

New Records of Lichens and Lichenicolous Fungi from La Gomera (Canary Islands, Spain), Including the New Species: *Usnea boomiana* P. Clerc

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Source: *Candollea*, 70(2) : 165-177

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: <https://doi.org/10.15553/c2015v702a1>

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New records of lichens and lichenicolous fungi from La Gomera (Canary Islands, Spain), including the new species: *Usnea boomiana* P. Clerc

Pieter P. G. van den Boom, Philippe Clerc & Damien Ertz

Abstract

VAN DEN BOOM, P.P.G., P. CLERC & D. ERTZ (2015). New records of lichens and lichenicolous fungi from La Gomera (Canary Islands, Spain), including the new species: *Usnea boomiana* P. Clerc. *Candollea* 70: 165-177. In English, English abstract. DOI: <http://dx.doi.org/10.15553/c2015v702a1>

Lichens and lichenicolous fungi are very diverse in the Canary Islands but the flora is still poorly known despite numerous recent publications. For this reason, two field trips were undertaken in 2011 in order to study the lichen flora of La Gomera (western Canary Islands). About 1000 specimens were collected in the different habitats of the island. In addition, c. 200 specimens collected in 1986, and c. 60 specimens from the Oslo herbarium (O) were studied. As a result, an annotated list of 107 newly recorded lichens and lichenicolous fungi from La Gomera is presented. Terricolous, saxicolous, as well as corticolous species are included. Further notes are given for 17 taxa that are new for the Canary Islands. *Hypotrachyna meyeri* (Zahlbr.) Streim. is new to Macaronesia. In addition, one species is newly described in the genus *Usnea* Dill. ex Adans., *Usnea boomiana* P. Clerc characterized notably by large and convex soralia and by the presence of caperatic acid in the medulla.

Keywords

Ascomycetes – *Usnea* – Mycoflora of Macaronesia – La Gomera – Canary Islands – Taxonomy – Ecology

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Submitted on November 20, 2014. Accepted on March 31, 2015.

Edited by M. W. Callmander

Introduction

La Gomera is, after El Hierro, the smallest of the seven main islands of the Canary Islands, with an area of about 378 km² (Fig. 1) (PITARD & PROUST, 1908). This mid-Atlantic island has a volcanic origin and a circular shape of about 24 km in diameter. The central plateau with a gentle relief and the highest point of the island (1487 m) is surrounded by deeply eroded valleys and ravines. It is densely covered with some of the best preserved laurel forests of the Canary Islands, i.e. by evergreen forests dominated by species of *Lauraceae*. They are included in the protected Garajonay National Park that covers 40 km² and is recognized as a World Natural Heritage by UNESCO. Lichens and lichenicolous fungi recorded from the island are compiled in HERNANDEZ-PADRON & PÉREZ-VARGAS (2010)'s checklist. Those results were mainly based on previous studies by ETAYO (1996, 1998) and SICILIA et al. (2009).

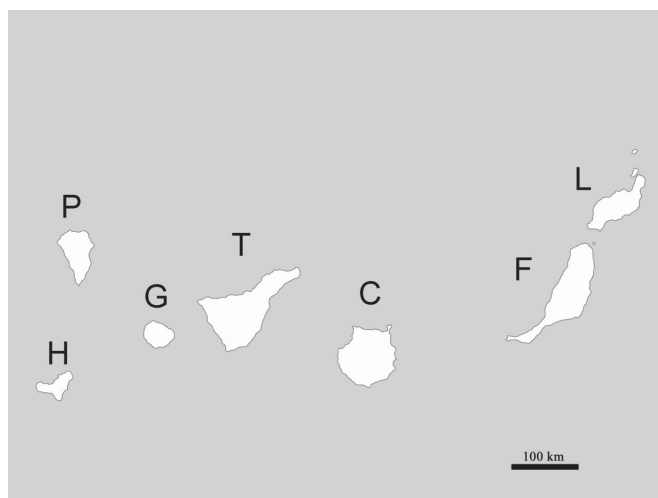


Fig. 1. –Schematic map of the Canary Islands with the situation of Gomera (G). The other islands are: Gran Canaria (C), Fuerteventura (F), El Hierro (H), Lanzarote (L), La Palma (P) and Tenerife (T).

Subsequent lichens and lichenicolous fungi studies for the Canary Islands have been either focusing on species: *Rinodina lindingeri* Erichsen and *R. ballii* Tuck. (GIRALT et al., 2010a), *R. flavosoralifera* Tønsberg (GIRALT et al., 2010b) and three new lichenicolous fungi (PÉREZ VARGAS et al., 2013); on genera: *Buellia* De Not. s.l. and some related genera (GIRALT & VAN DEN BOOM, 2011), *Dirina* Fr. (TEHLER et al., 2013), *Endohyalina* Marbach (GIRALT et al., 2010c), *Trapelia* M. Choisy and *Trapeliopsis* Hertel & Gotth. Schneid. (APTROOT & SCHUMM, 2012), and *Valbiella* P. M. Jørg. (PÉREZ VARGAS et al., 2014); or on diversity of other Canary Islands: El Hierro (VAN DEN BOOM & ERTZ, 2012), Gran Canaria (VAN DEN BOOM, 2010a), Lanzarote (VAN DEN BOOM, 2010b), and Tenerife (VAN DEN BOOM, 2013).

Following the checklist of HERNANDEZ-PADRON & PÉREZ-VARGAS (2010), very few records have been published on La Gomera, i.e. *Trapelia gymnidiata* Aptroot & Schumm (APTROOT & SCHUMM, 2012), *Lichenodiplis anomalus* Etayo & Pérez-Vargas (PÉREZ-VARGAS et al., 2013) and *Valbiella isidioides* Pérez-Vargas et al. (PÉREZ-VARGAS et al., 2014). Based on the latter three publications, 675 species were currently recorded to La Gomera.

In the aim of completing our knowledge of the lichens and lichenicolous fungi flora for La Gomera, the authors gathered c. 1200 specimens for the present study. Specimens were collected all over the island, from coastal areas to the highest laurisilva forests up to elevations of c. 1400 m. During a one-week fieldtrip to La Gomera by two of the authors: Pieter van den Boom (PvdB) in summer 2011 and Damien Ertz (DE) in spring 2011, altogether c. 1000 collections of lichens and lichenicolous fungi were gathered. About 200 specimens were also previously collected by Philippe Clerc (PhC) in 1986. 675 species were already known from La Gomera, the study of our material revealed 107 additional new taxa for the island (Table 1), raising the total number to 782. Detailed comments are provided for the 17 taxa newly recognized taxa for the Canary Islands. A new species of *Usnea* Dill. ex Adans., *U. boomiana* P. Clerc has been found and is here described as new. A further detailed study of the genus *Usnea* on La Gomera was done by PhC, based on our specimens with the addition of c. 60 specimens deposited at O. The taxonomy of many groups are still in a state of flux, therefore several of our specimens are still unidentified so far, and are thus not included in this study. Our study highlights the importance of conserving natural habitats such as the laurel forests and rock outcrops, since they are very diverse in rare lichen species.

