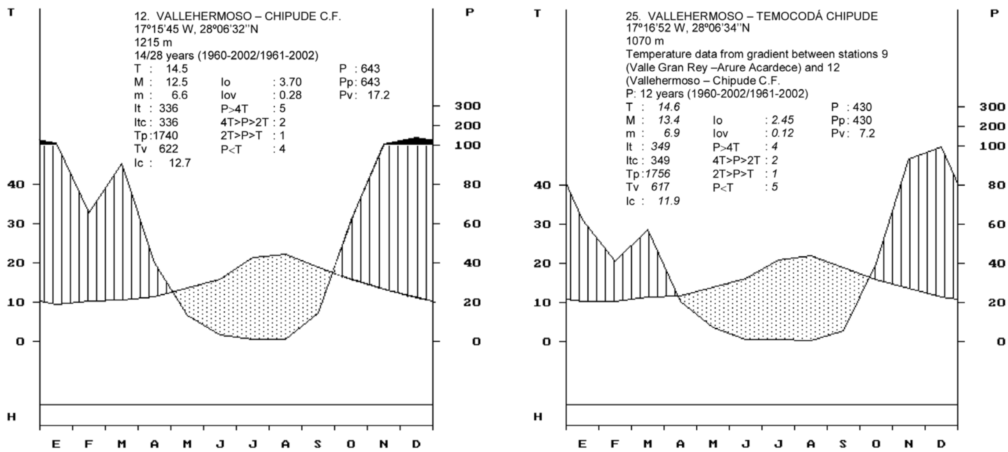


Subhumid Pluviseasonal Lower-Mesomediterranean
(with trade-wind clouds, except summer; Ic >12)
Violo rivinianae-Myrico fayae S.



Subhumid Pluviseasonal Lower-Mesomediterranean
(with trade-wind clouds, except summer; Ic > 12)
Violo rivinianae -Myrico fayae S. (climatophilous series)
Micromerio lepidae-Erico arboreae S. (edaphophilous series)

Fig. 2. Continued.



Subhumid Pluviseasonal Lower-Mesomediterranean
(with trade-wind clouds, except summer; Ic > 12)
Violo rivinianae-Myrico fayae S.
in transition to
Subhumid Pluviseasonal Lower-Mesomediterranean
(with overflowing trade-wind clouds)
Cisto gomearae-Pino canariensis S.

Dry Pluviseasonal Lower-Mesomediterranean
(without trade-wind clouds)
Cisto gomerae-Pino canariensis S.

Fig. 2. Continued.

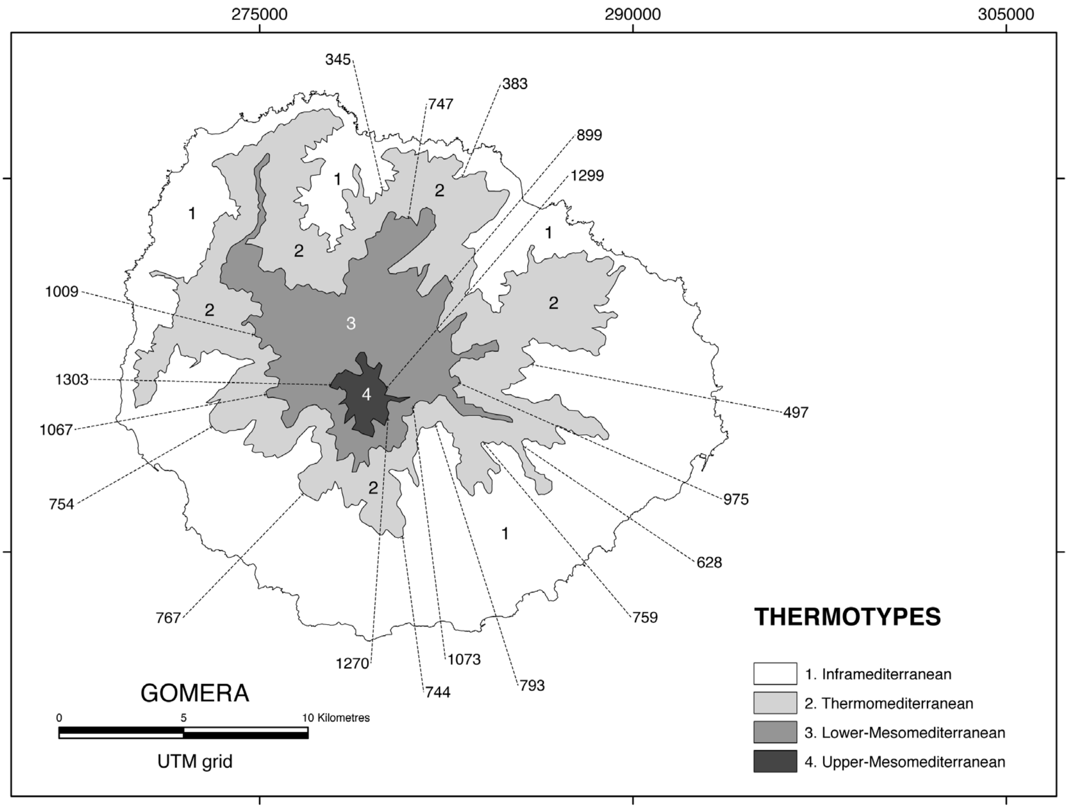


Fig. 3. Map of thermotypes.

Nomenclature

The phytosociological nomenclature follows Rivas-Martínez *et al*. (2001, 2002); below association level, Rodríguez-Delgado *et al*. (1998) may be consulted. The taxonomic nomenclature

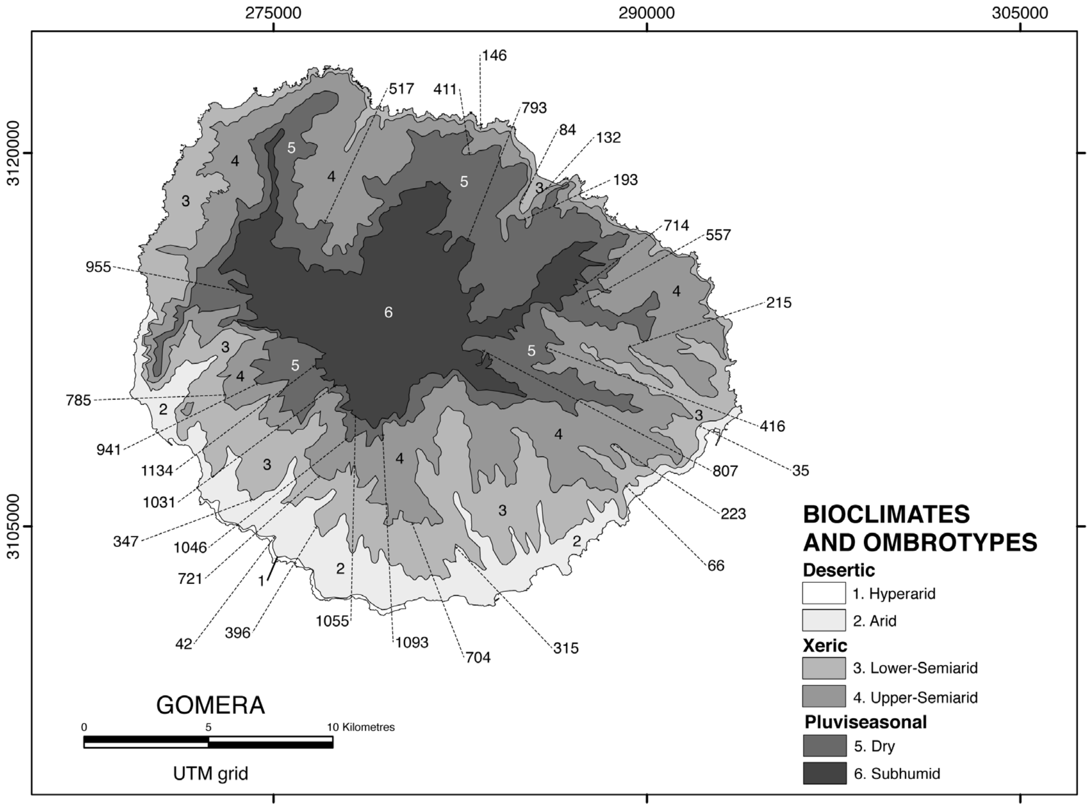


Fig. 4. Map of bioclimate and ombrotypes.

is mainly according to Acebes *et al*. (2004). Common names (Perera López 2005) of the taxa are mentioned the first time they appear.

Results

Thermotypes, bioclimates, and ombrotypes.

Three thermotypes (Inframediterranean, Thermomediterranean and Mesomediterranean; Fig. 3), three bioclimates (oceanic-desertic, oceanic-xeric and oceanic-pluviseasonal; Fig. 4), and five ombrotypes (hyperarid, arid, semiarid, dry and subhumid; Fig. 4), were present on the island.

Bioclimatic belts and vegetation series

Upon overlapping the thermotype, bioclimate, and ombrotype and taking into account the absence or presence of t.w.c., 19 bioclimatic belts were demarcated (Fig. 5) as hosts to the seven climatophilous vegetation series found on the island (Fig. 6 and Table 5).

Table 2. Threshold values for thermotypes, bioclimates and ombrotypes according to Rivas-Martínez (1997).

	Itc	Tp
Thermotype		
Inframediterranean	450–580	> 2450
Thermomediterranean	350–450	2150–2450
Mesomediterranean	210–350	1500–2150
Supramediterranean	80–210	900–1500
Oromediterranean	–	450–900
Bioclimate	Io	
Oceanic-desertic	0.1–0.9	
Oceanic-xeric	0.9–2.0	
Oceanic-pluviseasonal	> 2.0	
Ombrotype	Io	
Hyperarid	0.1–0.3	
Arid	0.3–0.9	
Semiarid	0.9–2.0	
Dry	2.0–3.0	
Subhumid	3.0–5.5	
Humid	5.5–11	

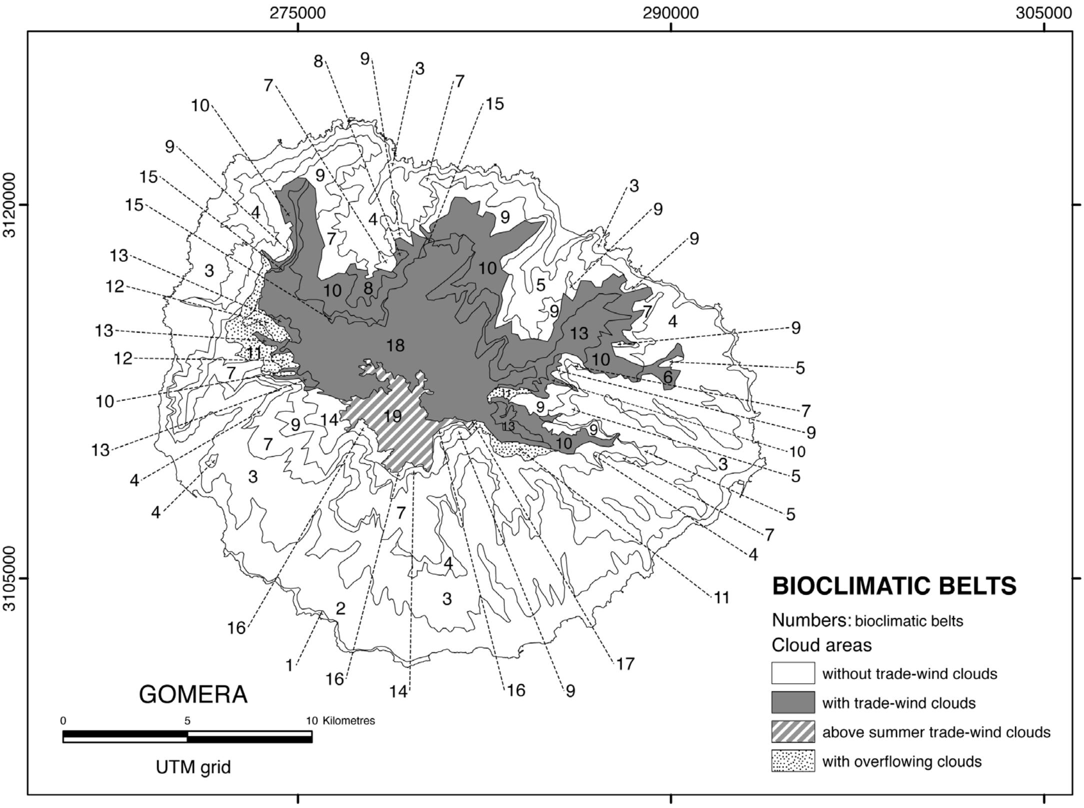


Fig. 5. Bioclimatic belts. 1 = Hyperarid desertic Inframediterranean; 2 = Arid desertic Inframediterranean; 3 = Lower-semiarid xeric Inframediterranean; 4 = Upper-semiarid xeric Inframediterranean; 5 = Dry pluviseasonal Inframediterranean (–); 6 = Dry pluviseasonal Inframediterranean (+); 7 = Upper-semiarid xeric Thermomediterranean (–); 8 = Upper-semiarid xeric Thermomediterranean (+); 9 = Lower-dry pluviseasonal Thermomediterranean (–); 10 = Dry pluviseasonal Thermomediterranean (+); 11 = Dry pluviseasonal Thermomediterranean (+); 12 = Subhumid pluviseasonal Thermomediterranean (+); 13 = Subhumid pluviseasonal Thermomediterranean (+); 14 = Dry pluviseasonal Mesomediterranean (–); 15 = Dry pluviseasonal Mesomediterranean (+); 16 = Subhumid pluviseasonal Mesomediterranean (–); 17 = Subhumid pluviseasonal Mesomediterranean (+); 18 = Subhumid pluviseasonal Mesomediterranean (+; Ic < 11); 19 = Subhumid pluviseasonal Mesomediterranean (+, but lacking in summer; Ic > 12). (+): with trade-wind clouds; (–): without trade-wind clouds.

