Studies in Hyaloscyphaceae associated with major vegetation types in the Canary Islands I: Cistella and Hyphodiscus

Authors: Quijada, Luis, Huhtinen, Seppo, and Beltrán-tejera, Esperanza

Source: Willdenowia, 45(1) : 131-146

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.45.45114

LUIS QUIJADA[1*], SEPPO HUHTINEN[2] & ESPERANZA BELTRÁN-TEJERA[1]

Studies in *Hyaloscyphaceae* associated with major vegetation types in the Canary Islands I: *Cistella* and *Hyphodiscus*

Abstract

Quijada L., Huhtinen S. & Beltrán-Tejera E.: Studies in *Hyaloscyphaceae* associated with major vegetation types in the Canary Islands I: *Cistella* and *Hyphodiscus*. – Willdenowia 45: 131–146. 2015. – Version of record first published online on 27 March 2015 ahead of inclusion in April 2015 issue; ISSN 1868-6397; © 2015 BGBM Berlin-Dahlem.

DOI: http://dx.doi.org/10.3372/wi.45.45114

A contribution to the knowledge of *Cistella* and *Hyphodiscus* in the Canary Islands is presented. Seven species are reported as new to the Canary Islands and to the Macaronesian Region: *Cistella dentata*, *C. grevillei*, *C. mali*, *C. hungarica*, *C. pediformis*, *C. tenuicula* and *Hyphodiscus hymeniophilus*. Descriptions and illustrations of these species based on our own observations and a key to the species currently known from the Canary Islands are provided. Closely related species are briefly discussed.

Additional key words: *Ascomycota*, diversity, *Helotiales*, identification key, Macaronesia, taxonomy, Tenerife

Introduction

Nannfeldt (1932) classified the family *Hyaloscyphaceae* in three tribes: *Arachnopezizeae*, *Hyaloscypheae* and *Lachneae*. The family members are saprophytic, distinguished by their small apothecia covered by well-differentiated hairs, inoperculate asci, and ectal excipulum composed of *textura prismatica*. A recent phylogenetic study of *Hyaloscyphaceae* based on ITS and LSU rDNA, RPB2, and mtSSU sequences, suggested the family is not monophyletic and should be tentatively restricted to the single genus *Hyaloscypha* Boud. (Han & al. 2014). However, the relationship among supported clades in *Hyaloscypheae*, and its relationships with other helotialean genera, were not strongly supported based on maximum likelihood and/or parsimony bootstrap and thus the limits of the family are not resolved. To solve the relationships and limits of families in *Helotiales*, more taxa should be sequenced, the low number of representative species for each genus being the main problem. Therefore, we here refer to *Hyaloscyphaceae* in the sense of Raitviir (2004). The molecular data suggest that *Hyphodiscus* Kirschst. is closely related to *Hyphopeziza* J. G. Han & al., *Venturiocistella* Raitv. and members of *Calycellina* Höhn., *Calycina* Nees ex Gray, *Hamatocanthoscypha* Svrček, *Microscypha* Syd. & P. Syd, *Mollisina* Höhn. ex Weese and *Phialina* Höhn. *Cistella* Quél. is suggested to be closely related to *Urceolella* Boud. (Han & al. 2014). The generic type species of *Cistella* and *Hyphodiscus*, however, have not been included in any phylogenetic analyses.

The knowledge of the diversity of *Hyaloscyphaceae* s.l. in the Canary Islands is a compendium of reports in different journals and books, with 21 species distributed in 12 genera (Beltrán-Tejera 2010; Pärtel & Põldmaa 2011). Two species are endemic: *Hyphodiscus pinastri* R. Galán & Raitv. and *Lachnum canariense* Urries. Until

1 Department of Botany, Ecology and Plant Physiology, University of La Laguna, 38071 La Laguna, Tenerife, Canary Islands, Spain; *e-mail: lquijull@gmail.com (author for correspondence), ebeltran@ull.edu.es
2 Herbarium, University of Turku, FI-20014 Turku, Finland; e-mail: sephuh@utu.fi

the present study, the most diverse genera were *Arachnopeziza* Fuckel, with four species, and *Hyaloscypha* Boud. and *Lachnum* Retz., with three species each.

Cistella and *Hyphodiscus* are two of the approximately 70 genera included in the family *Hyaloscyphaceae* s.l. (Nannfeldt 1932). *Cistella* is a widespread genus with 38 species, while *Hyphodiscus* contains ten species in the temperate N hemisphere (Raitviir 2004; Kirk & al. 2008; Huhtinen & al. 2010). Members of both genera are easily overlooked and occur on a great diversity of substrates, e.g. deciduous and coniferous trees (wood, bark, cones), herbaceous stems, fallen leaves and needles, ferns and fruit bodies of *Antrodia* P. Karst., *Botryobasidium* Donk, *Stereum* Hill ex Pers., etc. (Baral 1993; Raitviir 2004; Hosoya & al. 2011; Pärtel & Põldmaa 2011). *Hyphodiscus* was also recently reported from mosses (Huhtinen & al. 2010). Both genera have rather similar, cylindric to clavate, septate hairs.

The morphological concept of hair vesture varies for each author, in *Hyphodiscus* from tuberculate warts (Baral 1993) to rod-like granules (Zhuang 1988), and in *Cistella* from cyanophilous needle-like spines to acyanophilous spines or warts (Huhtinen & Söderholm 1997). The type of hair and ectal excipulum allows the two genera to be distinguished. *Hyphodiscus* has a gelatinized ectal excipulum, and a more or less parallel intricate texture, whereas *Cistella* has a non-gelatinized excipulum with a texture from *prismatica* to *angularis* (Raitviir 2004).