Material and methods

About 1260 specimens of lichens and lichenicolous fungi were investigated with a light-microscope or binocular microscope. About 65 of these specimens were also studied by TLC according to CULBERSON & AMMANN (1979) or ORANGE et al. (2001). Anatomical measurements of the cortex, medulla and central axis (%C/%M/%A) in the genus *Usnea* were established according the method given in CLERC (1987). The checklists of HERNÁNDEZ-PADRÓN & PÉREZ-VARGAS (2010), HAFELLNER (2002, 2005, 2008) and the recent papers mentioned in the introduction were consulted for comparison. Voucher specimens studied are deposited in Bruxelles (BR) for DE (Ertz), in the private herbarium of PvdB (Boom) and in G for PhC (P. Clerc). Localities of material examined are presented in Appendix 1 by collectors for PvdB and DE and by herbaria for G and O for the remaining collectors (including PhC) in a numbering order. Substrate abbreviations are as follow:

Cs = <i>Castanea sativa</i>	c = calcareous rock
Ci = <i>Cistus</i>	cw = cement of wall
Er = <i>Erica</i>	s = acidic rock
Eu = <i>Euphorbia</i>	st = stump
Hy = <i>Hypericum</i>	sts = stone on soil
Il = <i>Ilex</i>	sw = stone of wall
Jn = <i>Juniperus</i>	t = terricolous
Ju = <i>Juglans</i>	ush = unid. shrub
Lr = <i>Laurus</i>	ut = unid. tree
Mr = <i>Myrica</i>	vr = volcanic rock
Pm = Palm	w = wood
Pn = <i>Pinus</i>	
Sek = <i>Senecio</i>	
Tel = <i>Teline</i>	

Some specimens of various genera were determined by specialists: Mireia Giralt (*Amandinea* Choisy ex Scheid. & H. Mayrhofer, *Buellia* De Not., *Rinodina* (Ach.) Gray), Didier Masson (*Hypotrachyna* (Vain.) Hale), Per Jørgensen (*Vabliella* P. M. Jørg.) and Emmanuël Sérusiaux (*Ramalina* Ach.).

Results

Table 1 presents the 107 taxa newly recorded from La Gomera and further includes 17 taxa newly recorded from the Canary Islands. This raises the total of taxa of lichens and lichenicolous fungi known from La Gomera to 782.

The results section is divided in two parts: the first one focuses on the genus *Usnea* with *U. boomiana* described as new and a second one provides notes on the new records for the Canary Islands. All new records for La Gomera are provided in Table 1 with their respective distribution among the other islands of the Canary Archipelago. *Vabliella atlantica* P. M. Jørg. is known from the Canary Islands but its accurate distribution is unknown (PEREZ-VARGAS et al., 2014).

Notes on the genus *Usnea* on La Gomera

Usnea boomiana P. Clerc, *spec. nova* (Fig. 2).
Mycobank No.: MB 807125

Typus: SPAIN. Canary Islands. El Hierro: SSE of Frontera, near mountain top, S or road HI-1, N and W side of Montana de la Fuente, along trail in “fayal brezal” forest, 27°44.15'N 17°59.50'W, 1300 m, on *Erica* sp., 31.III.2009, *P. van den Boom* & *B. van den Boom* 42838 (holo-: G [G00262105]!; iso-: hb. PvdB!), %C/%M/%A: 7/33/19. Chemistry: usnic and caperatic acids.

Thallus shrubby, to 5 cm long; lateral branches very slightly to distinctly narrowed at attachment point; mature soralia as large or even broader than branch's diameter, convex with numerous isidiomorphs; cortex shiny and thin; medulla dense and thick containing caperatic acid.

Table 1. – Species of lichens and lichenicolous fungi, recorded as new from La Gomera, with distribution in the Canary Islands and notes on localities and substrata. All new records for the Canary Islands are in bold. Locality numbers after the species name correspond to the list of localities in Appendix 1. Substrate abbreviations are presented in the Material and Methods section. [Abbreviations: C: Gran Canaria; F: Fuerteventura; G: La Gomera; H: El Hierro; L: Lanzarote; P: La Palma and T: Tenerife].

Taxa	Islands					Collections studied
	H	P	T	C	F	
<i>Abrothallus chrysanthus</i> Stein						11, Ju, Boom 46078; 27, Ci, Boom 46423 [all on <i>Usnea</i>]
<i>Acarospora heufferiana</i> Körb.		P	T	C		L 5, vr, Boom 45973
<i>Acarospora impressula</i> Th. Fr.		P				20, vr, Boom 46472
<i>Agonimia opuntiella</i> (Buschardt & Poelt) Vězda		P		C		L 41, t, Ertz 16242
<i>Anomalographis madeirensis</i> (Tav.) Kalb		P	T	C		41, vr, Ertz 16244
<i>Arthonia dispersa</i> (Schrad.) Nyl.						37, Ertz 16226; 40, Ertz 16233 [all on ut]
<i>Bacidia paramedialis</i> M. Brand, Coppins, van den Boom & Sérus		P				6, Lr, Boom 45989; 9, Mr, Boom 46053
<i>Bacidia sipmanii</i> M. Brand, Coppins, van den Boom & Sérus		P	T			6, sts, Boom 46006
<i>Bactrospora thyrsoles</i> (Stirt.) Llop & van den Boom	H		T	C	F	L 51, vr, Ertz 16342
<i>Baeomyces rufus</i> (Huds.) Rebent.		P	T			44, vr, Ertz 16269
<i>Buellia dispersa</i> A. Massal.	H	P	T	C	F	20, Boom 46240; 22, Boom 46325; 53, P. Clerc P11655-11656 [all on vr]
<i>Buellia griseovirens</i> (Turner & Borrer ex. Sm.) Almb.	H	P	T	C		2, Er, Boom 45909
<i>Buellia saxorum</i> A. Massal.						3, vr, Boom 45910
<i>Buellia stellulata</i> (Taylor) Mudd	H		T	C	F	22, vr, Boom 46324