Ordination of the climatic and bioclimatic data with PCA revealed that those parameters discriminate two main tendencies (Fig. 7). The most important parameters are related to temperature variations in relation to altitude. These parameters are closely related to axis 1, which separates bioclimatic belts (especially B2 and B19) and vegetation series (especially those located in the Inframediterranean and Mesomediterranean).

Differences mainly conditioned by rainfall and humidity (mist precipitation) are ordinated by axis 2, where bioclimatic belts and vegetation series are separated according to the different ombrotypes. Three main groups of variables and belts can be distinguished. Inframediterranean belts are correlated with highest temperatures (upper left area of the graph), while Mesomediterranean belts (right area) are related with highest altitude. The Mesomediterranean belts without clouds or outside the influence of clouds in summer, are correlated with altitude, continentality index, and frost probability. Finally, a third group, in the lower right area of the graph, corresponds with Thermomediterranean and Mesomediterranean bioclimatic belts. These belts differ in mist, PP, Pv, Iov, and Io.

DCA (Fig. 8) was also very consistent in discriminating the bioclimatic belts. Along axis 1, plots were discriminated into different belts (Inframediterranean, Thermomediterranean, and Mesomediterranean) according to altitude and temperature parameters (T, M, m, It, Itc, Tp, Tv). Sample scores of axis 1 were correlated with these parameters ($p < 0.001$). Axis 2 separates different plot groups within each mentioned bioclimatic belt, according to precipitation parameters (Pp, Pv, Iv, Iov and Mist). Sample scores of axis 2 were correlated with these parameters

Table 3. References for constructing the bioclimatic maps: thermotypes.

Stations	Height (m) difference between stations	Itc difference between stations	Altitude (m) of transition between thermotypes		
			Infra-thermo (Itc = 450)	Thermo-meso (Itc = 350)	Lower-meso-upper-meso (Itc = 280)
4–10	628	156	345	747	
4–7	518	100	383		
1–6	265	61	497		
2–6	265	38	628		
2–8	795	94	759		
3–8	650	59	744		
5–8	585	81	767		
7–11	230	45		899	
6–13	945	204		975	1299
8–13	415	148	793	1073	1270
9–12	405	24		1009	
23–24	350	112	754	1067	
12–14	60	38			1303

Table 4. References for constructing the bioclimatic maps: bioclimates and ombrotypes.

			Altitude (m) of transition between bioclimates				
			Desertic-xeric (Io = 0.9)		Xeric-pluviseasonal (Io = 2)		
			Upper altitude (m) of ombrotype				
Stations	Height difference (m)	Io difference	Hyperarid (Io = 0.3)	Arid (Io = 0.9)	Lower-semiarid (Io = 1.45)	Upper-semiarid (Io = 2)	Dry (Io = 3)
7–17	320	0.63				517	
15–20	540	1.12			146	411	
4–15	172	0.41			132		
15–16	175	0.88			84	193	
1–6	265	0.81		35	215		
2–6	265	0.93		66	223		
11–19	400	2.53				557	714
6–13	945	2.42				416	807
3–8	650	0.92		315	704	1093	
5–8	585	0.99	42	396	721	1046	
5–22	475	1.13		347			
23–25	350	1.23			785	941	
21–10	240	1,75					682
7–10	110	1.73					766
22–26	640	2.34					1055
22 –12	515	1.96					1031
25–12	145	1.25					1134
9–12	375	1.01					955
7–11	230	2.13					793

Table 5. Correspondence between bioclimatic belts and climatophilous vegetation series.

	Bioclimatic belt		Climatophilous vegetation series
1	Hyperarid desertic Inframediterranean	1	*Neochamaeleo pulverulentae-Euphorbio balsamiferae sigmetum*
2	Arid desertic Inframediterranean	1	*Neochamaeleo pulverulentae-Euphorbio balsamiferae sigmetum*
3	Lower-semiarid xeric Inframediterranean	2	*Euphorbio berthelotii-canariensis sigmetum*
4	Upper-semiarid xeric Inframediterranean	3	*Brachypodio arbusculae-Junipero canariensis sigmetum*
5	Dry pluviseasonal Inframediterranean (without trade-wind clouds)	3	*Brachypodio arbusculae-Junipero canariensis sigmetum*
6	Dry pluviseasonal Inframediterranean (with trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
7	Upper-semiarid xeric Thermomediterranean (without trade-wind clouds)	3	*Brachypodio arbusculae-Junipero canariensis sigmetum*
8	Upper-semiarid xeric Thermomediterranean (with trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
9	Lower-dry pluviseasonal Thermomediterranean (without trade-wind clouds)	3	*Brachypodio arbusculae-Junipero canariensis sigmetum*
10	Dry pluviseasonal Thermomediterranean (with trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
11	Dry pluviseasonal Thermomediterranean (with overflowing trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
12	Subhumid pluviseasonal Thermomediterranean (with overflowing trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
13	Subhumid pluviseasonal Thermomediterranean (with trade-wind clouds)	5	*Lauro novocanariensis-Perseo indicae sigmetum*
14	Dry pluviseasonal Mesomediterranean (without trade-wind clouds)	7	*Cisto gomerae-Pino canariensis sigmetum*
15	Dry pluviseasonal Mesomediterranean (with trade-wind clouds)	4	*Visneo mocanerae-Arbuto canariensis sigmetum*
16	Subhumid pluviseasonal Mesomediterranean (without trade-wind clouds)	7	*Cisto gomerae-Pino canariensis sigmetum*
17	Subhumid pluviseasonal Mesomediterranean (with overflowing trade-wind clouds)	7	*Cisto gomerae -Pino canariensis sigmetum*
18	Subhumid pluviseasonal Mesomediterranean (with trade-wind clouds; Ic < 11)	5	*Lauro novocanariensis-Perseo indicae sigmetum*
19	Subhumid pluviseasonal Mesomediterranean (with trade-wind clouds, but lacking in summer; Ic > 12)	6	*Violo rivinianae-Myrico fayae sigmetum*

($p < 0.001$). Along axis 2, humid bioclimatic belts are situated in the lower area of the graph, while the drier ones are located in the upper area.

Figure 9 shows the vegetation series differentiated by DCA. Three groups can be distinguished along axis 1. The first consists of the series *Neochamaeleo–Euphorbio balsamiferae sigmetum* and *Euphorbio berthelotii–canariensis sigmetum*; the latter appears in the lower part of the graph due to greater water requirements. The second group includes the *Brachypodio arbusculae–Junipero canariensis sigmetum*. The third group includes, from top to bottom, *Cisto gomerae–Pino canariensis sigmetum*, *Violo-Myrico fayae sigmetum*, *Visneo mocanerae–Arbuto canariensis sigmetum*, and *Lauro novocanariensis–Perseo indicae sigmetum*. All four *sigmeta* in this group are positioned according to humidity conditions.

Potential natural vegetation map

Several potential natural vegetation maps of Gomera have been produced, among them those by Ceballos and Ortuño (1951), Santos and Fernández (1980), Rivas-Martínez (1987), Santos (2000), and Del-Arco *et al*. (2006b) based on climatophilous macroseries.

As a complement to the climatophilous vegetation series map (Fig. 6), which represents a rather theoretical approach to vegetation distribution, we have drawn a potential natural vegetation map. The influence of topographic, geomorphic, edaphic, and geological factors (Carracedo 1980, Rodríguez-Losada & Martinez-Frías 2004) (Fig. 10) affecting the expansion of edaphophilous vegetation (edaphophilous series and permanent vegetation) makes other potential communities appear in the potential natural vegetation map (Fig. 11), although only the more representative potential communities at the map scale are displayed. These two maps show differences and several improvements on the previously mentioned maps.

Climatophilous vegetation series

There is a clear correspondence between the climatophilous series map, obtained from the bio-

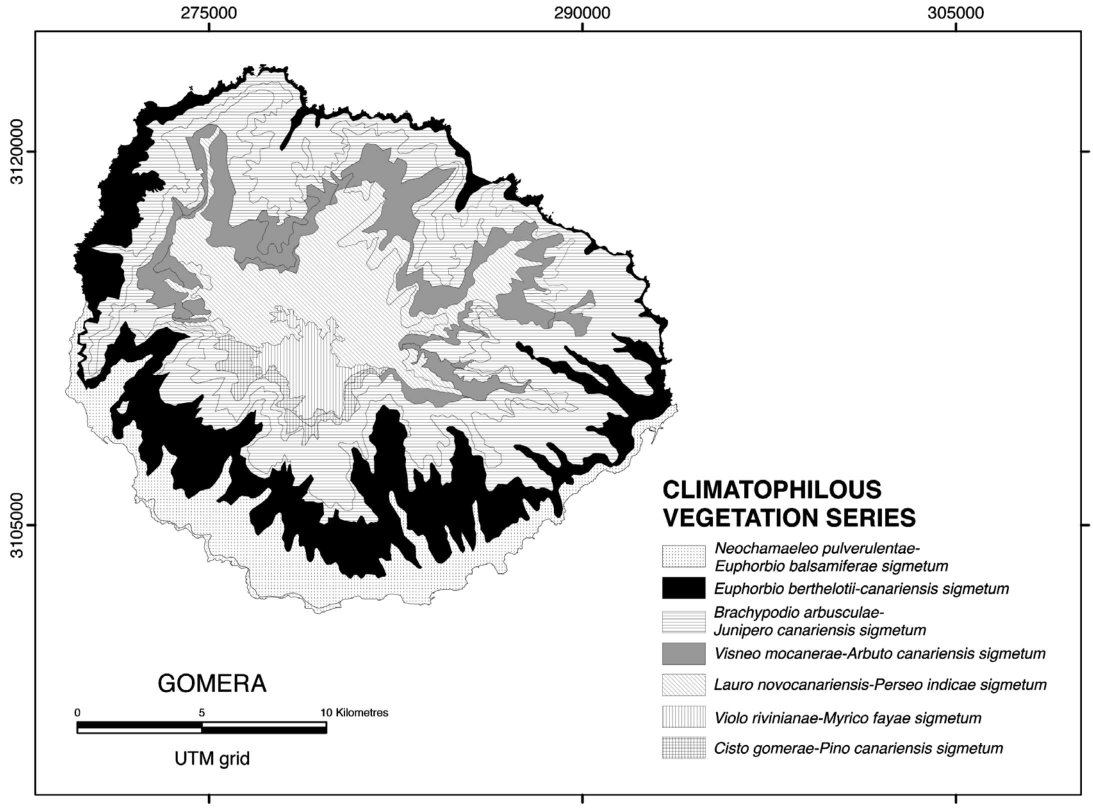


Fig. 6. Map of climatophilous vegetation series.