The aim of this investigation is to contribute to the knowledge of both the genera *Cistella* and *Hyphodiscus* in the Canary Islands, providing detailed descriptions, ecological data and a useful identification key for the species known to occur in this archipelago.

Material and methods

All samples were collected on the island of Tenerife (Canary Islands, Spain) from 2008 to 2014. During this six-year period, four types of vegetation, from sea-level to mountain summits, were monitored: (1) *Euphorbia* scrub (three different units); (2) evergreen laurel forest (dry, *Erica platycodon* ridge-crest, humid, and hygrophilous); (3) Canary pine woodland (typical, humid, and with summit broom scrub); and (4) Meso-oromediterranean summit broom scrub (Del Arco & al. 2006, 2010). About ten localities of each type were sampled in the rainy season (September to May) and in the dry season (June to August) along an altitudinal transect (50–2800 m) on both northern and southern slopes.

Descriptions were done according to Huhtinen (1989); vital study and abbreviations follow Baral (1992). Data collection and macro- and microscopic methods follow Quijada & al. (2012). Measurements for each character are given in the format (*a*–)*b*–*c*(–*d*), where *a* = the smallest single measurement, *b* = the smallest value for percentile of 95 %, *c* = the largest value for percentile of 95 %, and *d* = the largest single measurement. For asci and ascospores the *mean* is added in italics between the smallest and the largest value for percentile of 95 %. Wherever possible, biometric values are based on ≥ 10 measurements for each character on an individual specimen. The {number of studied specimens} is indicated in curly brackets, except if only one collection was found. Distribution of treated species was explored using the bibliography of this article, as well as The Global Biodiversity Information Facility (GBIF, http://www.gbif.org/). Specimens are deposited at the Mycological Section of the Herbarium of the University of La Laguna (TFC Mic). Colour coding refers to ISCC-NBS (1976). Municipalities and place names for localities were looked up in IDECanarias visor 3.0 (http://visor.grafcan.es/visorweb/).

Abbreviations used are as follows: * = living state; † = dead state; CR = aqueous congo red; CRB = aqueous cresyl blue; f.g. = frequency of guttules content between 0–90 % according to Baral & Marson (2005); idem = the same; KOH = potassium hydroxide; LUG = Lugol's solution; MLZ = Melzer's reagent; pop. = populations; *t.* = *textura*.

Main specimen collectors are abbreviated as follows: CQ = Camilo Quijada; EBT = Esperanza Beltrán-Tejera; JDA = Jonathan Díaz-Armas; LQ = Luis Quijada; RN = Rubén Negrín.

Vegetation types sampled

1. *Euphorbia* scrub — This is composed of succulent plants (*Aeonium lindleyi* (Webb & Berthel.) Webb & Berthel., *A. pseudourbicum* Bañares, *Euphorbia atropurpurea* Brouss. ex Willd., *E. balsamifera* Aiton, *E. canariensis* L., *E. lamarckii* Sweet, *Kleinia neriifolia* Haw.) accompanied very often by other woody plants (*Artemisia thuscula* Cav., *Periploca laevigata* Aiton, *Rubia fruticosa* Aiton) and occasionally by aphyllous or spiny shrubs (*Launaea arborescens* (Batt.) Murb., *Lycium intricatum* Boiss.). This vegetation, mostly of endemic species (> 50 %), is developed in the lower elevations, between 0–400 m on the northern slopes, and between 0–1000 m on the southern slopes. The mean annual precipitation is 50–300 mm and mean temperature ranges vary between 11–18 °C. We have sampled three different units: (1.1) *Euphorbia balsamifera* scrub; (1.2) *Euphorbia canariensis* scrub; and (1.3) *Euphorbia atropurpurea* scrub.

2. Evergreen laurel forest — This is a cloud forest that develops under the influence of NE trade winds. It is composed of perennial broadleaved laurifolious trees (*Apollonias barbujana* (Cav.) Bornm., *Ilex canariensis* Poir., *Laurus novocanariensis* Rivas Mart. & al., *Morella*

faya (Aiton) Wilbur, *Ocotea foetens* (Aiton) Baill., *Persea indica* (L.) Spreng., *Picconia excelsa* (Aiton) DC., *Prunus lusitanica* subsp. *hixa* (Willd.) Franco, etc.) and also, at the top of the ridges, by ericoid species (*Erica arborea* L., *E. platycodon* (Webb & Berthel.) Rivas Mart. & al.). This vegetation develops between 350–1500 m on the northern slopes. The mean annual precipitation is 500–1200 mm and mean temperature ranges between 13–18 °C. We have sampled four different units: (2.1) dry; (2.2) *Erica platycodon* ridge-crest; (2.3) humid; and (2.4) hygrophilous.

3. Canary pine woodland — This is an open formation characterized by *Pinus canariensis* C. Sm. Its undergrowth is poor in species diversity compared with other vegetal communities, and typical shrub species in this woodland are *Chamaecytisus proliferus* (L. f.) Link, *Cistus monspeliensis* L. and *C. symphytifolius* Lam. It grows without the influence of trade-wind clouds on the northern slopes, between 1500–2000 m, widening its altitudinal range on the southern slopes, between 900–2250 m. The mean annual precipitation is 450–550 mm and mean temperature ranges between 11–15 °C. We have sampled three different units: (3.1) typical; (3.2) humid; and (3.3) with summit broom scrub.