Taxa	Islands						Collections studied
	H	P	T	C	F	L	
<i>Buellia tesserata</i> Körb.	H	P	T	C	F		28, vr, Boom 46460
<i>Caloplaca canariensis</i> (Follmann & Poelt) Breuss	H	P	T	C			22, vr, Boom 46305
<i>Caloplaca congregiadiens</i> (Nyl.) Zahlbr.	H	P	T	C			22, vr, Boom 46307
<i>Caloplaca flavocitrina</i> (Nyl.) A. E. Wade		P					10, sw, Boom 46060
<i>Caloplaca pelodella</i> (Nyl.) Hasse	H	P	T	C			22, vr, Boom 46312
<i>Caloplaca pollinii</i> (A. Massal.) Jatta							12, Lr, Boom 46143
<i>Catillaria nigroclavata</i> (Nyl.) Th. Fr.		P	T	C			3, Sek, Boom 45939; 23, vr, Boom 46355
<i>Cercidospora macrospora</i> (Uloth) Hafellner & Nav.-Ros			T	C			48, vr, Ertz 16294, on <i>Lecanora muralis</i>
<i>Cladonia polydactyla</i> (Flörke) Spreng.							25, st, Boom 46377
<i>Cladonia ramulosa</i> (With.) J. R. Laundon	H	P	T				12, Boom 46412; 27, Boom 46144 [all on st]
<i>Cladonia subulata</i> (L.) Weber ex F. H. Wigg.	H	P	T				27, t, Boom 46415
<i>Cornutispora ciliata</i> Kalb			T				28, vr, Boom 46458A, on an isidiate crust
<i>Dactylospora parasitica</i> (Flörke) Zopf			T				23, vr, Boom 46487, on <i>Pertusaria flavicans</i>
<i>Diploschistes caesioplumbeus</i> (Nyl.) Vain.		P	T				3, sw, Boom 45933
<i>Endococcus exerrans</i> Nyl.							3, s, Boom 45911, on <i>Rhizocarpon</i> sp.
<i>Endococcus propinquus</i> (Körb.) D. Hawksw.		P					22, vr, Boom 46293, on a crust
<i>Endohyalina brandii</i> Giralt, van den Boom & Elix	H		T				22, vr, Boom 46323
<i>Enterographa elaborata</i> (Lyell ex Leight.) Coppins & P. James		P	T				45, ut, Ertz 16272
<i>Enterographa pitardii</i> (de Lesd.) Redinger	H						47, vr, Ertz 16291
<i>Fulgensia fulgens</i> (Sw.) Elenkin		P	T	C	F	L	43, t, Ertz 16260
<i>Halecania viridescens</i> Coppins & P. James		P		C			2, Er, Boom 45908
<i>Hypotrachyna afrorevoluta</i> (Krog & Swinscow) Krog & Swinscow							7, Boom 46016; 12, Boom 46134; 25, Boom 46394 [all on Er]
<i>Hypotrachyna meyeri</i> (Zahlbr.) Streim.							52, Pn, P. Clerc P11628-11630
<i>Lecania hutchinsiae</i> (Ach.) A. L. Smith	H	P					6, sts, Boom 46005
<i>Lecania nigra</i> van den Boom & Ertz	H						23, vr, Boom 46346
<i>Lecanora flowersiana</i> H. Magn.				C			11, Mr, Boom 46089
<i>Lecanora sulphurea</i> (Hoffm.) Ach.		P	T		F		3, s, Boom 45924; 5, s, Boom 45971; 53, vr, P. Clerc P11655-11658
<i>Lecidea fuliginosa</i> Taylor							3, s, Boom 45929
<i>Lecidella elaeochroma</i> f. <i>soralifera</i> (Erichsen) D. Hawksw.							3, Er, Boom 45942
<i>Lecidella stigmathea</i> (Ach.) Hertel & Leuckert		P	T		F	L	10, sw, Boom 46061
<i>Lepraria nivalis</i> J. R. Laundon	H	P	T		F	L	23, vr, Boom 46356
<i>Lepraria umbricola</i> Tønsberg							16, Er, Boom 46185
<i>Lichenothelia rugosa</i> (G. Thor) Ertz & Diederich	H	P	T				48, vr, Ertz 16298, on <i>Diploschistes</i>
<i>Micarea doliiformis</i> (Coppins & P. James) Coppins & Sérus.	H						1, Er, Boom 45890; 27, st, Boom 46414; 54, Lr, P. Clerc P11725-11728
<i>Micarea micrococca</i> (Körb.) Gams ex Coppins	H						9, Mr, Boom 46058
<i>Muellerella lichenicola</i> (Sommerf.) D. Hawksw.	H	P					23, vr, Boom 46346a, on <i>Lecania</i> ; 43, Pn, Ertz 16261, on <i>Caloplaca</i>
<i>Paralecanographa grumulosa</i> (Dufour) Ertz & Tehler	H	P	T		F	L	43, vr, Ertz 16256
<i>Paranectria oropensis</i> (Ces.) D. Hawksw. & Pir.		P	T				26, Er, Boom 46399, on <i>Parmeliella</i> sp.
<i>Parmotrema tinctorum</i> (Nyl.) Hale	H	P	T	C	F	L	21, vr, Boom 46268
<i>Peccania fontqueriana</i> P. Moreno & Egea			T	C	F	L	23, vr, Boom 46347

Taxa	Islands						Collections studied
	H	P	T	C	F	L	
<i>Peltula farinosa</i> Büdel				C			22, vr, Boom 46329
<i>Peltula patellata</i> (Bagl.) Swinscow & Krog		P	T	C	F		22, vr, Boom 46301
<i>Pertusaria flavicans</i> Lamy	H	P				L	23, vr, Boom 46352
<i>Pertusaria leucosora</i> Nyl.					F		3, s, Boom 45928
<i>Phaeophyscia hirsuta</i> (Mereschk.) Essl.		P	T	C	F		22, vr, Boom 46281
<i>Phaeophyscia orbicularis</i> (Neck.) Moberg	H	P	T				22, vr, Boom 46308
<i>Phoma cladoniicola</i> Diederich, Kocourk. & Etayo	H						48, vr, Ertz 16296, on <i>Ramalina polymorpha</i>
<i>Physcia adscendens</i> (Fr.) H. Oliver	H	P	T	C	F	L	23, ush, Boom 46363
<i>Physconia enteroxantha</i> (Nyl.) Poelt		P	T	C			3, sw, Boom 45937
<i>Physconia muscigena</i> (Ach.) Poelt		P	T	C			23, vr, Boom 46353
<i>Piccolia ochrophora</i> ((Nyl.) Hafellner		P	T	C			6, ut, Boom 45988
<i>Placopyrenium bucekii</i> (Nádv. & Servít) Breuss		P	T	C			22, Boom 46309; 41, Ertz 16246; 51, Ertz 16334 [all on vr]
<i>Placynthiella dasaea</i> (Stirt.) Tønsberg	H	P					11, w, Boom 46093
<i>Polycoccum microsticticum</i> (Leight.) Arnold		P					28, vr, Boom 46463, on <i>Dimelaena radiata</i>
<i>Porpidia contraponenda</i> (Arnold) Knoph & Hertel	H						3, vr, Boom 45912, 45947
<i>Protoparmelia hierrensis</i> van den Boom & Ertz	H						3, Boom 45919; 28, Boom 46455; 33, Ertz 16195 [all on vr, on <i>Pertusaria</i> sp.]
<i>Protoparmelia montagnei</i> (Fr.) Sancho & A. Crespo		P	T		F		20, vr, Boom 46234
<i>Pyrenopsis subareolata</i> Nyl.			T				5, s, Boom 45975; 22, vr, Boom 46333
<i>Ramalina alisiosae</i> Pérez-Vargas & Pérez-Ortega	H						20, Jn, Boom 46249
<i>Ramalina bourgeana</i> Mont. ex Nyl.	H	P	T	C	F	L	19, Boom 46219; 22, Boom 46291; 33, Ertz 16187 [all on vr]
<i>Ramalina capitata</i> (Ach.) Nyl.			T				23, vr, Boom 46362
<i>Ramalina subwebbiana</i> (Nyl.) Hue	H						3, Boom 45948; 20, Boom 46265; 23, Boom 46345; 28, Boom 46454 [all on vr]
<i>Rinodina beccariana</i> var. <i>lavicola</i> (M. Steiner) Matzer & H. Mayrhofer	H	P	T		F	L	21, vr, Boom 46270
<i>Rinodina disjuncta</i> Sheard & Tønsberg	H						27, Mr, Boom 46408
<i>Rinodina gennarii</i> Bagl.			T				10, vr, Boom 46066
<i>Rinodina intermedia</i> Bagl.		P	T	C			21, Boom 46271; 22, Boom 46275 [all on vr]
<i>Rinodina trachytica</i> (A. Massal.) Bagl. & Carestia	H	P	T	C			28, vr, Boom 46292a
<i>Rocella fuciformis</i> (L.) DC.	H	P	T	C	F	L	19, Pm, Boom 46232; 29, vr, Ertz 16097
<i>Roccellographa circumscripta</i> (Taylor) Ertz & Tehler	H		T				33, vr, Ertz 16190
<i>Schismatomma physconiicola</i> Ertz & Diederich				C			48, vr, Ertz 16293, on <i>Physconia</i>
<i>Skyttea lecanorae</i> Diederich & Etayo		P					2, Er, Boom 45907, on a soresiate cf. <i>Lecanora</i> ; 29, Pn, Ertz 16099, on <i>Lecanora</i> sp.
<i>Skyttea nitschkei</i> (Körb.) Sherwood, D. Hawksw. & Coppins			T				41, ut, Ertz 16235, on <i>Thelotrema lepadinum</i>
<i>Solenopsora vulturiensis</i> Bagl.	H	P	T	C			19, Boom 46220; 23, Boom 46357 [all on vr]
<i>Sparria endlicheri</i> (Garov.) Ertz & Tehler	H						36, vr, Ertz 16221
<i>Syzygospora physciacearum</i> Diederich & M. S. Christ.			T				49, vr, Ertz 16319, on <i>Physcia tenella</i>
<i>Tephromela deplanata</i> (J. Steiner) Motyka							28, vr, Boom 46467
<i>Tephromela grumosa</i> (Pers.) Hafellner & Cl. Roux							28, vr, Boom 46459
<i>Thelopsis isiacae</i> Stizenb.	H	P	T		F	L	51, vr, Ertz 16338