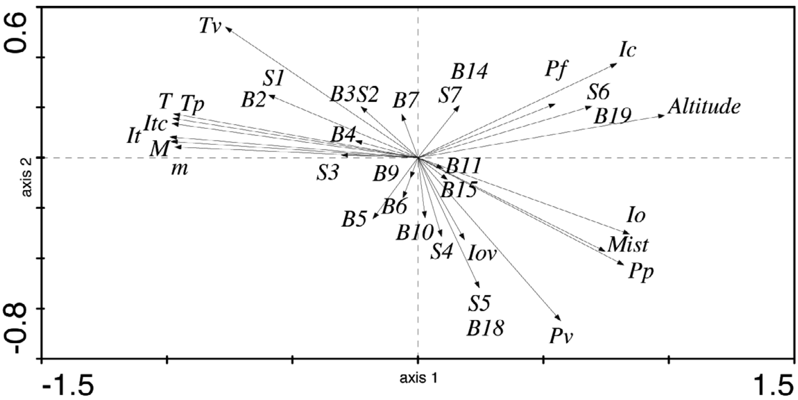


Fig. 7. Principal Component Analysis of all variables of the plots. Eigenvalues axis 1: 0.933 (93.3% of the cumulative percentage of variance), axis 2: 0.044 (97.7% of the cumulative percentage of variance). B = Bioclimatic belt., S= Vegetation series (S1 = *Neochamaeleo pulverulentae-Euphorbio balsamiferae sigmetum*, S2 = *Euphorbio berthelotii-canariensis sigmetum*, S3 = *Brachypodio arbusculae-Junipero canariensis sigmetum*, S4 = *Visneo mocanerae-Arbuto canariensis sigmetum*, S5 = *Lauro novocanariensis-Perseo indicae sigmetum*, S6 = *Violo rivinianae-Myrico fayae sigmetum*, S7 = *Cisto gomerae-Pino canariensis sigmetum*). *T* = mean annual temperature, *M* = mean maximum temperature of the coldest month, *m* = mean minimum temperature of the coldest month, It = thermicity index, Ic = continentality index, Itc = compensated thermicity index, Tp = positive temperature, Tv = summer temperature, Pf = frost period, P = annual rainfall (mm), Pp = Positive rainfall, Pv = Summer rainfall, Io = Ombrothermic index, Iov = Summer ombrothermic index. B: Bioclimatic belts according to Table 5.

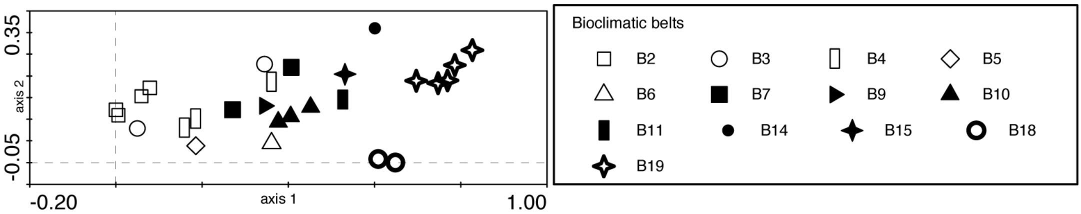


Fig. 8. Detrended Correspondence Analysis Axes 1 and 2. Axis 1 eigenvalue: 0107 (cumulative percentage of the variance: 73.05) while 0.06 for axis 2 (cumulative percentage of the variance: 78.4). Different symbols indicate bioclimatic belts. Inframediterranean belt plots are indicated with empty symbols with straight lines; Thermomediterranean belt plots are indicated with solid symbols; Mesomediterranean belt plots are indicated with empty symbols with bold lines.

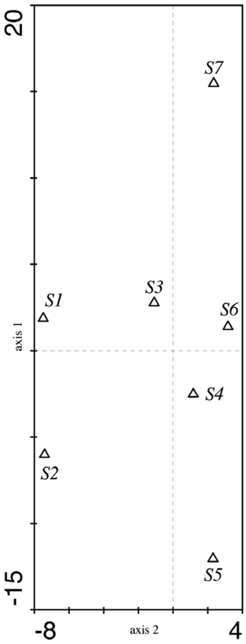


Fig. 9. Detrended Correspondence Analysis. Axis 1 eigenvalue: 0.107 (cumulative percentage of the variance: 73.05) while 0.06 for axis 2 (cumulative percentage of the variance: 78.4). Vegetation series (S1 = *Neochamaeleo pulverulentae–Euphorbio balsamiferae sigmetum*, S2 = *Euphorbio berthelotii-canariensis sigmetum*, S3 = *Brachypodio arbusculae–Junipero canariensis sigmetum*, S4 = *Visneo mocanerae–Arbuto canariensis sigmetum*, S5 = *Lauro novocanariensis–Perseo indicae sigmetum*, S6 = *Violo rivinianae–Myrico fayae sigmetum*, S7 = *Cisto gomerae–Pino canariensis sigmetum*).

climatic belts map, and the distribution of their remnants, their serial substitute communities and distribution of bioindicative species. These are evidence of the reciprocal correspondence between climatophilous series and bioclimatic belts. Seven climatophilous vegetation series are recognizable.

Although this paper attempts to characterize the climatophilous series and their relation to bioclimatic belts, we comment on the other potential communities, since they are in special locations of their general area, and also show some illustrative relevés. We also describe some substitutional communities.

Neochamaeleo pulverulentae–Euphorbietum balsamiferae Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Holotype: Table 6; rel. no. 10].

Common name: Gomera sweet-spurge scrub.

This sweet-spurge scrub is an association endemic to Gomera (Table 6). Its structure and physiognomy are those of a crassicaule desertic scrub, terminal community of the hyperarid and arid desertic Inframediterranean climatophilous series of the sweet spurge (*Euphorbia balsamifera*) on Gomera: *Neochamaeleo pulverulentae–Euphorbio balsamiferae sigmetum*.

It is a community with few species, where besides *Euphorbia balsamifera* the following are common among others: *Kleinia neriifolia* ("verode"), *Euphorbia berthelotii* ("tabaiba picuda"), *Neochamaelea pulverulenta* ("leña buena"), *Campylanthus salsoloides* ("romero marino") and *Launaea arborescens* ("ahulaga"). Its potential area is confined to the hyperarid and arid desertic Inframediterranean bioclimatic belts. The hyperarid occupies a short and narrow SSW coastal strip between Punta del Becerro and Punta de Iguala; the arid extends in an arc at low altitude on the E, S and W slopes, from San Sebastian, in the E, to Taguluche, in the W. Along this area it borders with *Frankenio-Astydamietum latifoliae* (Table 7) (rocky cost halophilous belt) in the SE, with *Euphorbietum berthelotii–canariensis* (cardón scrub) at a certain altitude, with *Atriplici-Tamaricetum canariensis* ("tarajal") (Table 7) in some ravine mouths,

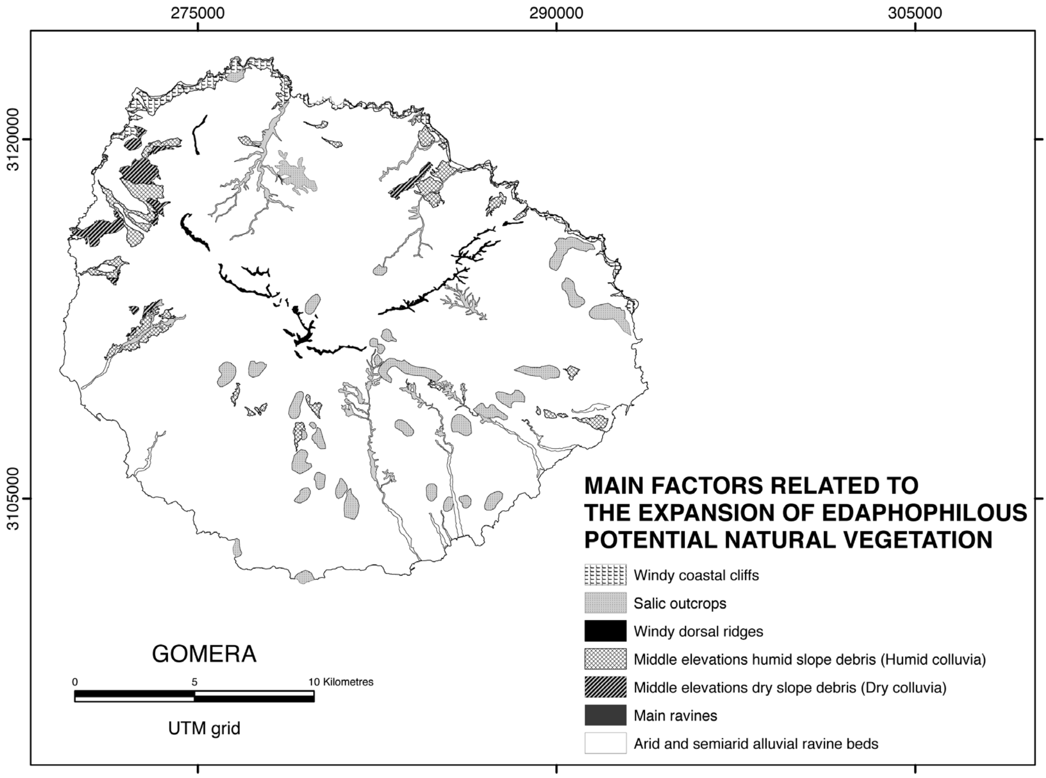


Fig. 10. Main factors related to the expansion of edaphophilous potential natural vegetation.

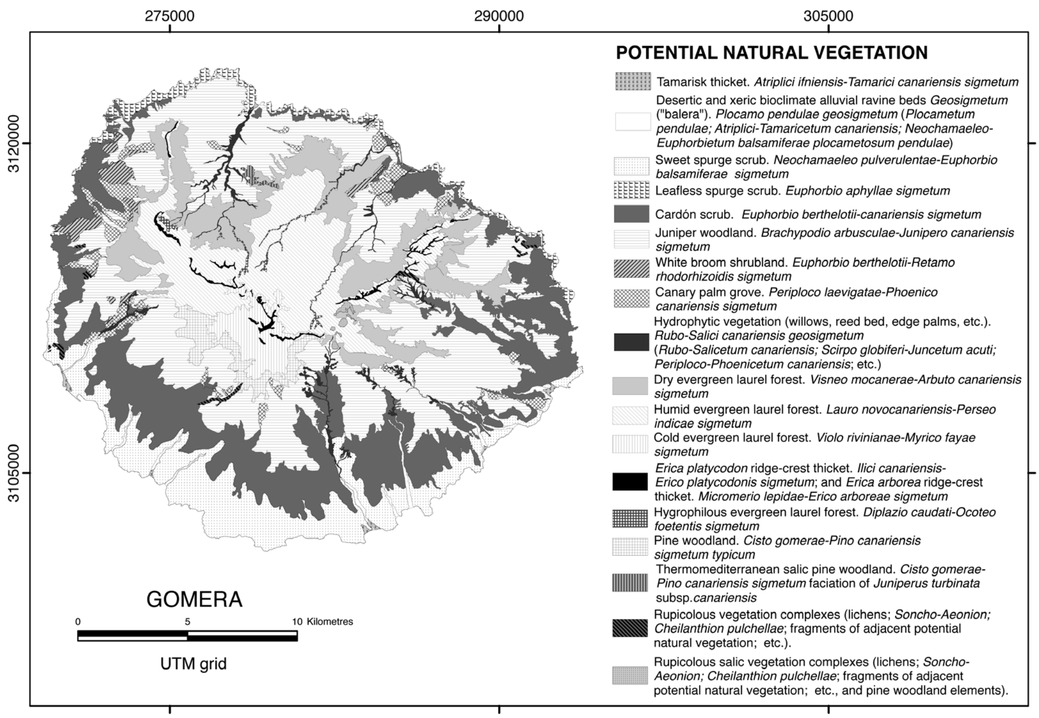


Fig. 11. Map of potential natural vegetation.

Table 6. *Euphorbietum aphyllae stat. nov.* (1–6); *Neochamaeleo pulverulentae-Euphorbietum balsamiferae ass. nov.* (7–11); *Euphorbietum berthelotii-canariensis* (12–15); *Plocametum pendulae* subass. *euphorbietosum berthelotii* (16). [*Aeonio-Euphorbion*, *Kleinio-Euphorbietalia*, *Kleinio-Euphorbietea*]. * for Braun-Blanquet's abundance-cover scale *see* p. 165. Same scale is used in Tables 7–14.