4. Meso-oromediterranean summit broom scrub — This is characterized by harsh climatic conditions (high day/night temperature contrast) and is dominated by legume species (*Adenocarpus viscosus* (Willd.) Webb & Berthel., *Spartocytisus supranubius* L. f.), also very frequent being *Descurainia bourgeauana* (E. Fourn.) O. E. Schulz and *Pterocephalus lasiospermus* Link and the emblematic endemic *Echium wildpretii* Hook. f. "Meso-oromediterranean" is a thermotype, "meso" refers to the temperature average in the mid-level zone (11–18 °C), and "oro" in the upper zone (3.5–11 °C). It is developed at the top of the island of Tenerife, between 2000–2700 m on the southern slope and between 2200–3250 m on the northern slope. The annual precipitation is 350–500 mm (snow and frost are common) and mean temperature ranges between 6–11 °C.

Results

Cistella dentata (Pers.) Quél., Enchir. Fung.: 319. 1886. – Fig. 1.

Description — Apothecia 0.4–0.9 mm in diam., 0.1–0.4 mm high, subgregarious to gregarious, discoid, with broad attachment, yellow-grey (93.yGy) to greyish yellow (91.gy.Y), margin whitish, conspicuously dentate due to groups of cohering hairs. Hairs cylindric, 2- or 3(or 4)-septate, straight to slightly sinuous; apical cell densely spiny, smooth below, spines 0.5–0.8(–1.7) × 0.2–0.4 µm, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(20–)27.7–51.3(–61.5) × 2.4–4.2 µm, at margin *53.2–65.3(–68.2) × 2.7–4.2 µm. Asci *(49.5–)56.6–*60*–63.4(–66.7) × 5.2–*5.7*–6.2 µm, †43.5–*47*–48.7(–51) × 4–*4.4*–5.1 (*n* = 10) µm; cylindric-clavate, 8-spored, spores 2-seriate, *pars sporifera* *14–22 µm, pore amyloid in MLZ and LUG with and without KOH pre-treatment; base long and tapering, arising from croziers. Ascospores *(6.4–)7.3–*8*–9.3 × 2–*2.3*–2.5(–2.9) µm, †6–*6.4*–6.7 × 1.6–*1.8*–2.1 µm (*n* = 10); cylindric-clavate, straight, aseptate, hyaline, thin-walled, multiguttulate at poles, f.g. (2–)4–7(–12) %. Paraphyses uninflated, cylindric to obtusely sublanceolate, hyaline, 2- or 3-septate; terminal cell *(17.8–)21–26(–29.6) × 1.9–3 µm, cell below *(11.5–)14.7–19.3(–20.3) × 1.4–2.3 µm; bifurcate at ascus base level, thin-walled, guttules scanty in terminal cell. Ectal excipulum at base and middle flanks *t. globulosa-angularis* to *t. prismatica*, *69–89 µm thick; at margin and upper flank *t. prismatica*, *14–24(–33) µm; hyaline to medium orange-yellow (71.m.OY) at base, without guttules, medium orange-yellow (71.m.OY) to strong yellowish brown (74.s.yBr) resinous exudates present at base and lower flank, dissolving in MLZ. Ectal cells *13–19(–26.2) × 8.4–10.5 µm at middle flank, wall thickness *0.4–0.8 µm; *(8.3–)10.2–13(–14.2) × 3.6–5.3(–6.7) µm at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Germany, Norway, Spain, Sweden, United Kingdom), Asia (Pakistan) and North America (United States); and from the S hemisphere in Australia. Growing on hardwood (*Acer* L., *Fagus* L., *Populus* L.) and unidentified herbaceous stems. Occurring from autumn to summer (Kanouse 1947; Dennis 1949; Spooner 1987; Cheype 2004; Raitviir 2004; GBIF; Stefan Blaser and Enrique Rubio pers. comm. in Ascofrance forum).

Remarks — *Cistella dentata* can be identified due to the conspicuously dentate apothecia growing on wood. The main differences to existing descriptions in the literature were found in the ascospores and asci. Dennis (1949) and Raitviir (2004) gave the same measurements for ascospores and asci, both longer than ours: 12–13 µm vs 6.4–9.3 µm and 80–90 µm vs 50–67 µm, respectively. On the other hand, illustrations and measurements in Baral & Marson (2005) and the recent reports in Ascofrance forum (Stefan Blaser and Enrique Rubio pers. comm.) fit better with our observations (ascospores 7.1–10.5 µm and asci 50–79 µm). The protologue of the basionym, *Peziza dentata* Pers. (Persoon 1798), shows the following measurements: asci 56–80 × 9–10 µm, ascospores 5–8 × 1–3 µm.

A similar species growing on wood is *Cistella granulosella* (P. Karst.) Nannf., but the apothecia are smaller without a dentate margin, the asci are shorter (40–50 µm), hairs are clavate and wider (3–6 µm) and spores are ellipsoid (Raitviir 2004). Taking into consideration the variability observed in the literature, we prefer to have a broad circumscription of *C. dentata*.