Taxa	Islands						Collections studied
	H	P	T	C	F	L	
<i>Toninia cinereovirens</i> (Schaerer) A. Massal.		P	T	C			51, vr, Ertz 16335
<i>Toninia squalida</i> (Ach.) A. Massal.	H	P	T	C			L 22, Boom 46289; 23, Boom 46341, 46348 [all on vr]
<i>Tremella cladoniae</i> Diederich & M. S. Christ.	H		T				13, Er, Boom 46152, on <i>Cladonia</i> sp.
<i>Tremella ramalinae</i> Diederich	H		T				16, Lr, Boom 46192, on <i>Ramalina</i> sp.
<i>Trinathotrema hierrensis</i> Ertz & van den Boom	H						11, Mr, Boom 46091
<i>Usnea boomiana</i> P. Clerc							see text
<i>Usnea fragilescens</i> Lynge							see text
<i>Usnea glabrescens</i> var. <i>fulvoreaegens</i> Räsänen							see text
<i>Usnea subflammea</i> P. Clerc				T			see text
<i>Usnea subgracilis</i> Vain.		P	T				see text
<i>Usnea wasmuthii</i> Räsänen		P	T				see text
<i>Vahliella atlantica</i> P. M. Jørg.				Present			3, vr, Boom 45921
<i>Verrucaria muralis</i> Ach.							10, sw, Boom 46064
<i>Waynea stoechadiana</i> (Abassi Maaf & Cl. Roux) Cl. Roux & P. Clerc				T			23, vr, Boom 46338
<i>Zwackhia circumducta</i> (Nyl.) Ertz							35, vr, Ertz 16203

Thallus shrubby, short, 3–5 cm long, greyish green; branching anisotomic- to isotomic-dichotomous; trunk short, 1–4 mm long, with a short (1 mm) but distinct jet-black pigmented zone in the basal part. *Main branches* 0.9 to 1.3 mm large, irregular to fusiform with larger diameter not close to the basal part, usually inconspicuously segmented. *Lateral branches* very slightly to distinctly narrowed at point of attachment, sometimes fusiform; *apices* thin with few ramifications; *segments* terete and cylindrical to slightly fusiform. *Foveoles* and *transverse furrows* absent. *Pseudocyphellae* and *maculae* absent; papillae numerous, regularly disposed, indistinct to short verrucous. *Tubercles* absent. *Fibrils* short (1–3 mm), few, irregularly disposed. *Fibercles* few. *Soralia* developing on the cortex “ad initio”, ± circular when young, of ± irregular shape, as large or even broader than branch’s diameter when mature, flat to distinctly convex and efflorescent, often becoming confluent especially towards the tips. *Isidiomorphs* usually numerous on young and mature soralia; cortex shiny, moderately thin, (6–)7% (–9); medulla thick, dense to lax, (25.5–)30% (–33); axis thin (19–)25% (–36). *Ascomata* and *conidiomata* not observed.

Etymology. – The new species is named after Pieter van den Boom, who collected the type specimen and did a lot of fieldwork on all the Canary Islands since 15 years.

Chemistry. – K-, C-, KC-, P-. Usnic and caperatic acids.

Habitat and distribution. – *Usnea boomiana* grows on shrubs and trees of *Erica* sp. in “fayal brezal” forests or at the edge of laurisilva at around 1300 m of altitude. This species is so far known only from the Canary Islands of La Gomera and El Hierro.

Variability. – The constriction of the lateral branches at attachment points might vary from almost not constricted to distinctly constricted, but some branches are always ± constricted (numerous branches should be checked). The papillae might be almost invisible (indistinct) to well developed. Soralia might have few to numerous isidiomorphs.

Taxonomic notes. – *Usnea boomiana* is a small species that is morphologically and anatomically closely related to *U. cornuta* Körb. It differs from the latter species by its large and convex soralia as well by its particular chemistry (*U. cornuta* has mainly salazinic acid or compounds belonging in the stictic acid group, ± lobaric acid or protocetraric acid in the medulla). Other short and shrubby species with large soralia are *U. esperantiana* P. Clerc, *U. fragilescens* Lynge, *U. glabrata* (Ach.) Vain., *U. glabrescens* (Vain.) Räsänen, *U. lapponica* Vain., *U. macaronesica* P. Clerc and *U. substerilis* Motyka. *Usnea esperantiana* has a K+ red medulla (salazinic acid), soralia that are not convex but flat and no isidiomorphs at all. *Usnea fragilescens* has more regularly shaped and circular soralia that are not confluent, more distinctly constricted lateral branches at point of attachment and compounds belonging to the stictic acid group in the medulla. *Usnea glabrata* has strongly constricted lateral branches at point of attachment and a very lax medulla with protocetraric or barbatic acids. *Usnea glabrescens* has a conspicuously blackened basis, a thicker and mat cortex, a compact thin medulla, lateral branches that are never constricted at point of attachment and a different chemistry (norstictic ± salazinic ± diffractaic acids, stictic acid group ± diffractaic acid). *Usnea lapponica* has deeply excavate soralia without isidiomorphs, lateral branches that