Relevé	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Altitude (m. a.s.l.)	10	40	85	•	45	40	45	285	365	150	420	370	390	375	280	•
Slope (°)	7	7	40	•	40	5	20	40	30	45	15	•	50	60	25	•
Aspect	N	N	N	•	N	E	N	SE	SE	NE	SW	NW	W	S	S	•
Area (m²)	9	16	50	•	16	100	16	100	200	100	100	200	100	100	100	•
Cover (%)	75	90	75	•	90	90	90	75	70	80	50	•	75	50	70	•
Number of taxa/relevés	8	8	15	3	13	19	11	18	12	16	13	18	12	14	17	8
Character taxa*																
Euphorbia aphylla	3	3	3	3	2	1	•	•	•	•	•	•	•	•	•	•
Euphorbia balsamifera	3	5	3	2	4	5	5	3	4	4	3	•	•	•	•	•
Euphorbia canariensis	•	•	•	•	•	•	•	•	•	•	•	3	4	3	3	•
Plocama pendula	•	2	1	2	2	2	2	+	2	+	1	•	•	1	2	V
Kleinia neriifolia	•	•	1	2	•	+	•	2	2	2	1	+	2	2	3	IV
Periploca laevigata	•	•	+	2	1	2	•	2	1	2	•	+	•	2	2	I
Euphorbia berthelotii	•	•	•	•	•	•	•	+	1	•	•	3	2	1	2	IV
Rubia fruticosa	•	•	•	1	2	2	2	•	•	•	•	1	2	1	•	•
Echium aculeatum	•	•	+	1	1	•	•	1	•	•	•	2	+	•	1	•
Neochamaelea pulverulenta	•	•	2	2	•	+	•	•	2	1	•	•	•	•	•	•
Euphorbia lamarckii	•	•	•	2	3	+	3	•	•	•	•	•	•	•	•	•
Micromeria varia	•	•	+	2	1	•	•	•	•	•	•	1	•	•	•	•
Asparagus arborescens	•	•	•	•	•	•	•	2	•	•	•	•	•	2	1	•
Campylanthus salsoloides	•	•	•	•	•	•	•	2	•	1	•	1	•	•	•	•
Kickxia scoparia	•	•	•	•	•	•	•	•	1	•	1	•	•	1	•	•
Vicia cirrhosa	•	•	•	•	•	•	•	•	1	•	•	•	•	1	•	•
Ceropegia dichotoma subsp. *krainzii*	•	•	•	•	•	•	•	•	•	•	1	•	1	•	•	•
Companion taxa																
Hyparrhenia sinaica	•	2	2	3	+	1	1	2	•	1	2	2	•	1	1	II
Launaea arborescens	1	2	1	3	2	1	3	•	1	1	1	+	•	•	•	IV
Aeonium viscatum	•	1	2	1	2	2	2	1	•	1	•	2	3	•	•	•
Cenchrus ciliaris	•	•	•	1	•	+	•	2	1	•	1	•	•	+	2	II
Lavandula canariensis	•	•	•	1	•	•	•	2	1	•	+	•	+	1	2	•
Lycium intricatum	1	•	+	2	•	2	3	•	•	•	2	•	•	•	•	•
Schizogyne sericea	1	•	1	2	•	+	•	•	•	1	•	•	•	•	•	III
Pinus halepensis (plant.)	3	1	•	3	1	•	2	•	•	•	•	•	•	•	•	•
Argyranthemum frutescens	•	•	•	•	•	+	1	•	•	•	2	•	•	•	+	III
Bituminaria bituminosa	•	•	+	2	•	•	•	•	•	+	•	1	•	•	1	•
Aristida adscensionis	•	•	•	2	•	1	•	•	•	•	•	•	•	1	+	•
Aeonium decorum	•	•	•	•	•	•	•	•	•	•	•	+	1	1	2	•
Brachypodium arbuscula	•	•	3	2	•	•	•	•	•	2	•	•	•	•	•	•
Aeonium castello-paivae	•	•	•	1	•	•	•	2	•	2	•	•	•	•	•	•
Lotus emeroides	2	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•
Monanthes muralis	•	•	•	1	•	•	•	1	•	•	•	•	•	•	•	•
Ajuga iva	•	•	•	1	•	•	•	•	•	•	1	•	•	•	•	•
Asphodelus ramosus subsp. *distalis*	•	•	•	•	•	•	•	•	•	•	•	1	1	•	•	•
Crithmum maritimum	•	•	•	•	1	•	+	•	•	•	•	•	•	•	•	•
Sideritis spicata	•	•	•	•	•	•	•	•	•	•	•	+	1	•	•	•
Phagnalon saxatile	•	•	•	+	•	•	•	•	•	•	•	•	•	•	•	I
Rumex lunaria	•	+	•	•	•	•	•	+	•	•	•	•	•	•	•	•
Opuntia ficus-indica	•	•	•	•	•	•	•	•	•	+	•	•	•	•	+	•

Other taxa (relevé): (1) *Patellifolia webbiana* +; (4) *Juniperus turbinata* subsp. *canariensis* 3, *Phoenix canariensis* (plant.) 1, *Juncus acutus* 1, *Retama rhodorhizoides* 1, *Globularia salicina* 1; (6) *Volutaria canariensis* +, *Pinus halepensis* (pl.) 1, *Seseli webbii* 1; (8) *Polycarpaea divaricata* 2, *Reseda scoparia* 1, *Convolvulus floridus* 1; (9) *Ceballosia fruticosa* +; (10) *Sonchus ortunoi* 2, *Atalanthus sp.* +; (11) *Artemisia thuscula* +; (12) *Cistus monspeliensis* 1, *Piptatherum caerulescens* +, *Cosentinia vellea* subsp. *bivalens* +; (13) *Scilla haemorrhoidalis* 1; (15) *Todaroa aurea* subsp. *suaveolens* 1, *Heteropogon contortus* +; (16) *Nicotiana glauca* II, *Lotus sessilifolius* I, *Rumex vesicarius* I, *Calendula arvensis* I, *Patellifolia patellaris* I, *Reichardia ligulata* I, *Astydamia latifolia* I.

Localities and sources: 1, 2, 5, 7 = Puntallana, III.1989; 3 = Mouth of Barranco de Vallehermoso, 7.IV.1994; 4 = Del-Arco *et al.* 1990: table IV, rel. 33–35, p. 44–45; 6 = Puntallana, 23.IV.2002; 8 = Agulo Tunnel, 6.IV.1994; 9, 14 = Los Revolcaderos, 29.I.2002; 10 = Below road from Hermigua to Agulo, 6.IV.2002 (holotype); 11 = Playa de Santiago (Alajeró), 5.IV.2002; 12 = Cañada de la Hurona (San Sebastián), Rivas-Martínez *et al.* 1993: p. 191–192; 13 = Barranco de la Villa (San Sebastián), 6.IV.2002; 15 = Barranco de la Villa (San Sebastián), 6.IV.2002; 16 = Marrero-Gómez *et al.* 2003: table III, p. 388.

with *Plocametum pendulae* subass. *euphorbietosum berthelotii* ("balera") in the arid and semiarid alluvial ravine beds ("ramblas") (Table 6, and with a finicolous representation of *Tragano moquinii sigmetum* (Table 7) on the sand of Playa del Inglés, in the W.

Nowadays the community has a scarce, fragmented distribution within its potential area and its best nuclei are in the SW, between Punta del Becerro and Punta Calera. A facies of *Plocama pendula* ("balo") is common in the SE, between Punta Gorda and Punta Gaviota. The substitutional shrubby nitrophilous community *Launaeo arborescentis–Schizogynetum sericeae* has a wide distribution over disturbed areas of the sweet-spurge scrub potential territory, as has the halonitrophilous herbaceous community *Mesembryanthemetum crystallinum*.

Euphorbietum berthelotii-canariensis Rivas-Martínez *et al.* 1993

Common name: Gomera cardón scrub.

This is an endemic association to Gomera (Table 6), representative of the cardón scrub of the lower-semiarid xeric Inframediterranean bioclimatic belt. Its potential area rings the island; in the southern half above the climatophilous area of *Neochamaeleo pulverulentae–Euphorbietum balsamiferae*, and in the northern half from near sea level, above *Frankenio-Astydamietum latifoliae* or *Euphorbietum aphyllae* (potential edaphophilous community of windward promontories and cliffs; Table 6), until it reaches the potential area of *Brachypodio-Juniperetum canariensis* (juniper woodland). It can enter the climatophilous area of the latter as edaphoxerophilous potential vegetation on steep rocky places with scarce soil.

Its structure and physiognomy are those of a xeric crassicaule association, terminal community of the lower-semiarid xeric Inframediterranean climatophilous, and lower-semiarid and dry (without t.w.c.) Infra-Thermomediterranean edaphoxerophilous series of cardón (*Euphorbia canariensis*) on Gomera: *Euphorbio berthelotii-canariensis sigmetum*.

The main species apart from *Euphorbia canariensis* are among the others: *Kleinia neriifolia, Euphorbia berthelotii, Rubia fruticosa* ("tasaigo"), *Periploca laevigata* ("cornical"), and *Plocama pendula*. The cardón scrub has substantially lost area and nowadays can only be observed in isolated, cleared, and sheltered steep places, throughout its potential area. The best remnants of the subass. *typicum* are commoner in the E of the island. The subass. *euphorbietosum balsamiferae* (northern sweet-spurge scrub) is frequent in particular xeric conditions favoured by rocky substrates on the N and NE slopes; the abundance of *Euphorbia balsamifera* gives a particular sweet-spurge scrub physiognomy to the association.

There is a facies of *Periploca laevigata* that develops on slope debris very close to the potential area of *Brachypodio-Juniperetum canariensis*. The facies of *Plocama pendula* is to a physiognomic appearance of the community on very fragmented, eroded and porous old lava substrates, particularly developed on the NE, E, SE and NW sides of the island.

Table 7. *Frankenio ericifoliae-Astydamietum latifoliae* (1); *Traganetum moquinii* (2); *Atriplici ifniensis-Tamaricetum canariensis* (3–4).

Relevé	1	2	3	4
Altitude (m a.s.l.)	50	45	5	10
Slope (°)	40	•	•	5
Aspect	N	•	•	N
Area (m²)	25	20	100	100
Cover (%)	40	80	100	100
Number of taxa	12	3	4	3
Character taxa				
Astydamia latifolia	3	•	•	•
Frankenia ericifolia	+	•	•	•
Zygophyllum fontanesii	1	2	•	•
Traganum moquinii	•	3	•	•
Salsola divaricata	•	2	2	•
Tamarix canariensis	•	•	5	5
Companion taxa				
Lycium intricatum	1	•	•	2
Schizogyne sericea	2	•	•	+
Launaea arborescens	1	•	•	•

Other taxa (relevé): (1) *Argyranthemum frutescens* 2, *Neochamaelea pulverulenta* 1, *Micromeria varia* 1, *Periploca laevigata* +, *Plocama pendula* +, *Phagnalon saxatile* +; (3) *Phoenix dactylifera* 1, *Nicotiana glauca* +. **Localities**: 1 = Playa de Alojera, 1.V.1987; 2 = Charco del Cieno (Del-Arco & Wildpret 1990: inv. 12, p. 106); 3 = Charco del Conde (Valle Gran Rey), 7.IV.1994; 4 = Mouth of Barranco de Vallehermoso, 7.IV.1994.

The main substitutional scrub is *Euphorbietum berthelotii* ("tabaibal amargo"), bitter-spurge scrub widely distributed over the potential area of the cardón scrub. Its floristic composition differs little from the latter but there is an impoverishment in species and the absence of *Euphorbia canariensis* is striking. The nitrophilous scrub *Artemisio thusculae–Rumicetum lunariae* ("inciensal-vinagreral") is also common in anthropic areas, as are the nitrophilous herbaceous communities of *Echio-Galactition*.

Brachypodio arbusculae–Juniperetum canariensis M. Fernández 1983, corr. Rivas-Martínez *et al.* 1993

Common name: Juniper woodland.

This is an association endemic to Gomera (Table 8), the Infra-Thermomediterranean juniper woodland. Its climatophilous area rings the island above the climatophilous area of *Euphorbio berthelotii-canariensis* and below that of *Visneo mocanerae–Arbutetum canariensis* (dry evergreen laurel forest) on the slopes under the influence of the t.w.c., and the climatophilous area of *Cisto gomerae–Pinetum canariensis* (pine woodland) on the southern slope. It can also develop upwards as an edaphoxerophilous community.

Its structure and physiognomy are those of a xeric, open woodland, terminal community of upper-semiarid xeric Infra-Thermomediterranean, dry pluviseasonal Inframediterranean (without t.w.c.), and lower-dry pluviseasonal Thermomediterranean (without t.w.c.) climatophilous series of juniper (*Juniperus turbinata* subsp. *canariensis*) on Gomera: *Brachypodio arbusculae-Junipero canariensis sigmetum*.