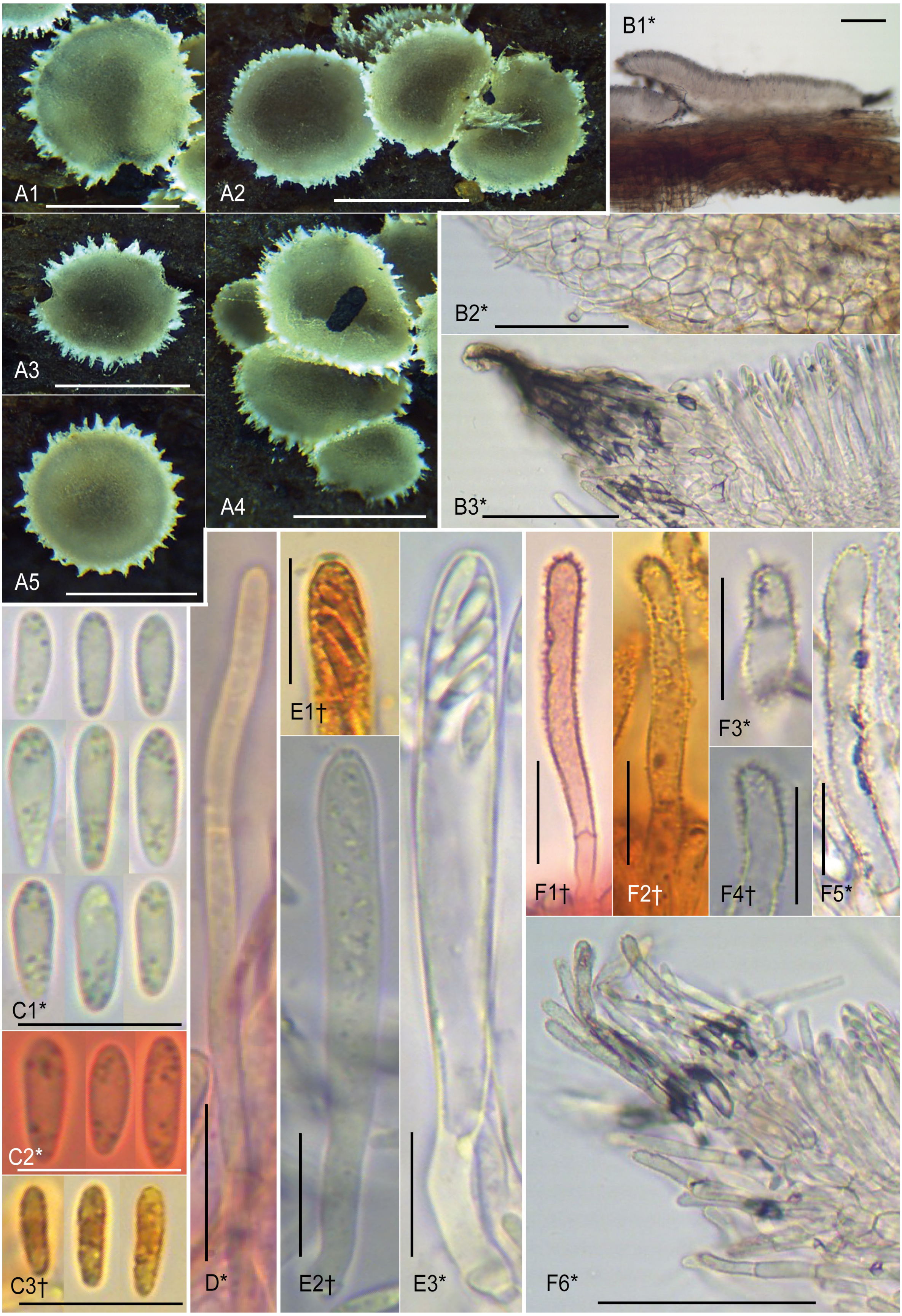

Fig. 1. Morphological features of *Cistella dentata*. – A: fresh apothecia; B: excipular tissues in section; C: ascospores; D: paraphyses; E: asci; F: hairs. – Scale bars: A1–5 = 500 µm; B1 = 100 µm; B2, 3, F6 = 50 µm; C1–3, D, E1–3, F1–5 = 10 µm. – Mounted in: C2, D, F1 = CR; B1–3, C1, E3, F3, 5, 6 = H_2O; E2, F4 = KOH; C3, E1, F2 = MLZ. – All photos from TFC Mic. 24518.

Specimen studied — Spain: Canary Islands: Tenerife: La Orotava, Los Lajones, 28°19'51"N, 16°29'37"W, 2060 m, Canary pine woodland with broom scrub, on bark and wood of *Spartocytisus supranubius*, 23 Mar 2014, *LQ, CQ & RN* (TFC Mic. 24518).

Cistella grevillei (Berk.) Raitv. in Scripta Mycol. 8: 151. 1979. – Fig. 2.