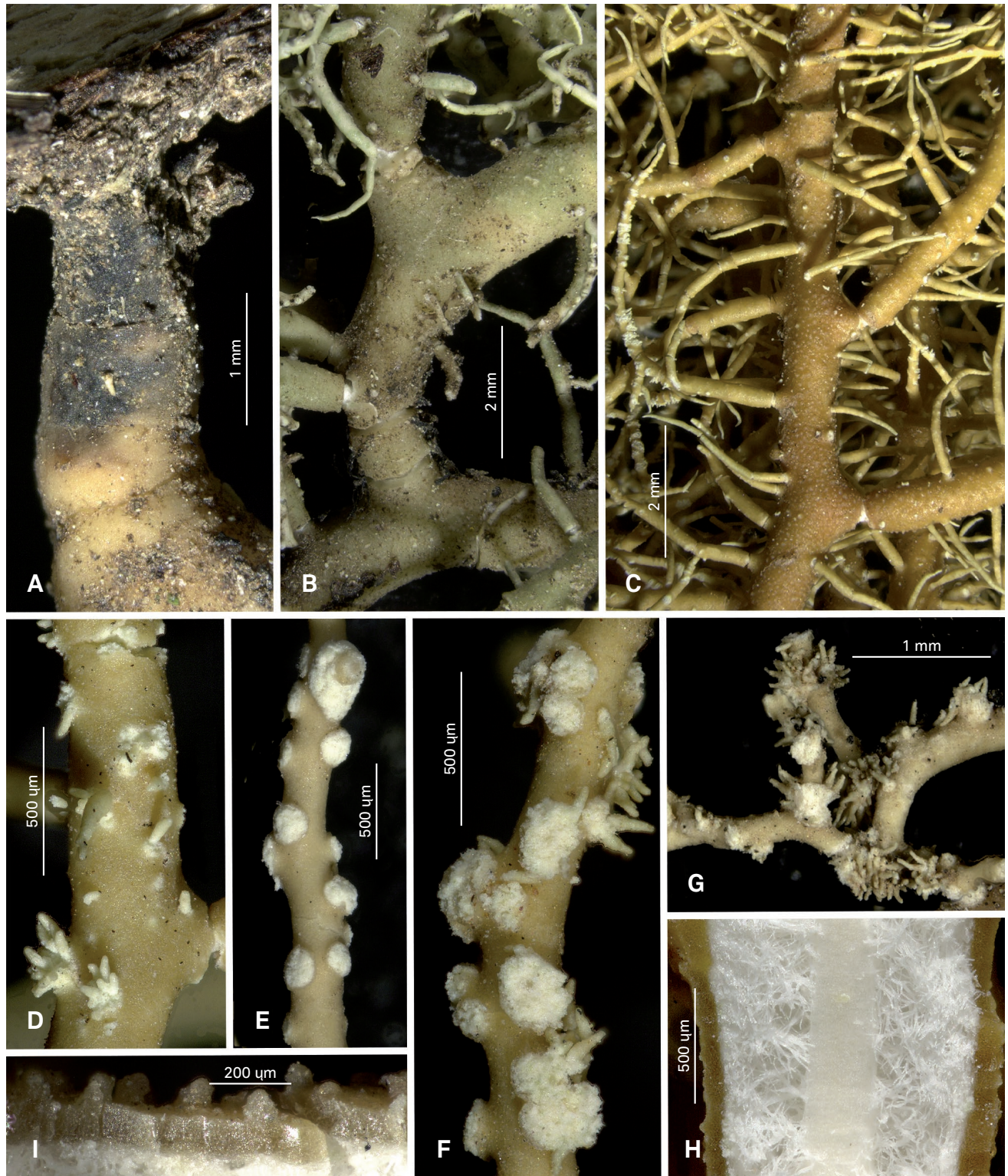


Fig. 2. – *Usnea boomiana* P. Clerc. **A.** Basal part with blackish pigmentation; **B.** Main branches; **C.** Main branch with slightly constricted lateral branches at ramification points; **D.** Young soralia with isidiomorphs; **E.** Mature soralia without isidiomorphs; **F.** Mature soralia a few isidiomorphs; **G.** Overmature soralia with numerous isidiomorphs; **H.** Transversal section of a main branch; **I.** Small verrucous papillae on the cortex. [A-B: P. van den Boom & B. van den Boom 42838, G; C-E, H: P. Clerc G262116, G; F-G: P. Clerc G262111, G]

are never constricted at point of attachment, a mat cortex and salazinic or psoromic acids in the medulla. *Usnea macaronesica* has deeply excavate soralia, strongly constricted lateral branches at point of attachment, a thin and smooth cortex, a broader and very lax medulla with stictic and/or barbatic acids. *Usnea substerilis* has lateral branches that are never constricted at point of attachment, a mat cortex, papillae that are larger and more conspicuous and salazinic and/or barbatic acids in the medulla. Finally, studies of most of the types of North and South American species to find an already published name for this taxon were unsuccessful.

Paratypi. – SPAIN. **Canary Islands. El Hierro:** Frontera, El Golfo, Izique, on *Erica arborea* in Fayal-Brezal, 1200 m, 1.X.1986, *P. Clerc* G262107 (G); *ibid. loc.*, *P. Clerc* G262108 (G); SSE of Frontera, Montana de la Fuente, on *Erica* in Fayal-Brezal, 1300 m, 31.III.2009, *Boom* 42773 (hb. PvdB); *ibid. loc.*, *Boom* 42771 (hb. PvdB). **La Gomera:** Garajonaj N. P., NE of Igualero, on *Erica arborea* at the edge of laurisilva, 1350 m, 5. IX. 2011, *Boom* 46370 (hb. PvdB); *ibid. loc.*, *Boom* 46371 (hb. PvdB); Alajero, Lomo de la Mulata, on *Erica arborea* and *Pinus* sp. in pine plantations, 1320–1340 m, 23–25.IX.1986, *P. Clerc* G262113 (G); *ibid. loc.*, *P. Clerc* G262116 (G); *ibid. loc.*, *P. Clerc* G262117 (G); *ibid. loc.*, *P. Clerc* G262118 (G); Hermigua, Bosque El Cedro, on *Castanea sativa* in agricultural landscape, 850–900 m, 5.X.1986, *P. Clerc* G262110 (G); Hermigua, Las Mimbreras, on *Laurus* sp. in laurisilva, 1000 m, 27.IX.1986, *P. Clerc* G262109 (G); Hermigua, Cabezo Alto, on *Erica arborea* on windy ridgeline, 900–1000 m, 27.IX.1986, *P. Clerc* G262111 (G); Vallehermoso, Montana de la Zarza, on *Ilex* and *Erica arborea* in Fayal-Brezal, 900 m, 26.IX.1986, *P. Clerc* G262106 (G); *ibid. loc.*, *P. Clerc* G262112 (G); Valle Grand Rey, Las Cabecillas, on *Erica arborea* in Fayal-Brezal, 1080 m, 23.IX.1986, *P. Clerc* G262114; *ibid. loc.*, *P. Clerc* G262115 (G).

Usnea fragilesceus Lyngby

Notes. – This taxon was mentioned for the first time for the Canary Islands by TAVARES (1952) under the name *U. mollis* Stirt., a synonym of *U. fragilesceus* (CLERC, 1987). This indication was then taken up again by CHAMPION & SANCHEZ PINTO (1978), HAFELLNER (1995) and HERNÁNDEZ PADRÓN & PÉREZ-VARGAS (2010), “collected on Tenerife”. *Usnea cornuta* Körb. (= *U. inflata* (Duby) Motyka) a frequent and variable species was not mentioned for the Canary Islands in the report of TAVARES (1952). There is thus a high probability that the species reported as *U. mollis* by TAVARES (1952) was in fact *U. cornuta*. So the report in this paper of *U. fragilesceus* on La Gomera is the first credible mention of this species for the Canary Islands. One of the specimen (*Hernández & Pérez* 56615) out of the two collected by Hernández & Pérez on La Gomera corresponds well to the description of *U. fragilesceus* given by CLERC (1987) with the stictic acid group as medullary substances. The second specimen (*Hernández & Pérez* 56616) however differs in the presence of thamnolic acid as medullary substance. This constitutes a new chemotype for *Usnea fragilesceus*.

Material examined. – 12, Er, *Boom* 46120; 59, *Hernández & Pérez* 56615; 60, *Hernández & Pérez* 56616.