Apart from *Juniperus turbinata* subsp. *canariensis* ("sabina"), the most characteristic species among others are: *Olea cerasiformis* ("acebuche"), *Pistacia atlantica* ("almácigo"), *Rubia fruticosa*, *Euphorbia berthelotii*, *Kleinia neriifolia*, *Jasminum odoratissimum* ("jazmín silvestre"), *Asparagus umbellatus* ("esparraguera"), *Rhamnus crenulata* ("espinero") and *Brachypodium arbuscula* ("cebadilla").

A facies of *Periploca laevigata* can be distinguished on slope debris in the Hermigua Valley and a *Plocama pendula* facies develops over myocene pyroclasts in several places on the island.

Besides subass. *typicum*, we recognize the subass. *ericetosum arboreae* Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *subass. nov. hoc loco* (Table 8, holotype rel. no. 7) which grows in contact with the dry evergreen laurel forest. Their differential species are *Erica arborea* ("brezo"), *Myrica faya* ("faya") and *Visnea mocanera* ("mocán").

Within its potential area, the most characteristic substitutional scrubs are *Micromerio gomerensis–Cistetum monspeliensis* (rockrose scrub, "jaral") and *Euphorbietum berthelotii*, both widely spread on the island's S slope, and *Artemisio thusculae–Rumicetum lunariae* in anthropic places. *Rhamno crenulatae–Hypericetum canariensis* ("espinal-granadillal") is the substitutional scrub found mostly in disturbed places within the potential area of the humid juniper woodland (subass. *ericetosum arboreae*), which shows a notable presence of the Canary endemism *Spartocytisus filipes* ("escobonero").

Euphorbio berthelotii–Retamatetum rhodorhizoidis (white broom scrub), a characteristic community growing on dry slope debris, reaches its optimum within the territory of juniper woodland, and can also extend as a substitution favoured by grazing and fires. The Canary Palm (*Phoenix canariensis*) community (*Periploco laevigatae–Phoenicetum canariensis* — "palmeral") (Table 8) has its main potential territory on humid colluvial slopes within this climatophilous area. It reaches its maximum current representation on this island and Gran Canaria. The azonal Canary willow community (*Rubo-Salicetum canariensis* — "sauzal"), which grows at a wide range of altitudes along ravine edges and beds with running water a large part of the year and on dripping rock faces, is also well represented here (Rivas-Martínez *et al*. 1993, Rodríguez *et al*. 1986).

In Vallehermoso (Garabato and surroundings), in a small proportion of its climatophilous area, there is an especially low altitude pine woodland community with participation of elements of the juniper woodland (*Cisto gomerae–Pinetum canariensis* subass. *juniperetosum canariensis*) on salic plugs.

The Gomera juniper woodland is today largely an open community, but impoverished as a result of human action. Its biotope was the preferred habitat in which to establish urban nuclei, to grow crops and to graze animals, because of its favourable orographic and climatic conditions. The juniper woodland is nowadays dispersed into several patches on the island, but some important nuclei like those of Hermigua, Agulo, Vallehermoso and Tazo still persist.

Visneo mocanerae–Arbutetum canariensis Rivas-Martínez *et al.* 1993

Common name: Dry evergreen laurel forest.

Table 8. *Brachypodio arbusculae-Juniperetum canariensis* subass. *typicum* (1–3); subass. *ericetosum arboreae subass. nov.* (4–7); *Periploco laevigatae-Phoenicetum canariensis* (8). [*Mayteno-Juniperion, Rhamno-Oleetalia, Rhamno-Oleetea*].

Relevé	1	2	3	4	5	6	7	8
Altitude (m a.s.l.)	350	445	350	500	450	370	450	330
Slope (°)	50	80	45	60	45	50	30	•
Aspect	NE	NW	S	NW	NE	NW	NE	•
Area (m^2)	400	100	200	200	100	200	100	60
Cover (%)	90	80	80	70	80	85	85	90
Number of taxa	13	12	12	19	13	13	13	14
Character taxa								
Juniperus turbinata subsp. *canariensis*	3	3	3	4	3	4	4	•
Brachypodium arbuscula	4	2	1	3	1	3	2	•
Phoenix canariensis	•	•	•	•	•	•	•	5
Globularia salicina	+	•	3	1	+	2	+	•
Micromeria varia	•	2	2	+	•	1	1	1
Spartocytisus filipes	•	+	+	•	3	1	+	•
Rubia fruticosa	•	2	•	+	•	2	2	•
Rhamnus crenulata	•	2	•	2	•	1	1	•
Bystropogon origanifolius var. *origanifolius*	•	•	•	•	+	•	+	•
Olea cerasiformis	•	3	•	•	•	•	•	•
Differential taxa								
Erica arborea	•	•	•	2	2	1	2	•
Myrica faya	•	•	•	•	•	1	1	•
Hypericum canariense	•	•	•	2	+	•	•	•
Teline gomerae	•	•	+	3	•	•	•	•
Companion taxa								
Bituminaria bituminosa	1	2	2	1	+	1	1	2
Hyparrhenia sinaica	•	+	4	1	+	1	•	2
Artemisia thuscula	•	+	•	+	+	+	•	•
Periploca laevigata	1	•	•	•	+	•	•	2
Phagnalon saxatile	•	•	1	•	•	+	•	+
Sonchus ortunoi	1	•	•	1	•	•	•	•
Aeonium castello-paivae	•	•	+	1	•	•	•	•
Sideritis spicata	+	•	•	•	•	•	•	1
Euphorbia lamarckii	•	+	•	+	•	•	•	•
Asistida adscensionis	•	•	+	•	+	•	•	•

Other taxa (relevé): (1) *Lotus emeroides* 1, *Greenovia aurea* 1, *Carlina salicifolia* 1, *Atalanthus sp.* +, *Argyranthemum frutescens* +, *Cheirolophus ghomerytus* 2; (2) *Kleinia neriifolia* +; (3) *Lotus glinoides* 2; (4) *Convolvulus subauriculatus* +, *Pericallis steetzii* +, *Ajuga iva* +, *Aeonium viscatum* +; (5) *Opuntia ficus-indica* +; (7) *Visnea mocanera* +, *Sideritis sp.* +; (8) *Dittrichia viscosa* 1, *Vicia cirrhosa* 1, *Euphorbia berthelotii* 1, *Echium aculeatum* +, *Cistus monspeliensis* +, *Descurainia millefolia* +, *Pallenis spinosa* +.
Localities: 1 = Road Agulo-Las Rosas, 6.IV.2002; 2, 5, 7 (holotype) = Opposite Roque Cano (Vallehermoso), 6.IV.1994; 3, 6 = La Culata tunnel (Vallehermoso), 6.IV.1994; 4 = Barranco de Vallehermoso, 6.IV.2002; 8 = Cañada de Hurona (San Sebastián de La Gomera), 29.IX.1985 (Rivas-Martínez *et al.* 1993: table 6, rel. 13, pp. 200–202).

This is a western Canary association (Table 9), the more thermophilous and resistant to the xeric conditions of the other types of evergreen laurel forest. It grows at the lower levels of areas affected by NE t.w.c., NW sheltered slopes of the cloud area where it reaches its highest altitudes, and the upper part of some southern thermomediterranean slopes influenced by overflowing clouds. It is a dense forest of medium size trees present in all the western Canary Islands.

Its climatophilous area extends over the slopes under the influence of NE trade-winds above the potential area of thermosclerophilous forest (*Brachypodio arbusculae-Juniperetum canariensis*) and extends to reach the area of dominance of the subhumid ombrotype, around 800 m a.s.l., where the area of the humid evergreen laurel forest (*Lauro novocanariensis–Perseetum indicae*) starts. In a small proportion of its climatophilous area above Vallehermoso, a particular community with Canary pine and elements of the dry evergreen laurel forest is found over salic outcrops (*Cisto gomerae-Pinetum canariensis* subass. *juniperetosum canariensis*).

Its structure and physiognomy are those of dense xerophilous forest, terminal community of upper-semiarid xeric Thermomediterranean (with t.w.c.), dry pluviseasonal Infra-Thermo-Mesomediterranean (with t.w.c.) and subhumid pluviseasonal Thermomediterranean (with overflowing t.w.c.) of the Canary strawberry tree (*Arbutus canariensis*) on Gomera: *Visneo mocanerae–Arbuto canariensis sigmetum*.

The trees *Visnea mocanera, Arbutus canariensis* ("madroño"), *Apollonias barbujana* ("barbusano"), *Picconia excelsa* ("palo blanco"), *Ilex canariensis* ("acebiño"), *Heberdenia excelsa* ("aderno"), *Myrica faya*, and *Erica arborea* are common in the association. The shrubs *Hypericum canariense* ("granadillo"), *Jasminum odoratissimum* ("jazmín"), *Daphne gnidium* ("trovisca"), and *Spartocytisus filipes*, among others, are frequent at forest edges and in sustitutional scrubs.

Nowadays the association is found fragmented over steep areas like ravine cornices and high ledges in the middle part of the N, mainly in the Hermigua and Vallehermoso basins. Common in the lower two thirds of the potential area of the association is the substitutional scrub *Rhamno-Hypericetum canariensis*, and in the upper third, *Myrico fayae–Ericetum arboreae* ("fayal-brezal"). The nitrophilous scrub *Artemisio thusculae-Rumicetum lunariae* is also widespread.

Lauro novocanariensis–Perseetum indicae Oberdorfer *ex* Rivas-Martínez *et al.* 1977, corr. Rivas-Martínez *et al.* 2002

Common name: Humid evergreen laurel forest.

A western Canary association (Table 9) of Thermo- and Mesomediterranean belts affected by t.w.c. It is a tall, dense, floristically diverse forest at its optimum. Its climatophilous area is on the northern slopes under the influence of NE t.w.c., from 800 m a.s.l., above the potential area of *Visneo-Arbutetum canariensis* to about 1250 m a.s.l., where it reaches the climatophilous area of cold evergreen laurel forest (*Violo rivinianae-Myricetum fayae*).

Its structure and physiognomy correspond to mesophytic forest, terminal community of the subhumid pluviseasonal Thermo- and Mesomediterranean with t.w.c., climatophilous series of "viñátigo" (*Persea indica*): *Lauro novocanariensis-Perseo indicae sigmetum*.

The most common laurifolious trees making up the forest matrix are *Laurus novocanariensis* ("laurel"), *Ilex canariensis*, and *Myrica faya*. *Persea indica* ("viñátigo"), although present, is more common in edaphohygrophilous positions; *Picconia excelsa,* is mostly present at low altitude. *Prunus lusitanica* subsp. *hixa* ("hija"), very rare, was recently discovered there as native to the island. Besides these, the needleleaved *Erica arborea* is common. Among the small trees are *Viburnum rigidum* ("follao") and *Sambucus palmensis* ("sauco") — the latter very rare. Accompanying them are a number of shrubs, lianas, herbs, and ferns.

Two plant communities are common on the ridge crests within the potential area of this association: *Ilici canariensis–Ericetum platycodonis* at altitudes below 1100 m and is year-round under the influence of clouds; and *Micromerio lepidae–Ericetum arboreae* above 1100 m a.s.l., which is drier due to the lower frequency of t.w.c.

Table 9. *Visneo mocanerae–Arbutetum canariensis* (1 and 2); *Lauro novocanariensis–Perseetum indicae* (3–5); *Diplazio caudati–Ocoteetum foetentis* (6 and 7); *Rubo-Salicetum canariensis* (8 and 9). [*Pruno-Lauretea*].