Description — Apothecia 0.2–0.3(–0.4) mm in diam., 0.1–0.2 mm high, scattered to gregarious, broadly sessile, white (263.White) to pink-white (9.PkWhite), margin shortly hairy. Hairs cylindric to subclavate, (1 or)2- or 3(or 4)-septate, straight to slightly sinuous, densely spiny, spines 0.6–0.8(–1.4) × 0.3–0.6 µm, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(14–)17.3–35 × 3.2–4.8 µm, at margin *(19.8–)24–37(–46.3) × 3.1–5 µm. Asci *(44.3–)46.2–*48*–49.5(–51.4) × 5.2–*5.6*–6.2 µm, †(30.4–)33–*35*–38(–41) × 3.4–*3.7*–4 µm (*n* = 10); cylindric, 8-spored, spores 2-seriate, *pars sporifera* *17.5–22.5 µm, pore amyloid in MLZ and LUG with and without KOH pre-treatment; arising from croziers. Ascospores *8–*8.8*–9.2(–9.8) × 1.6–*1.9*–2.1 µm, †5.3–*6.6*–7.9 × 1.3–*1.5*–1.7 µm (*n* = 10); cylindric to clavate, straight to slightly curved, aseptate, hyaline, thin-walled, multiguttulate at poles, f.g. (2–)4–20(–30) %. Paraphyses cylindric to sublanceolate, hyaline, 3- or 4-septate; terminal cell *(8.7–)11–14.3(–15.2) ×1.8–2.3 µm, cell below *10.3–13(–14.7) × 1.7–2.6 µm; not branched, thin-walled, without guttules. Ectal excipulum at base and middle flanks *t. angularis* to *t. prismatica*, *40–55 µm thick; at margin and upper flank *t. angularis* to *t. prismatica*, *12–28 µm; hyaline to yellow-white (92.yWhite), without exudates, each ectal cell in flank and margin containing 1 yellow refractive guttule (*0.9–2 µm in diam.). Ectal cells *10.4–14(–17.5) × 5.6–7.5(–8.4) µm at middle flank, wall thickness *0.3–0.5 µm; *(5.9–)7.8–10.3(–11.1) × 3.1–5.3 µm at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Austria, Denmark, Finland, France, Germany, Hungary, Iceland, Italy, Lithuania, Norway, Russia, Sweden, Switzerland, United Kingdom), Asia and North America; and from the S hemisphere in the Antarctic Peninsula. Growing on herbaceous stems (*Achillea* L., *Aconitum* L., *Adenostyles* Cass., *Angelica* L., *Cirsium* Mill., *Colobanthus* Bartl., *Deschampsia* P. Beauv., *Epilobium* L., *Heracleum* L., *Peucedanum* L., *Senecio* L., *Urtica* L., *Veratrum* L.). Occurring from spring to autumn, not in winter, and frequently from spring to summer (Raitviir 1970; Raschle 1978; Gamundi & Spinedi 1988; Hansen & Knudsen 2000; Raitviir 2004; Kutorga & Raitviir 2006; GBIF).

Remarks — Our samples match quite well with existing descriptions (Hansen & Knudsen 2000; Raitviir 2004). Raschle (1978) reported notably longer spores for his material (6–15 µm). The closest species is *Cistella hungarica*, but the differences to the Canarian specimen are: (1) ascospores in *C. grevillei* are longer (*8–9.8 µm vs *6.3–7.5 µm); (2) terminal cell in paraphyses in *C. grevillei* are shorter (*8.7–15.2 µm vs *12.5–21.3 µm); and (3) colour of apothecia is white in *C. grevillei* and yellowish in *C. hungarica*. Ascus and ascospore size were used by Raitviir (2004) to distinguish between the two taxa, and this view is followed here, whereas Raschle (1978) reported exceptionally large variability for ascus length.

Specimen studied — Spain: Canary Islands: Tenerife: Candelaria, Lomo Colorado, 28°24'37"N, 16°24'21"W, 1430 m, humid Canary pine woodland, in standing remains of inflorescence of unidentified *Asteraceae*, 12 Mar 2014, *RN* (TFC Mic. 24514).

Cistella hungarica (Rehm) Raitv. in Scripta Mycol. 8: 151. 1979. – Fig. 3.

Description — Apothecia (0.2–)0.4–0.5(–0.6) mm in diam., 0.2–0.3 mm high, gregarious to crowded, with broad attachment, sessile to very shortly stipitate, brilliant yellow (83.brill.Y) to brilliant orange-yellow (67. brill.OY), margin shortly hairy, whitish. Hairs cylindric to subclavate, (0 or)1- or 2-septate, straight to slightly sinuous, densely spiny at apex with smooth areas below, spines 0.3–0.8 × 0.1–0.3 µm {3}, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(9.2–)12.7–24.7(–36.2) × 2.7–4.1(–4.8) µm {3}, at margin *(21.6–)32–43(–57) × 3.2–4.1(–4.7) µm {3}. Asci *(37–)41.2–*45*–47(–48) × 4.7–*5*–5.7 µm (*n* = 46, from 3 pop.), †30–*33*.4–35.6(–37.6) × 3.3–*3.7*–4.6 µm (*n* = 20, from 3 pop.); cylindric-clavate, 8-spored, spores 2-seriate, *pars sporifera* *18–21 µm, pore amyloid in MLZ and LUG with and without KOH pre-treatment; base short, arising from croziers. Ascospores *6.3–*7*–7.5 × 2–*2.2*–2.5 µm (*n* = 35, from 3 pop.), †5.7–*6.3*–6.8 × 1.3–*1.5*–1.6 µm (*n* = 30, from 3 pop.); subcylindric to clavate, straight, aseptate, hyaline, thin-walled, without guttules. Paraphyses cylindric to lanceolate, hyaline, 2- or 3(or 4)-septate; terminal cell *(12.5–)14.5–20(–21.3) × 1.9–2.6 µm {3}, cell below *(9–)10–13(–15) × 1.3–1.8(–2) µm {3}; not branched, thin-walled, with low-refractive guttules in tap water, clearly visible in CRB. Ectal excipulum at base and middle flanks *t. globulosa-angularis* to *t. prismatica*, *34–51 µm {3} thick; at margin and upper flank *t. angularis* to *t. prismatica*, *16–25 µm {3}; hyaline to light yellow (86.l.Y), without exudates and guttules. Ectal cells *(9.8–)13.3–18.3(–21.4) × (6.1–)7.5–10.3(–11.7) µm {3} at middle flank, wall thickness *0.4–1 µm; *7.8–9.3 × 3.5–5.1 µm {3} at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Denmark, Hungary, Lithuania) and