Usnea glabrescens var. *fulvovireagens* Räsänen (≡ *U. fulvovireagens* (Räsänen) Räsänen)

Notes. – This taxon is a new record for the Canary Islands. CLERC (2011) considered it as a synonym of *U. glabrescens* because there are many intermediate forms, especially in North America. However, in Europe, most of the specimens can be reliably identified to one or the other varieties, justifying their acceptance. *Usnea glabrescens* var. *glabrescens* has well delimited circular soralia that are not at all or little excavate whereas *U. glabrescens* var. *fulvovireagens* has distinctly excavate *U. lapponica* like soralia. See CLERC (2007) for a detailed description of this taxon.

Material examined. – 12, Er, *Boom* 46119; 24, Er, *Boom* 46386/a; 55, Pn, *P. Clerc* G262086.

Usnea subflammea P. Clerc

Notes. – Described from the Azores (CLERC, 2006), with a paratype collected on Tenerife, this species has been later found to occur in the low montane forests of South America (TRUONG et al., 2013).

Material examined. – 4, Er, *Boom* 45951; 66, *Dahl* 841/10; 58, *Hernández & Pérez* 56609; 68, *Krog & Østhagen* 3428b, 3429b.

Usnea subgracilis Vain. (= *U. hesperina* Motyka, *U. schadenbergiana* sensu P. Clerc [non Göpp. & Stein.]

Notes. – Details on this taxon are given in CLERC (1997), HERRERA CAMPOS et al. (1998) and TRUONG et al. (2013). In the Canary Islands it was known so far from Tenerife and La Palma (HERNÁNDEZ PADRÓN & PÉREZ-VARGAS, 2010). It is with *U. articulata* (L.) Hoffm. one of the most frequent pendulous *Usnea* species on the western Islands of this archipelago.

Material examined. – 1, Er, *Boom* 45871, 45881, 45887, 45888; 7, Er, *Boom* 46029; 11, Lr, *Boom* 46110; 16, Er, *Boom* 46187, 46193; 24, Er, *Boom* 46387/a; 27, Er, *Boom* 46440; 57, Er, *P. Clerc* G262104; 66, *Dahl* 841/10b; 67, *Dahl* 844/13b; 62, *Defago Paroz & Hainard* 298232; 59, *Hernández & Pérez* 56614; 68, *Krog & Østhagen* 3428c; 69, *Krog & Østhagen* 3283d.

Usnea wasmuthii Räsänen

Notes. – In the Canary Islands, this species was known from La Palma. It occurs on Tenerife as well. Details on this taxon are given in CLERC (2011). Both specimens collected on La Gomera have salazinic and barbatic acids in the medulla.

Material examined. – 56, Cs, *P. Clerc* G26119; 63, Eu, *P. Clerc* G26120.

Notes on the new taxa records for the Canary Islands

Abrothallus chrysanthus Stein

Notes. – In Macaronesia, this lichenicolous fungus was previously only known from the Azores (VAN DEN BOOM & ERTZ, 2014). It is closely related to *A. usneae* Rabenh., but *A. chrysanthus* has ascospores of 8–10 × 3–4 µm and those of *A. usneae* are 14–18 × 5–7 µm.

Material examined. – 11, Ju, *Boom* 46078; 27, Ci, *Boom* 46423 [all on *Usnea*].

Arthonia dispersa (Schrad.) Nyl.

Notes. – *Arthonia dispersa* is a pioneer and a weak competitor. In Europe, it is widely distributed from boreal to Mediterranean areas (WIRTH, 1995), but not recorded from the British Islands in SMITH et al. (2009). It was only known from Madeira in Macaronesia (CARVALHO et al., 2008).

Material examined. – 37, Ertz 16226; 40, Ertz 16233 [all on ut].

Buellia saxorum A. Massal.

Notes. – This species was previously not recorded from Macaronesia (CARVALHO et al., 2008; GABRIEL, 2008; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010; GIRALT & VAN DEN BOOM, 2011).

Material examined. – 3, vr, *Boom* 45910.

Caloplaca pollinii (A. Massal.) Jatta

Notes. – This species was previously not mentioned from Macaronesia (CARVALHO et al., 2008) nor the Azores (GABRIEL, 2015). It was however recorded from mainland Portugal, especially in Algarve, where it is a rather common species (VAN DEN BOOM & GIRALT, 2012).

Material examined. – 12, Lr, *Boom* 46143.

Cladonia polydactyla (Flörke) Spreng.

Notes. – This species was only mentioned from Madeira in Macaronesia (CARVALHO et al., 2008) and the Azores (GABRIEL, 2015).

Material examined. – 25, st, *Boom* 46377.

Endococcus exerrans Nyl.

Notes. – Several species of this genus are known from the Canary Islands (HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010), with the exception of this taxon. It was neither mentioned from Madeira (CARVALHO et al., 2008) nor from the Azores (GABRIEL, 2015). This taxon can be easily mistaken for *E. rugulosus* Nyl. which has ascomata of 0.2–0.3 mm and ascospores of 12–22 × 5–8 µm, broadly ellipsoid. Our specimen has ascomata of 0.05–0.1 mm and ascospores of 15–20 × 5–6 µm, fusiform.

Material examined. – 3, s, *Boom* 45911, on *Rhizocarpon* sp.

Hypotrachyna afrorevoluta (Krog & Swinscow) Krog & Swinscow

Notes. – This species was overlooked for *H. revoluta* (Flörke) Hale (SMITH et al., 2009) and not reported for Macaronesia before (CARVALHO et al., 2008; GABRIEL, 2015; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010).

Material examined. – 7, *Boom* 46016; 12, *Boom* 46134; 25, *Boom* 46394 [all on Er].

Hypotrachyna meyeri (Zahlbr.) Streim.

Notes. – We have found usnic acid and salazinic acid by TLC. This species is widely distributed in the tropics and was not reported from Macaronesia before (CARVALHO et al., 2008; GABRIEL, 2015; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010).

Material examined. – 52, Pn, *P. Clerc* P11628–11630.

Lecidea fuliginosa Taylor

Notes. – Although this species is widely distributed in Europe where it is not rare, it was previously not reported from Macaronesia (CARVALHO et al., 2008; GABRIEL, 2015; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010).

Material examined. – 3, s, *Boom* 45929.

Lecidella elaeochroma f. *soralifera* (Erichsen) D. Hawksw.

Notes. – This mainly coastal forma (SMITH et al., 2009) has been found on small branches and twigs of an *Erica* shrub. It is abundantly covered with apothecia and the thallus has partly yellowish soredia. This forma is not mentioned in HERNÁNDEZ-PADRÓN & PÉREZ-VARGAS (2010).

Material examined. – 3, Er, *Boom* 45942.

Lepraria umbricola Tønsberg

Notes. – This species is widespread in Europe (SMITH et al., 2009). In Macaronesia it was already known from the Azores (GABRIEL, 2008).

Material examined. – 16, Er, *Boom* 46185.

Tephromela deplanata (J. Steiner) Motyka

Notes. – This species was found on north exposed vertical rock growing with *Lecanora sulphurella* Hepp. KALB & HAFELLNER (1992) treated this species and recorded it from eastern Mediterranean areas. It was previously not mentioned from Macaronesia (CARVALHO et al., 2008; GABRIEL, 2008; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010).

Material examined. – 28, vr, *Boom* 46467.