Relevé	1	2	3	4	5	6	7	8	9
Altitude (m a.s.l.)	585	•	•	•	•	•	955	•	700
Slope (°)	75	•	•	•	•	•	10	•	20
Aspect	N	•	•	•	•	•	S	•	NW
Area (m^2)	400	•	•	•	•	•	400	•	150
Cover (%)	80	•	•	•	•	•	90	•	90
Number of taxa/relevés	13	2	4	8	5	4	15	12	11
Character taxa									
Apollonias barbujana	2	2	•	•	•	•	•	•	•
Visnea mocanera	1	2	•	•	•	•	•	•	•
Arbutus canariensis	•	1	•	•	•	•	•	•	•
Laurus novocanariensis	•	2	4	V	V	3	3	•	+
Persea indica	•	1	4	I	I	3	•	•	+
Diplazium caudatum	•	•	3	•	•	3	3	•	2
Ocotea foetens	•	•	•	•	•	4	1	•	•
Sambucus palmensis	•	•	•	•	•	•	2	•	•
Salix canariensis	•	•	•	•	•	•	•	V	5
Rubus ulmifolius	•	•	1	•	•	•	•	III	3
Myrica faya	2	2	2	V	III	4	2	III	1
Ilex canariensis	3	1	1	V	IV	2	2	•	•
Viburnum rigidum	2	1	4	IV	V	1	1	•	•
Brachypodium sylvaticum	•	2	1	V	IV	2	1	II	•
Erica arborea	2	2	1	IV	III	2	•	II	•
Asplenium onopteris	•	2	4	V	IV	4	2	•	•
Dryopteris oligodonta	•	•	4	IV	IV	4	3	•	1
Pteridium aquilinum	•	•	3	IV	V	1	2	I	•
Galium scabrum	•	2	3	IV	III	2	2	•	•
Picconia excelsa	1	2	1	II	IV	1	•	•	•
Hypericum grandifolium	•	1	3	V	V	2	•	•	•
Viola riviniana	•	•	3	II	V	3	•	•	•
Pteris incompleta	•	1	4	•	•	4	•	•	1
Tamus edulis	1	1	•	II	•	1	•	•	•
Cedronella canariensis	•	•	•	IV	IV	2	•	•	•
Urtica morifolia	•	•	3	III	•	1	•	•	•
Gesnouinia arborea	•	1	•	•	•	2	•	•	2
Phyllis nobla	•	•	•	•	I	•	•	III	+
Asplenium hemionitis	•	•	•	II	I	1	•	•	•
Rhamnus glandulosa	•	1	•	•	•	2	•	•	•
Dryopteris guanchica	•	•	2	I	•	•	•	•	•
Athyrium filix-femina	•	•	1	•	•	1	•	•	•
Polystichum setiferum	•	•	•	I	•	1	•	•	•
Companion taxa									
Ageratina adenophora	•	2	•	I	•	•	•	V	1
Geranium reuteri	•	•	1	II	•	1	1	•	•
Cryptotaenia elegans	•	•	•	II	•	2	2	•	•
Myosotis latifolia	•	•	1	I	IV	•	•	•	•
Aichryson laxum	•	•	•	I	III	•	•	•	•
Pericallis appendiculata	•	•	•	I	•	2	•	•	•
Carex divulsa	•	•	•	•	•	1	•	II	•

Other taxa (relevé): (1) *Rhamnus crenulata* 2, *Pericallis steetzii* 1, *Spartocytisus filipes* 1, *Hypericum canariense* 1, *Globularia salicina* 1; (2) *Bystropogon canariensis* 1, *Smilax aspera* 1, *Bystropogon origanifolius* 1, *Aeonium subplanum* 1, *Micromeria varia* 1, *Andryala pinnatifida* 1; (3) *Vandenboschia speciosa* 1, *Tradescantia fluminensis* 1; (4) *Ixanthus viscosus* II, *Heberdenia excelsa* I, *Parietaria debilis* I; (5) *Davallia canariensis* I, *Polypodium macaronesicum* I, *Pericallis* cf. *tussilaginis* I, *Ranunculus cortusifolius* I, *Gennaria diphylla* I; (6) *Woodwardia radicans* 2, *Hedera canariensis* 1, *Cystopteris grex diaphana* 1, *Iris* cf. *foetidissima* 1; (7) *Carex canariensis* 1; (8) *Juncus effusus* III, *Adiantum capillus-veneris* III, *Polygonum salicifolium* II, *Apium nodiflorum* II, *Pericallis cruenta* I, *Mentha longifolia* I, *Epilobium parviflorum* I, *Scirpus holoschoenus* I, *Mentha spicata* +, *Nasturtium officinale* +, *Samolus valerandi* +, *Commelina diffusa* +, *Equisetum ramosissimum* +.

Localities and sources: 1 = El Rejo basin (Hermigua), 6.IV.2002; 2 = Pérez-de-Paz *et al.* 1990: table III, p. 147; 3 = Pérez-de-Paz *et al.* 1990: table I, rel. 1–4, pp. 140–141; 4 = Pérez-de-Paz *et al.* 1990: table II, p. 144; 5 = Oberdorfer 1965: table IV, rel. 17, 19, 14, 15, 16, pp. 68–70; 6 = Pérez-de-Paz *et al.* 1990: table I, inv. 5–8, pp. 140–141; 7. Cañada de Jorge, 12.IX.2006; 8 = Rodríguez *et al.* 1986: table I, inv. 6, 7, 13, 15–19, 21, 24–26, pp. 386–387; 9 = El Rejo (Hermigua), 18.XII.2004.

at those altitudes in summer. Also, in ravine beds and on very humid slopes year-round, there are remnants of the typical edaphohygrophilous broad-leaved evergreen community *Diplazio caudati-Ocoteetum foetentis* within the potential territory of *Lauro-Perseetum indicae*.

Although in the past this community was damaged by felling trees for human use, Gomera hosts the Canaries' best remnants of Tertiary Mediterranean evergreen laurel forest (Fernández López 1992, Fernández López & Moreno 2004, Santos 1990). Nowadays *Lauro novocanariensis–Perseetum indicae* shows an excellent state of conservation since the vast majority of its potential territory belongs to the Garajonay National Park, created in 1981 and a UNESCO World Heritage site since 1986 (Del Arco *et al*. 2009, Pérez-de-Paz *et al*. 1990, Romero Manrique 1987). In marginal locations within the park, the most common substitutional scrub is *Myrico fayae–Ericetum arboreae*, mainly as a consequence of past felling and later exploitation of the new growth for charcoal production, and as a source of vineyard stakes and poles for horticultural use. The *Adenocarpus foliolosus* scrub is also important, especially in the southern cloud overflow area of the summit, common in a repeatedly burnt territory in mixed patches together with *Micromerio gomerensis–Cistetum monspeliensis*. The *Teline stenopetala* subsp. *microphylla* ("jirdana") community (*Telino-Adenocarpion*), found as a mantle of broom shrubland at the fringes of the forest, is also noteworthy. Bramble patches of *Rubus ulmifolius* ("zarzal") (*Rubo-Rubion*), bracken areas of *Pteridium aquilinum*, hemicryptophytic meadows of *Piptathero miliacei-Foeniculetum vulgaris* ("hinojal") and nitrophilous meadows of *Echium-Galactition* are often signs of human disturbance.

Violo rivinianae–Myricetum fayae Fernández Galván *ex* Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Holotype: Table 10, rel. no. 6]

Common name: Cold evergreen laurel forest.

The association (Table 10) caps the island. It is a dense, mid-height forest (10–5 m) whose climatophilous area starts at 1250–1300 m a.s.l., which is above humid evergreen laurel forest (*Lauro-Perseetum indicae*) on the N slopes, and above pine woodland (*Cisto gomerae–Pinetum canariensis*) on the dry S slope.

Its structure and physiognomy correspond to mesophytic forest, terminal community of the subhumid pluviseasonal Mesomediterranean (with t.w.c., except in summer), climatophilous series of "faya" (*Myrica faya*): *Violo rivinianae–Myrico fayae sigmetum*.

At its optimum the community is dominated by *Myrica faya,* accompanied by the most cold-tolerant species of the evergreen laurel forest: *Ilex canariensis* and *Erica arborea*, along with some *Laurus novocanariensis* mainly at low altitude.

The altitudinal transition from *Lauro-Perseetum indicae* is driven by the predominant absence of clouds in summer at the altitudes where the community grows, which involves an increase in solar radiation, temperature, and evaporation, causing an increase in continentality index (Ic) values to > 12.

The community, although transformed over the years, is in a relatively acceptable state of conservation in the northern half of its climatophilous area, where it shares the territory with the Canary tree-heath crest community (*Micromerio lepidae–Ericetum arboreae*, Table 10). But its southern area has been much more transformed by human use, and the substitutional scrubs *Myrico-Ericetum arboreae* and *Micromerio gomerensis–Cistetum monspeliensis* fill the territory, together with some *Pinus canariensis* and *Pinus radiata* plantation patches, which are today being eradicated.

Cisto gomerae–Pinetum canariensis Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Holotype: Table 11, rel. no. 2]

Common name: Gomera pine woodland.

This is an association endemic to the island

Table 10. *Violo rivinianae–Myricetum fayae ass. nov.* (1–6); *Micromerio lepidae–Ericetum arboreae* (7); *Ilici canariensis–Ericetum platycodonis* (8–10). [*Ixantho-Laurion, Pruno-Lauretalia, Pruno-Lauretea*].

Relevé	1	2	3	4	5	6	7	8	9	10
Altitude (m a.s.l.)	1260	1260	1255	1255	1307	1320	•	•	•	1000
Slope (°)	5	10	15	55	20	20	•	•	•	60
Aspect	W	NE	NW	W	WSW	NNW	•	•	•	N
Area (m^2)	200	200	500	300	600	600	•	•	•	400
Cover (%)	85	85	80	80	80	80	•	•	•	90
Number of taxa/relevés	13	12	12	16	13	14	8	4	2	15
Character taxa										
Myrica faya	4	2	2	3	3	3	IV	4	1	1
Urtica morifolia	3	1	+	1	1	2	I	•	•	•
Rubia peregrina subsp. *agostinhoi*	2	2	•	2	1	2	I	•	•	•
Viola riviniana	1	1	2	2	2	2	V	2	1	2
Erica arborea	•	4	4	3	3	3	V	3	•	•
Micromeria lepida subsp. *lepida*	•	•	•	•	•	•	IV	•	•	•
Polystichum setiferum	•	•	•	•	•	•	II	1	•	1
Woodwardia radicans	•	•	•	•	•	•	I	1	1	•
Luzula canariensis	•	•	•	•	•	•	I	•	1	2
Erica platycodon	•	•	•	•	•	•	•	4	2	5
Ilex perado subsp. platyphylla	•	•	•	•	•	•	•	1	2	•
Ixanthus viscosus	•	•	•	•	•	•	•	3	2	•
Heberdenia excelsa	•	•	•	•	•	•	•	•	2	•
Laurus novocanariensis	1	1	3	3	2	2	V	2	1	+
Galium scabrum	2	2	2	2	2	2	V	1	•	1
Asplenium onopteris	1	•	1	+	2	1	V	4	2	2
Dryopteris oligodonta	+	•	+	1	2	3	V	4	2	•
Hypericum grandifolium	•	•	+	+	•	+	IV	4	1	1
Ilex canariensis	•	+	•	•	1	•	V	4	1	1
Brachypodium sylvaticum	+	•	•	1	+	+	IV	•	1	•
Cedronella canariensis	2	•	•	•	•	2	IV	2	•	•
Pteridium aquilinum	1	2	•	•	•	•	IV	•	•	•
Phyllis nobla	•	•	•	•	•	•	I	3	1	2
Rubus ulmifolius	1	•	•	2	•	•	I	1	•	•
Viburnum rigidum	•	•	•	•	1	•	III	•	1	•
Davallia canariensis	•	•	•	•	•	•	I	3	•	1
Ocotea foetens	•	•	•	•	•	•	•	1	2	•
Bystropogon canariensis	•	•	•	•	•	•	II	1	•	•
Polypodium macaronesicum	•	•	•	•	•	•	I	1	•	•
Dryopteris guanchica	•	1	+	•	•	•	•	•	•	•
Companion taxa										
Ageratina adenophora	•	+	•	1	•	1	II	•	•	+
Myosotis latifolia	+	1	•	•	•	•	V	•	•	•
Aichryson laxum	•	•	•	•	•	•	II	1	•	1
Cryptotaenia elegans	•	•	•	•	•	•	I	1	1	•
Adenocarpus foliolosus	•	•	•	•	•	•	II	1	•	•
Pericallis steetzii	•	•	•	•	+	•	II	•	•	•
Sonchus ortunoi	•	•	•	1	•	•	I	•	•	•

Other taxa (relevé): (3) *Geranium reuteri* +; (4) *Solanum nigrum* +; (7) *Andryala pinnatifida* II, *Aichryson pachycaulon* subsp. *gonzalezhernandezii* II, *Pericallis appendiculata* I, *Geranium purpureum* I, *Luzula forsteri* I, *Hymenophyllum tunbrigense* I; (8) *Visnea mocanera* 3, *Smilax aspera* 2, *Athyrium filix-femina* 1, *Semele androgyna* 1; (9) *Hedera canariensis* 2, *Rhamnus glandulosa* 1, *Blechnum spicant* 1; (10) *Globularia salicina* 1.