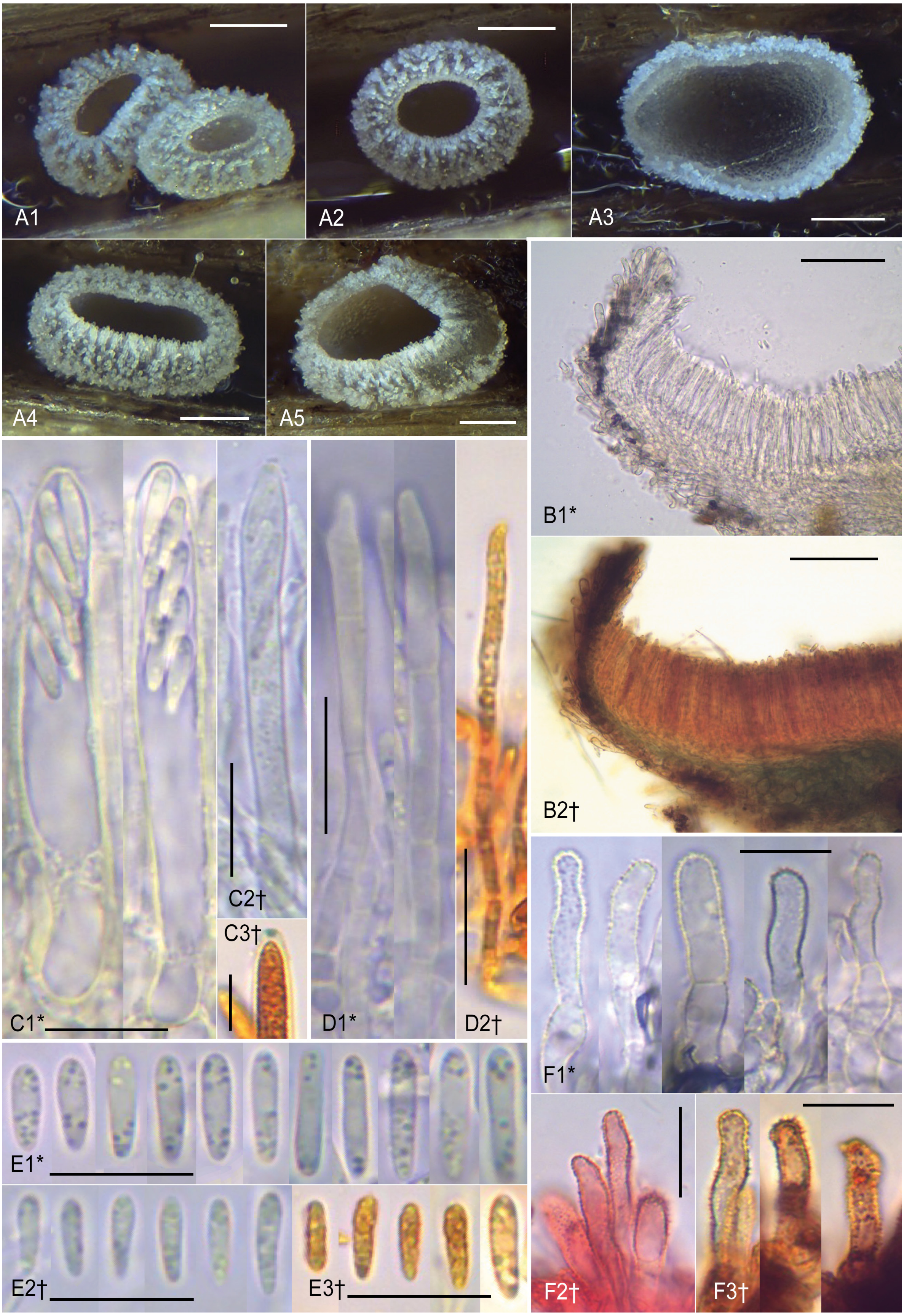

Fig. 2. Morphological features of *Cistella grevillei*. – A: fresh apothecia; B: excipular tissues in section; C: asci; D: paraphyses; E: ascospores; F: hairs. – Scale bars: A1–5 = 100 µm; B1, 2 = 50 µm; C1, 2, D1, 2, E1–3, F1–3 = 10 µm; C3 = 5 µm. – Mounted in: F2 = CR; B1, C1, D1, E1, F1 = H_2O; C2, E2 = KOH; B2, C3, D2, E3, F3 = MLZ. – All photos from TFC Mic. 24514.