Tephromela grumosa (Pers.) Hafellner & Cl. Roux

Notes. – This species was found on a steep, sheltered and shaded rock face, with the characteristic bluish soralia but without apothecia. It was previously not mentioned from Macaronesia (CARVALHO et al., 2008; GABRIEL, 2008; HERNANDEZ-PADRON & PÉREZ-VARGAS, 2010).

Material examined. – 28, vr, Boom 46459.

Verrucaria muralis Ach.

Notes. – This species has often been found on mortar of a wall, but it is easily overlooked. In Macaronesia it was only known from the Azores (GABRIEL, 2008).

Material examined. – 10, sw, Boom 46064.

Zwackbia circumducta (Nyl.) Ertz

Notes. – In Macaronesia it was previously recorded from Madeira as *Opegrapha circumducta* Nyl. (CARVALHO et al., 2008).

Material examined. – 35, vr, Ertz 16203.

Acknowledgements

Bern van den Boom contributed important support during the fieldwork. Flavien Pape (CJBG) is thanked for help with TLC. Isabel C. Barrio is thanked for proof-reading the manuscript. An anonymous referee is warmly thanked for providing useful comments.

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Appendix 1.

Localities of *P. van den Boom* collections

- 1 = NE of Valle Gran Rey, E of Arure, N side of Las Hayas, trail to Las Cabecillas, laurisilva, dominated by *Erica arborea*, 28°07.84'N 17°17.41'W, 950 m, 31.VIII.2011.
- 2 = NE of Valle Gran Rey, E of Arure, SE of Las Hayas, along road to El Cercado (halfway), near crossing with unpaved road to Barranco de las Lagunetas, a group of some small trees, 28°07.61'N 17°7.18'W, 1050 m, 31.VIII.2011.
- 3 = NE of Valle Gran Rey, SE of Arure, SE of Chipude, Monumento Natural de la Fortaleza, steep acidic outcrops, 28°06.08'N 17°16.58'W, 1220 m, 31.VIII.2011.
- 4 = NE of Valle Gran Rey, NE of Arure, Garajonay N.P., S of road TF-713, trail from Montaña de los Mamantiales to Raso de Don Pedro, laurisilva, 28°08.88'N 17°17.55'W, 1185 m, 31.VIII.2011.
- 5 = NE of Valle Gran Rey, c. 1.5 km S of Arure, between two tunnels, along restaurant and mirador César Manrique, acidic outcrops on top of hill, 28°07.19'N 17°19.04'W, 710 m, 1.IX.2011.
- 6 = Edge of Garajonay N.P., SW of Vallehermoso, S of Epina, Chorros de Epina, laurisilva along Ermita San Isidro and a few mature solitary *Myrica faya* trees, 28°09.78'N 17°18.03'W, 820 m, 1.IX.2011.
- 7 = SW of Vallehermoso, NE of Epina, trail from transmitter mast, to NE, to Vallehermoso, open *Laurus Erica Myrica* forest, alongside the trail, 28°10.32'N 17°17.56'W, 835 m, 1.IX.2011.
- 8 = Garajonay N.P., along road TF-713, La Laguna Grande, parking lot and open area in laurisilva, at the edge of forest, 28°07.60'N 17°15.53'W, 1260 m, 2.IX.2011.
- 9 = Garajonay N.P., SSW of Hermigua, S of El Cedro, along trail from campsite to Ermita Nuestra Señora de Lourdes, laurisilva with some mature *Laurus* s.l. trees (> 1 m diam.), 28°07.66'N 17°13.40'W, 1225 m, 2.IX.2011.
- 10 = Garajonay N.P., c. 5 km SSW of Hermigua, along road TF-711, mirador de el Rejo, wall of acidic stones, horizontal surface, steep N exposed outcrops and a *Myrica faya* tree, 28°07.53'N 17°12.44'W, 1190 m, 2.IX.2011.
- 11 = Garajonay N.P., c. 5.5 km SSW of Hermigua, along road TF-711, mirador del Bailadero, mixed trees along small trail and E exposed acidic outcrops, 28°07.39'N 17°12.65'W, 1050 m, 2.IX.2011.
- 12 = Garajonay N.P., N of alto del Garajonay, trail at starting point along road TF-713, just W of Alto de Contadero, trail to the north, to La Laguna Grande, in laurisilva, 28°07.09'N 17°15.15'W, 1030 m, 2.IX.2011.
- 13 = Garajonay N.P. (N edge), along secondary road from TF-713 near La Laguna Grande to visitors centre, mirador de Vallehermoso in laurisilva, 28°09.43'N 17°14.81'W, 1010 m, 3.IX.2011,
- 14 = SW of Agulo, visitors centre, garden with mixed trees and shrubs (e.g. *Rhamnus glandulosa*, *Teline linifolia*), 28°10.70'N 17°12.86'W, 875 m, 3.IX.2011.
- 15 = SW of Agulo, NE of visitors centre, near mirador de Agulo, *Erica* shrubs, sloping and facing sandstone and soil along small secondary road, 28°10.85'N 17°12.62'W, 705 m, 3.IX.2011.
- 16 = Garajonay N.P. (N edge), along secondary road from TF-713 near La Laguna Grande to the north (visitors centre), somewhat in the centre of laurisilva, 28°08.88'N 17°15.22'W, 670 m, 3.IX.2011.
- 17 = Garajonay N.P., N of alto del Garajonay, trail at starting point along road TF-713, just SE of Alto de Contadero, trail to the south, to the top of Garajonay, 28°06.74'N 17°14.69'W, 1435 m, 3.IX.2011.
- 18 = Garajonay N.P. (most western edge), NNE of Arure, mirador Alajero, edge of laurisilva with mainly *Erica arborea* and *Myrica faya*, 28°08.99'N 17°18.56'W, 1035 m, 4.IX.2011.
- 19 = E of Vallehermoso, along road to Agula, near Tamargada, N exposed steep outcrops along road, *Senecio kleinia* and two Palm trees, 28°09.00'N 17°18.56'W, 1005 m, 4.IX.2011.
- 20 = E of Vallehermoso, road to Agula, just E of Tamargada, along small paved (asphalt) road to the south, with *Juniperus* and *Erica* shrubs, outcrops and N exposed wall with big acidic stones, 28°11.43'N 17°13.87'W, 670 m, 4.IX.2011.
- 21 = 0.7 km S of Vallehermoso, small road to Garabato, a valley from N to S, with W exposed steep outcrops, 28°10.47'N 17°15.59'W, 280 m, 4.IX.2011.
- 22 = N of Alajeró, c. 1 km south of Imada, trail to Drago de Agalá, halfway from parking lot to the Dragon tree, steep N exposed outcrops along unpaved trail, steep W exposed outcrops along paved trail and S exposed sloping outcrops in field, 28°04.56'N 17°14.73'W, 945 m, 5.IX.2011.
- 23 = c. 1.2 km NNW of Imada, El Paso-Alajeró trail, from the main road (direction Alajeró) to the south, to Imada, trail on strong slope, with steep N exposed acidic outcrops and W exposed slope with shrubs and outcrops, 28°05.35'N 17°15.04'W, 1245 m, 5.IX.2011.
- 24 = Garajonay N.P., NE of Igualeto, near crossing TF-713 with road to the south, to Alajeró, c. 0.5 km to the south, roadside shrubs and trees at the edge of laurisilva, mainly *Erica arborea*, 28°06.16'N 17°14.80'W, 1350 m, 5.IX.2011.
- 25 = Garajonay N.P., NE of Igualeto, crossing TF-713 with road to the south, to Alajeró (starting point of trail to top of mountain 'Garajonay'), paved and unpaved trail with mainly *Erica arborea* shrubs and trees, 28°06.50'N 17°14.67'W, 1395 m, 5.IX.2011.
- 26 = La Gomera, Garajonay N.P., NE of Igualeto, crossing TF-713 with road to the south, to Alajeró (starting point trail to Los Roques and Imada), trail with mainly *Erica arborea* and *Myrica faya* shrubs and trees, 28°06.46'N 17°14.57'W, 1370 m, 5.IX.2011.
- 27 = Garajonay N.P., E of Las Hayas, trail in laurisilva from La Laguna Grande to the southeast, to the top of mountain Garajonay, 28°07.23'N 17°15.18'W, 1260 m, 6.IX.2011.
- 28 = NE of Valle Gran Rey, c. 1.5 km S of Arure, between two tunnels, along restaurant and mirador César Manrique, steep acidic outcrops on top of hill, 28°07.16'N 17°19.04'W, 720 m, 6.IX.2011.