Localities and sources: 1 = Cañada de Budién, 12.IX.2006; 2 = Lomos de Arguamul, 12.IX.2006; 3 = South of Laguna Grande, 19.II.2007; 4 = Las Tajoras forest track 19.II.2007; 5, 6 = Heights of Laguna Alta, 19.II.2007 (holotype); 7 = Del-Arco *et al.* (2009): table 5, rel. 1–8; 8 = Mester 1987: table II, rel. 40, 41, 89, 90; 9 = Pérez-de-Paz *et al.* (1990): table I, rel. 9–10, pp. 140–141; 10 = El Bailadero 19.VII.1988 (Pérez-de-Paz *et al.* 1990: table V, rel. 9, p. 155).

Tabla 11. *Cisto gomerae-Pinetum canariensis ass. nov.*; subass. *typicum* (1–3); subass. *juniperetosum canariensis subass. nov.* (4–7). [*Cisto-Pinion, Chamaecytiso-Pinetalia, Chamaecytiso-Pinetea*].

Relevé	1	2	3	4	5	6	7
Altitude (m a.s.l.)	1125	1160	1175	490	450	475	475
Slope (°)	30	60	70	70	60	60	80
Aspect	N	ESE	ESE	SW	SW	S	SW
Area (m^2)	500	200	200	200	1000	400	400
Cover (%)	70	70	60	70	70	60	60
Number of taxa	25	21	19	19	14	19	16
Character taxa							
Pinus canariensis	3	3	4	3	3	2	2
Bystropogon origanifolius var. *origanifolius*	+	1	2	+	+	•	•
Chamaecytisus proliferus subsp. *angustifolius*	2	3	2	2	•	•	•
Cistus chinamadensis subsp. *gomerae*	•	+	2	•	•	•	•
Differential taxa of subass. *juniperetosum canariensis*							
Erica arborea	•	•	1	2	3	1	1
Juniperus turbinata subsp. *canariensis*	•	•	•	2	1	1	1
Brachypodium arbuscula	•	•	•	+	2	1	2
Ilex canariensis	•	•	•	2	1	+	+
Spartocytisus filipes	•	•	•	•	2	1	2
Hypericum canariense	•	•	•	1	1	2	•
Myrica faya	•	•	•	2	•	+	•
Visnea mocanera	•	•	•	2	•	•	•
Companion taxa							
Cistus monspeliensis	3	2	2	•	2	3	+
Opuntia maxima	2	2	1	2	•	1	1
Kleinia neriifolia	1	+	+	+	•	1	+
Dicheranthus plocamoides	2	•	•	2	•	1	1
Aeonium castello-paivae	•	•	•	2	1	1	1
Davallia canariensis	•	•	•	2	•	1	2
Asphodelus ramosus subsp. *distalis*	1	2	2	•	•	•	.
Euphorbia berthelotii	1	2	1	•	•	•	•
Argyranthemum callichrysum	2	+	1	•	•	•	•
Paronychia canariensis	2	1	•	•	•	•	+
Atalanthus pinnatus	•	•	•	•	1	1	1
Aeonium rubrolineatum	1	+	1	•	•	•	•
Hypericum reflexum	1	+	1	•	•	•	•
Tolpis proustii	1	+	+	•	•	•	•
Carlina salicifolia	+	+	+	•	•	•	•
Micromeria varia subsp. *varia*	+	•	+	•	•	+	•
Bituminaria bituminosa	•	2	1	•	•	•	•
Sonchus hierrensis	•	•	•	•	•	1	2
Agave americana	2	•	•	•	•	+	•
Romulea columnae	•	1	1	•	•	•	•
Todaroa aurea subsp. *suaveolens*	+	1	•	•	•	•	•
Echium aculeatum	+	+	•	•	•	•	•
Phoenix canariensis	•	•	•	•	+	+	•

Other taxa (relevé): (1) *Cheilanthes pulchella* 2, *Greenovia aurea* 1, *Micromeria lepida* +, *Lavandula canariensis* +, *Lobularia canariensis* subsp. *intermedia* +, *Vicia* cf. *disperma* +; (2) *Silene bourgeaui* +, *Sonchus ortunoi* 1; (3) *Sideritis lotsyi* +; (4) *Spartocytisus filipes* 2, *Teline stenopetala* subsp. *microphylla* 1, *Hyparrhenia sinaica* 1, *Globularia salicina* +; (5) *Adenocarpus foliolosus* +, *Andryala pinnatifida* +; (7) *Artemisia thuscula* 1.

Localities: 1 = Roque de los Pinos de Imada (Alajeró) (Del-Arco *et al.* 1990: rel. 4, p. 38), 2 (holotype) and 3 = *ibid.* 4.XII.2007; 4 = Risco Blanco, Vallehermoso (4.XII.2007), 5 (holotype), 6 and 7 = El Andén, Barranco del Garabato (Vallehermoso), 11.XII.1987 (Del-Arco *et al.* 1990: table I, p. 35).

(Table 11) whose climatophilous area extends along a narrow southern strip lying between 1000–1200 (1250) m a.s.l., which is between the potential area of juniper woodland (*Brachypodio–Juniperetum canariensis*) and the summit evergreen laurel forest (*Ixantho-Laurion novocanariensis*).

Its structure and physiognomy correspond to open woodland, the terminal community of dry and subhumid pluviseasonal Mesomediterranean (without t.w.c.) climatophilous series of *Pinus canariensis* on Gomera: *Cisto gomerae–Pino canariensis sigmetum*.

The most representative taxa apart from *Pinus canariensis* are: *Bystropogon origanifolius* var. *origanifolius* ("poleo"), *Chamaecytisus proliferus* subsp. *angustifolius* ("escobón"), and *Cistus chinamadensis* subsp. *gomerae* ("jara blanca") (Demoly *et al*. 2006).

The only representative stand of the subassociation *typicum* is to be found in Imada (Del-Arco *et al*. 1990); although located on a salic substratum it is within a typical bioclimatic belt of climatophilous pine woodland (dry pluviseasonal lower Mesomediterranean). There are some xeric elements present, such as *Kleinia neriifolia*, *Euphorbia berthelotii*, *Echium aculeatum* ("tajinaste"), and *Cistus monspeliensis* ("jara"). These xero-thermophilous plants are differentials of thermophilous pine woodland, which is similar to those of the other Canary Islands low altitude southern pine woodland. Some humid elements like *Erica arborea* are to be found, due to the influence of nearby southward overflowing t.w.c. Probably in the narrow potential pine-woodland strip, dry and humid pine woodlands would have formed a mosaic depending on the exposure.

The Gomera pine woodland has become almost extinct and only a few remnants persist. The retreat of pine woodland was so strong, and probably occurred so early after the conquest of the island by the Spaniards that many authors have assumed the pre-contact absence of wild pine woodland. However, molecular analysis (Navascués *et al*. 2006, Vaxevanidou *et al*. 2006) and archaeological evidence (Navarro 1992, Rosario *et al*. 2002) support the existence of autochthonous *Pinus canariensis* on Gomera. Bioclimatic belts suitable for its development, the abundant presence of its substitutional and mantle community *Adenocarpo foliolosi–Chamaecytisetum angustifolii*, and old isolated individuals linked to salic outcrops and fragmentary little stands all support our thesis of accepting the potentiality of pine woodland on the island.

Cisto gomerae-Pinetum canariensis subass. ***juniperetosum canariensis*** Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *subass. nov. hoc loco*

[Holotype: Table 11, rel. no. 5].

Common name: Gomera salic pine woodland.

This is an edaphophilous subassociation endemic to Gomera (Table 11) which potentially develops on salic outcrops of the Thermo- and Mesomediterranean belts within the general climatophilous area of juniper woodland (*Brachypodio-Juniperetum canariensis*) and evergreen laurel forest (*Pruno-Lauretalia novocanariensis*).

Its structure and physiognomy correspond to a mixed pine woodland, the terminal community of upper-semiarid xeric Thermomediterranean (without t.w.c.), lower-dry pluviseasonal Thermomediterranean (without t.w.c.), and upper-semiarid to subhumid Thermo- and Mesomediterranean (with t.w.c.) salic edaphophilous subseries: *Cisto gomerae–Pino canariensis* faciation of *Juniperus turbinata* subsp. *canariensis*.

Its differential taxa are: *Brachypodium arbuscula*, *Erica arborea, Hypericum canariense*, *Ilex canariensis*, *Juniperus turbinata* subsp. *canariensis*, *Myrica faya*, *Spartocytisus filipes*, and *Visnea mocanera*.

Although there are many salic outcrops in the potential area (Rodríguez-Losada & Martinez-Frías 2004), only some support isolated pines or pine stands. For instance, on the the central salic rocks of the island (Agando, Ojila and La Zarzita), characteristic plants of pine woodland are present like *Cistus chinamadensis* subsp. *gomerae* and *Chamaecytisus proli-*

ferus subsp. *angustifolius*, but *Pinus canariensis* itself is only found at Agando. The community, although favoured by reforestation, nowadays has its best and only representation on crags at the northern locality of Garabato (Vallehermoso) (Del-Arco *et al*. 1990) at 300–500 (750) m a.s.l., within the general climatophilous area of humid juniper woodland (*Brachypodio-Juniperetum canariensis* subass. *ericetosum arboreae*) and dry evergreen laurel forest (*Visneo-Arbutetum canariensis*). In our map of potential natural vegetation (Fig. 11), we only show the community at Garabato, despite its possibly extending to other salic outcrops.

Other communities

We describe below some new communities mentioned in the text. The first two are the terminal communities of two edaphophilous series shown in the potential vegetation map, the others are serial or mantle communities.

Euphorbietum aphyllae (Rivas-Martínez *et al.* 1993) Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *stat. nov.*

[Art. 27d; Weber *et al*. 2000].

(Syn.: *Ceropegio-Euphorbietum aphyllae* subass. *plocametosum pendulae* Rivas-Martínez, Wildpret, Del-Arco, O. Rodríguez, Pérez-de-Paz, García-Gallo, Acebes, T.E. Díaz & Fernández González 1993).

Common name: Leafless spurge scrub.

This is a chamaephytic and low nanophanerophytic association endemic to Gomera (Table 6), characterized by *Euphorbia aphylla* (“tolda”). It grows on cliffs and rocky outcrops on the island’s N slope, under the steady influence of the prevailing NE trade-wind. It is an edaphophilous community in the climatophilous territory of *Euphorbio berthelotii–canariensis sigmetum*.

It corresponds to the terminal community of the semiarid xeric Inframediterranean edaphoxero-aerophilous series of leafless spurge (*Euphorbia aphylla*) on Gomera: *Euphorbio aphyllae sigmetum*. Apart from *Euphorbia aphylla*, *Euphorbia balsamifera*, *Plocama pendula*, *Rubia fruticosa*, *Kleinia neriifolia*, *Neochamaelea pulverulenta* and *Aeonium viscatum* (“melosilla”), stand out, all generalist plants of the lowest levels of the island. Also present are some plants from the rocky coast halophilous belt (*Frankenio-Astydamion latifoliae*).

In the NE, between Puntallana and Agulo, there is a facies of *Euphorbia balsamifera* with the physiognomy of sweet-spurge scrub.

Euphorbio berthelotii–Retamatetum rhodorhizoidis Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Holotype: Table 12, rel. no. 6].

Common name: Gomera white broom shrubland.

This is a nanophanerophytic association endemic to Gomera (Table 12) that develops on Infra- and Thermomediterranean dry slope debris. It grows as an edaphophilous community in the climatophilous territory of *Euphorbio berthelotii-canariensis* and *Brachypodio arbusculae-Juniperetum canariensis*.

It corresponds to the terminal community of the semiarid xeric Infra-Thermomediterranean and dry pluviseasonal Infra-Thermomediterranean (without t.w.c.) edaphoxerophilous colluvial series of white broom (*Retama rhodorhizoides*) on Gomera: *Euphorbio berthelotii-Retamo rhodorhizoidis sigmetum*.

The association is physiognomically characterized by *Retama rhodorhizoides* (“retama blanca”), accompanied by widespread species from the more hotter belts of the island, like *Echium aculeatum*, *Euphorbia berthelotii*, *Kleinia neriifolia*, *Micromeria varia* subsp. *varia* (“tomillo”), *Neochamaelea pulverulenta* and *Rubia fruticosa*, among others.

The community is spread particularly over the NW sector of the island (Arguamul-Alojera-Taguluche), and is more localised in the W (Valle Gran Rey), N (Hermigua Valley) and S (Santiago Valley). Its expansion in the NW is largely anthropic, mainly due to fires and grazing.