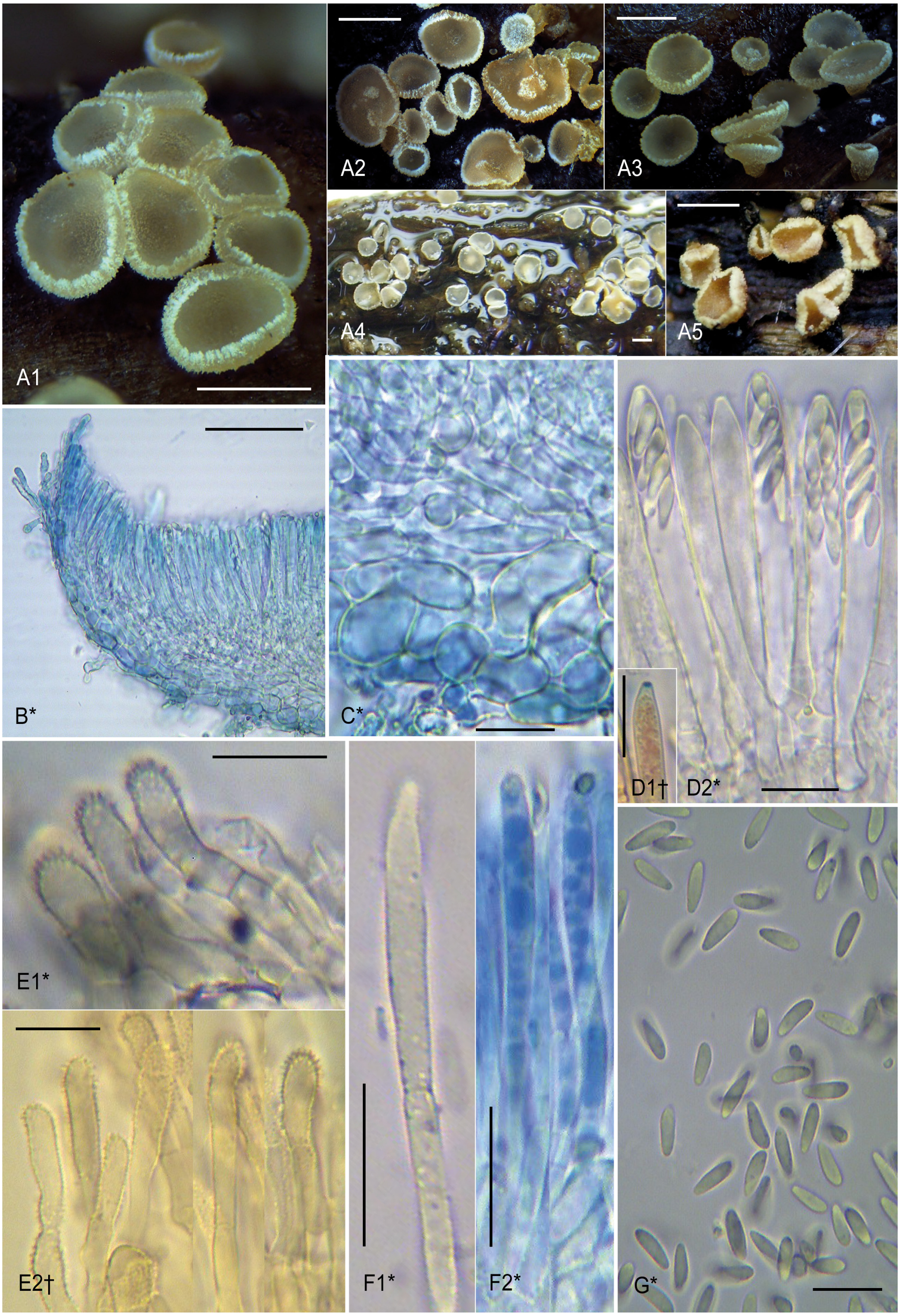

Fig. 3. Morphological features of *Cistella hungarica*. – A: fresh apothecia; B: excipular tissues in section; C: ectal excipulum at lower flank; D: asci; E: hairs; F: paraphyses; G: ascospores. – Scale bars: A1–5 = 500 µm; B = 50 µm; C, D1, 2, E1, 2, F1, 2, G = 10 µm. – Mounted in: B, C, F2 = CRB; D2, E1, F1, G = H_2O; D1, E2 = MLZ. – Photos: A4, 5 = TFC Mic. 19288; A1–3, B, C, D1, 2, E1, 2, F2, G = TFC Mic. 23709; F1 = TFC Mic. 23965.

Asia (China). Growing on herbaceous stems (*Aegopodium* L., *Filipendula* Mill., *Heracleum*, *Polygonatum* Mill., *Reynoutria* Houtt., *Urtica*). Occurring from spring to summer (Raitviir 1970, 2004; Kutorga & Raitviir 2006; GBIF).

Remarks — *Cistella hungarica* could be confused with *C. grevillei* (see remarks under the preceding species); in fact, some authors treat both species as synonymous (Hansen & Knudsen 2000), but here we prefer to use Raitviir's concept for *Cistella* species. The differences that Raitviir (2004) pointed out seem to distinguish the two species: ascospores and asci are shorter in *C. hungarica* (6–8 µm vs 8–10 µm and 28–42 µm vs 43–56 µm, respectively).