Localities of D. Ertz collections

- 29 = San Sebastián, road to Hermigua, La Gerode, path to Casas de Jaragán and Montaña Ismael, 28°07'45"N 17°08'50"W, 642 m, 29.III.2011.
- 30 = La Laja, Mirador de la Laja (Degollada de Peraza), 28°05'58"N 17°11'05"W, 965 m, 29.III.2011.
- 31 = Cumbre de Tajaque, near Mirador de Agando, 28°06'38"N 17°13'05"W, 1216 m, 30.III.2011.
- 32 = N of Imada, trail E of the island summit (Garajonay), W of the road from Alajero to Vallehermoso, 28°06'31"N 17°14'37"W, 1397 m, 30.III.2011.
- 33 = San Sebastián de la Gomera, Roque de Berruga, 28°05'34"N 17°11'17"W, 870 m, 30.III.2011.
- 34 = Hermigua, Mirador de Los Roques, 28°06'34"N 17°12'51"W, 1103 m, 30.III.2011.
- 35 = Vallehermoso, Chorros de Epina, trail "Ermita San Isidro" to Alojera, 28°09'46"N 17°17'56"W, 833 m, 31.III.2011.
- 36 = Vallehermoso, Montaña de los Manantiales, trail to Vallehermoso, 28°08'53"N 17°17'07"W, 990 m, 31.III.2011.
- 37 = Vallehermoso, S of La Meseta, trail from the crest road to Vallehermoso, at the limit of the Parque Nacional de Garajonay, 28°09'06"N 17°16'57"W, 872 m, 31.III.2011.
- 38 = N of Las Hayas, S of the road from Vallehermoso to Playa de Santiago, along the trail to Arure, 28°08'51"N 17°17'27"W, 1065 m, 31.III.2011.
- 39 = Las Rosas, Parque Nacional de Garajonay, along road going from S to N, S of Mirador de Vallehermoso, in laurisilva. 28°08'29"N 17°15'03"W, 1065 m, 31.III.2011.
- 40 = Las Rosas, Parque Nacional de Garajonay, Mirador de Vallehermoso, 28°09'25"N 17°14'43"W, 1044 m, 31.III.2011.
- 41 = Hermigua, Mirador del Bailadero, 28°07'24"N 17°12'32"W, 1015 m, 1.IV.2011.
- 42 = Arure, Mirador de Alojera, 28°09'04"N 17°18'30"W, 980 m, 2.IV.2011.
- 43 = Arure, trail N of Mirador Ermita del Santo, 28°07'55"N 17°19'23"W, 810 m, 2.IV.2011.
- 44 = N of Las Hayas, Las Creces, laurisilva, 28°08'21"N 17°17'12"W, 1085 m, 2.IV.2011.
- 45 = Vallehermoso, La Meseta, at the limit with the "Parque Nacional de Garajonay", 28°09'N 17°17'W, 720 m, 4.IV.2011.
- 46 = Vallehermoso, S of the road to Las Rosas and W of Roque El Cano, dry vegetation with *Juniperus*, 28°10'55"N 17°15'41"W, 200 m, 4.IV.2011.
- 47 = N of Las Rosas, N of the road to Vallehermoso, near Canada Cabrera, 28°11'33"N 17°13'50"W, 600 m, 4.IV.2011.
- 48 = NW of Imada, Raso Grande, volcanic outcrop, 28°05'36"N 17°14'52"W, 1288 m, 5.IV.2011.
- 49 = NW of Imada, NE of Erquito, volcanic outcrop, 28°05'20"N 17°15'20"W, 1164 m, 5.IV.2011.
- 50 = Hermigua, Bosque del Cedro, laurisilva, 28°07'02"N 17°14'31"W, 1310 m, 5.IV.2011.
- 51 = San Sebastián, N of road to Hermigua, La Gerode, path to Casas de Jaragán and Montaña Ismael, 28°07'44"N 17°08'43"W, 630 m, 6.IV.2011.

Localities Herbarium Geneva (G) - Collectors: H&P = *Hernández & Pérez*; D&H = *Defago Paroz & Hainard*; PhC = *Clerc*.

- 52 = Alajero, Lomo de la Mulata, 1320-1340 m, Pine plantations, 23.IX.1986. PhC.
- 53 = Hermigua, Cabezo Alto, 900-1000 m, windy ridge, 27.IX.1986. PhC.
- 54 = Hermigua, El Cedro, Las Mimbreras, Laurisilva, 27.IX.1986. PhC.
- 55 = Hermigua, Cabezo del Pajarito, 1400 m, Fayal-Brezal, 20.IX.1986. PhC.
- 56 = Hermigua, Bosque El Cedro, 850-900 m, cultivated landscape 5.X.1986. PhC.
- 57 = Hermigua, Montana Quemada, above El Carmen, rocky slope, 1000-1100 m, 27.IX.1986. PhC.
- 58 = Garajonay N. P., La Carbonera, 700 m, I.2007. H&P.
- 59 = Garajonay N. P., Cumbre del Carbonero, 900-1000 m, I.2007. D&H.
- 60 = Garajonay N. P., Sobre Los Loros, 900 m, I.2007. D&H.
- 61 = Valle Gran Rey, Las Cabecillas, 1080 m, 23.IX.1986. PhC.
- 62 = Versant N. du Mt. Garajonay, Barranco del Cedro, Caurisilve, 1250 m, 7.IV.2004. D&H.
- 63 = Vallehermoso, Mirador de Igualeiro, dry slope, 25.IX.1986. PhC.
- 64 = Vallehermoso, Montana de la Zarza, Fayal-Brezal, 900 m, 26.IX.1986. PhC.

Localities Herbarium Oslo (O) - Collectors: D = *Dahl*; K&Ø = *Krog & Østhaugen*.

- 65 = Cerco de Armas above Arure, 950 m, in *Erica arborea* forest, 11.I.1973. D.
- 66 = Monte de la Zarza, S. of Vallehermoso, *Laurus* forest, 1000 m, 11.I.1973. D.
- 67 = La Atalaya, S. of Hermigua, 980 m, 12.I.1973. D.
- 68 = Lomo del Lomito Plantado, S. of Quemado, 1100 m, 16.IV.1978. K&Ø.
- 69 = Bco De la Calle del Monte below Cabeso Alto, 850-900 m, in Laurel forest, 16.IV.1978. K&Ø.