Micromerio gomerensis–Cistetum monspeliensis Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Holotype: Table 13, rel. no. 2].

Common name: Gomera rockrose scrub.

This is a scarcely or non-nitrophilous chamaephytic-nanophanerophytic association endemic to Gomera (Table 13), that grows on eroded stony or decapitated soils, mainly within the climatophilous area of juniper woodland (*Brachypodio-Juniperetum canariensis*) and pine woodland (*Cisto gomerae-Pinetum canariensis*), although it can also be found in the upper level of cardón

Table 12. *Euphorbio berthelotii-Retamatetum rhodorrhizoidis ass. nov.* [*Mayteno-Juniperion, Rhamno Oleetalia, Rhamno-Oleetea*].

Relevé	1	2	3	4	5	6	7
Altitude (m a.s.l.)	500	425	225	150	425	550	500
Slope (°)	30	15	40	20	35	20	20
Aspect	SW	NW	N	NW	W	NW	SE
Area (m²)	100	100	100	100	100	100	100
Cover (%)	70	90	70	65	75	90	90
Number of taxa/relevés	16	13	18	23	14	13	22
Character taxa							
Retama rhodorhizoides	3	3	3	3	4	5	3
Kleinia neriifolia	2	+	1	+	2	2	1
Euphorbia berthelotii	•	2	2	2	2	2	2
Neochamaelea pulverulenta	2	•	2	2	1	•	•
Micromeria varia subsp. *varia*	1	1	1	1	•	•	•
Rubia fruticosa	•	+	•	+	•	1	1
Echium aculeatum	2	•	+	+	•	•	•
Periploca laevigata	•	•	+	+	•	•	2
Juniperus turbinata subsp. *canariensis*	1	•	1	1	•	•	•
Euphorbia balsamifera	•	3	•	(+)	(+)	•	•
Companion taxa							
Bituminaria bituminosa	•	1	1	1	1	2	2
Artemisia thuscula	+	+	•	1	1	1	+
Hyparrhenia sinaica	1	1	2	1	1	•	•
Phagnalon saxatile	•	+	•	+	+	+	1
Launaea arborescens	+	+	+	+	+	•	•
Plocama pendula	•	•	1	+	+	•	•
Schizogyne sericea	1	•	+	+	•	•	•
Argyranthemum frutescens	+	•	•	+	+	•	•
Rumex lunaria	+	•	+	•	•	•	+
Lobularia canariensis	•	•	+	•	•	+	+
Aeonium holochrysum	•	•	•	•	+	+	+
Opuntia ficus-indica	•	•	•	•	•	+	2
Aeonium castello-paivae	•	•	1	•	•	•	1
Lavandula canariensis	+	•	1	•	•	•	•
Phagnalon rupestre	1	+	•	•	•	•	•
Ajuga iva	+	•	•	+	•	•	•
Aristida adscensionis	•	+	•	•	+	•	•
Ferula linkii	•	•	•	•	•	+	+
Todaroa aurea	•	•	•	•	•	+	+

Other taxa (relevé): (1) *Brachypodium arbuscula* +; (3) *Monanthes* sp. +; (4) *Kickxia scoparia* +, *Lycium intricatum* +, *Cenchrus ciliaris* +, *Salvia verbenaca* +; (6) *Scilla latifolia* +; (7) *Argyranthemum callichrysum* 1, *Asparagus plocamoides* +, *Atalanthus canariensis* 1, *Bupleurum salicifolium* 2, *Descurainia millefolia* +, *Piptatherum coerulescens* +, *Spartocytisus filipes* +.

Localities (24.I.2003): 1 = Between Tazo and Arguamul (serial); 2 = Above Ermita de Santa Lucía, Tazo (serial); 3 = Tazo. 4 = Between Tazo and Alojera; 5 = Surroundings of Lomo del Balo, above Alojera; 6 = Between Risco de Alojera and Cabeza del Buey (holotype); 7 = El Palmarejo (Valle Gran Rey).

scrub (*Euphorbio berthelotii-canariensis*) and even within the potential territory of evergreen laurel forest (*Pruno-Lauretalia*). It is more abundant in the S sector of the island.

It is mainly characterized by *Micromeria varia* subsp. *gomerensis* ("tomillo"), *Cistus monspeliensis* and some widespread species of *Kleinio-Euphorbietea canariensis* such as *Euphorbia berthelotii*, and *Echium aculeatum*.

The subass. *adenocarpetosum foliolosi* Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *subass. nov. hoc loco* (Table 13, holotype rel. no. 10) grows in the coldest area of the association, which corresponds to potential territories of evergreen laurel forest and pine woodland. Its differential species are *Adenocarpus foliolosus* ("codeso de monte") and *Chamaecytisus proliferus* subsp. *angustifolius*.

Table 13. *Micromerio gomerensis–Cistetum monspeliensis ass. nov.*; subass. *typicum* (1–5); subass. *adenocarpetosum foliolosi subass. nov.* (6–12). [*Micromerio-Cistion, Micromerio-Cistetalia, Rhamno-Oleetea*].

Relevé	1	2	3	4	5	6	7	8	9	10	11	12
Altitude (× 10 m a.s.l.)	112	110	65	92	87	95	106	115	•	125	91	110
Slope (°)	20	20	20	•	45	5	10	20	•	10	15	45
Aspect	S	NE	SE	•	NE	NE	NE	NW	•	W	W	SW
Area (m²)	100	100	400	400	100	100	100	400	•	100	100	100
Cover (%)	90	70	90	70	70	90	90	90	•	75	95	40
Number of taxa/relevés	6	8	8	7	8	4	7	10	2	6	9	10
Characteristic taxa												
Cistus monspeliensis	5	4	5	4	4	5	4	4	2	3	5	3
Euphorbia berthelotii	2	2	•	+	2	•	•	•	1	3	+	•
Micromeria varia subsp. *gomerensis*	•	1	+	+	•	•	2	1	•	•	2	•
Micromeria varia subsp. *varia*	•	•	•	•	•	•	•	•	•	1	1	2
Echium aculeatum	•	1	+	+	•	•	•	•	•	•	•	•
Differential taxa												
Chamaecytisus proliferus ssp. *angustifolius*	•	•	•	•	•	•	1	+	1	1	+	2
Adenocarpus foliolosus	•	•	•	•	•	1	+	4	2	3	•	•
Companion taxa												
Dittrichia viscosa	•	•	1	1	2	•	•	1	•	•	1	•
Phagnalon saxatile	+	2	•	+	2	•	•	•	1	•	•	•
Erica arborea	•	•	+	•	•	2	2	•	1	•	•	•
Pericallis steetzii	•	•	•	•	•	•	1	3	•	•	•	1
Asphodelus ramosus subsp. *distalis*	•	1	•	•	2	•	•	•	1	•	•	•
Bituminaria bituminosa	1	•	•	•	•	•	•	+	•	•	•	2
Lobularia canariensis subsp. *intermedia*	•	1	•	•	1	•	•	•	•	•	•	1
Opuntia ficus-indica	•	•	1	•	•	•	•	•	•	•	1	+
Andryala pinnatifida	•	•	•	1	+	•	•	•	•	1	•	•
Argyranthemum callichrysum	+	•	•	•	•	•	1	•	•	•	•	+
Tolpis sp.	•	•	•	•	•	•	•	•	*1*	•	•	2

Other taxa (relevé): (1) *Paronychia canariensis* +; (2) *Kleinia neriifolia* +; (3) *Hyparrhenia sinaica* 1, *Rubia fruticosa* +; (5) *Vicia disperma* 1; (6) *Myrica faya* +; (8) *Sonchus ortunoi* 1, *Agave americana* +, *Phoenix canariensis* +; (9) *Sideritis lotsyi* 1; (11) *Descurainia millefolia* 1, *Artemisia thuscula* +; (12) *Ageratina adenophora* +.

Localities: 1 = Entrance to Arguayoda (Alajeró), 5.IV.2002; 2 = Imada (Alajeró), 13.XI.1987 (holotype); 3 = Barranco de Majona, 12.XII.1987; 4 = Arure Cemetery, 14.XI.1987; 5 = Tagamiche (San Sebastián), 11.XI.1987; 6 = Degollada de Peraza, 11.XI.1987; 7 = Degollada de Agando, 5.IV.2002; 8 = Above Chipude, 30.I.2002; 9 = Pérez-de-Paz *et al.* 1990, tables IX, rel. 1–2, p. 165; 10 = Road to Alajeró, 2.V.1987 (holotype); 11 = Degollada de las Hayas (Valle Gran Rey), 31.I.2002; 12 = Degollada de Peraza, 11.XI.1987.

Adenocarpo foliolosi–Chamaecytisetum angustifolii Del-Arco, O. Rodríguez, Acebes, García-Gallo, Pérez-de-Paz, J.M. González, R. González & V. Garzón *ass. nov. hoc loco*

[Table 14, Holotype rel. no. 5].

Common name: "escobón" shrubland.

This is a nano-microphanerophytic community (Table 14) with a preference for ledges, cornices and rocky biotopes in the dry-subhumid Thermo-Mesomediterranean belts of the S sector of the island, within the potential territory of pine woodland and cold evergreen laurel forest.

It is floristically characterized by *Chamaecytisus proliferus* subsp. *angustifolius* (usually dominant), *Adenocarpus foliolosus*, and to a small extent by *Sideritis lotsyi* ("tajora") and *Bystropogon origanifolius*. Apart from these, some dynamic plants belonging to *Cisto-Micromerietalia* and *Pruno-Lauretalia* are frequent by present.

Its expansion as a substitutional community in this S sector has probably been favoured by deforestation and fires, extending its area to the upper territories of juniper woodland and also to high territories of humid evergreen laurel forest on the central plateau of the island, and those of dry evergreen laurel forest in overflowing cloud areas. Today the community is also widely spread over abandoned agricultural areas.

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Table 14. *Adenocarpo foliolosi–Chamaecytisetum angustifolii ass. nov.* [*Cisto-Pinion*, *Chamaecytiso-Pinetalia*, *Chamaecytiso-Pinetea*].

Relevé	1	2	3	4	5	6	7	8
Altitude (m a.s.l.)	1000	1285	1000	1300	1200	1000	1050	910
Slope (°)	10	80	40	20	20	70	15	15
Aspect	SE	W	S	SW	SW	S	S	NW
Area (m^2)	200	100	400	100	400	800	100	200
Cover (%)	90	100	100	90	90	100	90	95
Number of taxa	6	7	9	10	12	6	6	4
Character taxa								
Chamaecytisus proliferus subsp. *angustifolius*	4	4	5	4	3	4	5	5
Adenocarpus foliolosus	1	•	1	2	3	2	•	•
Sideritis lotsyi	•	+	1	2	3	•	•	•
Bystropogon origanifolius	4	3	1	•	•	•	•	•
Companion taxa								
Cistus monspeliensis	4	+	2	1	1	+	1	1
Erica arborea	1	•	1	3	•	1	1	+
Pericallis steetzii	•	1	•	1	•	•	2	•
Micromeria lepida	•	•	•	•	1	•	1	•
Pteridium aquilinum	•	•	•	1	+	•	•	•
Myrica faya	•	•	+	•	•	1	•	•
Plantago arborescens	•	•	+	•	•	+	•	•

Other taxa (relevé): (1) *Kleinia neriifolia* 1; (2) *Sonchus ortunoi* +, *Aeonium spathulatum* +; (3) *Cistus chinamadensis* subsp. *gomerae* +; (4) *Cedronella canariensis* +, *Sonchus ortunoi* 1, *Bupleurum salicifolium* +; (5) *Phagnalon saxatile* 1, *Andryala pinnatifida* +, *Tolpis* sp. 1, *Lobularia canaariensis* subsp. *intermedia* 1, *Euphorbia berthelotii* 1, *Asphodelus ramosus* subsp. *distalis* 1; (7) *Argyranthemum callichrysum* 2; (8) *Micromeria varia* subsp. *gomerensis* 1.

Localities: 1 = Roque de Agando, 31.VII.1977; 2 = Mirador de Tajaqué, 19.II.2007; 3 = Degollada de Agando, 18.VII.1988; 4 = Casa Olsen (Tajaqué), 21.III.2003; 5 = Above Imada (Arure), 12.XI.1987 (holotype); 6 = Base of Roque de Agando, VII.1988; 7 = Degollada de Agando, 5.IV.2002; 8 = Degollada Hayas (Valle Gran Rey), 31.I.2002.

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