Specimens studied — Spain: Canary Islands: Tenerife: Guía de Isora, La Pedrera, 28°13'58"N, 16°42'02"W, 2180 m, mesomediterranean summit broom scrub, in hollow, standing remains of inflorescence of *Echium wildpretii*, near the base, 7 Mar 2008, *LQ, EBT, JDA & al.* (TFC Mic. 19288); idem, La Orotava, Cañada del Monton de Trigo, 28°13'46"N, 16°36'40"W, 2200 m, 5 Nov 2012, *LQ & CQ* (TFC Mic 23709); idem, Roques Blancos, 28°14'00"N, 16°38'23"W, 2190 m, idem, 21 Feb 2013, idem (TFC Mic 23847); idem, Vilaflor, Mesa de Ucanca, 2450 m, 28°12'11"N, 16°37'41"W, idem, 19 Mar 2013, idem (TFC Mic 23965).

Cistella mali (Rehm) Nannf. in Nova Acta Regiae Soc. Sci. Upsal., ser. 4, 8(2): 270. 1932. – Fig. 4.

Description — Apothecia 0.4–0.6(–1) mm in diam., 0.2–0.3 mm high, scattered, broadly sessile, discoid, with narrow attachment, yellow-white (92.yWhite) to deep greyish yellow (91.d.gy.Y), margin shortly hairy, whitish. Hairs cylindric to subclavate, 0- or 1-septate, straight to slightly sinuous; spiny on whole cell, spines 0.5–1.1 × 0.1–0.3 µm, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(16.2–)17.6–27.4(–30) × 2.3–2.5(–3.1) µm, at margin *24.7–33.2(–35.6) × 2.8–3.9 µm. Asci *(50–)55.7–*60*–63.4(–68.4) × 6.9–*7.5*–8.1 µm, †45.3–*47*–49.3(–51) × 5.1–*5.7*–6 µm ($n = 10$); cylindric-clavate, 8-spored, spores 2-seriate, *pars sporifera* *22–30 µm, pore inamyloid; base short, arising from croziers. Ascospores *9.8–*12*–13(–14.8) × 2.4–*2.9*–3.2 µm, †8.4–*9.5*–10.1(–11) × 2–*2.3*–2.6 µm ($n = 10$); cylindric to subcylindric, straight or slightly curved, 0- or 1-septate (equatorial septum), hyaline, thin-walled, with 4–8(–13) guttules (*0.4–1.2 µm in diam.), f.g. (7–)12–20(–30) %. Paraphyses slightly clavate to obtusely lanceolate, hyaline, 2-septate; terminal cell *(19.5–)21.5–26.3(–29) × 2–3.3 µm, cell below *(9.3–)12–15.4(–19) × 1.4–2.3 µm; branched at ascus base level, thin-walled, guttules scanty. Ectal excipulum at base and middle flanks *t. globulosa-angularis* to *t. prismatica*, *44–75 µm thick; at margin and upper flank *t. prismatica*, *(9.6–)12–16(–19) µm; hyaline to light orange-yellow (70.l.OY), without exudates or guttules. Ectal cells *(11.9–)13.2–16(–17.1) × (5.5–)6.2–8.7(–11)µm at middle flank, wall thickness *0.3–0.7 µm; *(6–)6.6–9.2(–11.8) × (2.6–)3.2–4.6 (–5.8) µm at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Germany, United Kingdom). Growing on hardwood (*Pyrus* L.). Occurring from winter to spring (Dennis 1949; Raitviir 1970; GBIF).

Remarks — Few species of *Cistella* have been reported to have inamyloid asci: *C. calyptrata* (Svrček) Raitv. and *C. typhae* (Svrček) Raitv. in Raitviir (2004); *C. chlorosticta* (E. P. Fr. ex Cooke) Nannf. and *C. mali* in Baral & Marson (2005). Our samples match well with the description of *C. mali* in Dennis (1949); the main difference is the length of the hairs (up to 35 µm vs 15 µm). *Cistella chlorosticta* has shorter and narrower ascospores (Phillips 1891) and *C. calyptrata* and *C. typhae* have shorter asci (Raitviir 2004).

Specimen studied — Spain: Canary Islands: Tenerife: Buenavista del Norte, Lomo las Toldas, 28°21'33"N, 16°53'58"W, 180 m, *Euphorbia balsamifera* scrub, in detached succulent remains of *E. canariensis* covered with bark on ground, 27 Dec 2012, *LQ & CQ* (TFC Mic. 23830).

Cistella pediformis Raitv. in Folia Cryptog. Estonica 12: 3. 1981. – Fig. 5.

Description — Apothecia 0.3–0.5(–0.7) mm in diam., up to 0.15 mm high, scattered, with broad attachment, brilliant yellow (83.brill.Y) to deep orange-yellow (69.d.OY), margin shortly hairy, whitish. Hairs cylindric to subclavate, (0 or)1- or 2-septate, straight to slightly sinuous near apex, apex sparsely with spines, smooth below, spines 0.3–1.4 × 0.1–0.3 µm {3}, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(12–)22.3–34.5(–44) × 3.1–4.6 µm {3}, at margin *(30–)52–62(–91.7) × 3–3.8(–4.7) µm {3}. Asci *(46.3–)53–*54.5*–56(–63) × (5.3–)6.5–*6.6*–7.3 µm ($n = 30$, from 3 pop.), †(37–)41–*43.4*–46(–48.8) × 4.2–*4.8*–5.8 µm ($n = 20$, from 3 pop.); cylindric-clavate, 8-spored, spores 2-seriate, *pars sporifera* *26–39 µm, pore inamyloid; base short, arising from croziers. Ascospores *(8.4–)11.6–*12*–12.4(–13.8) × 2.4–*3*–3.6 µm ($n = 45$, from 3 pop.), †(7.6–)9.4–*10.3*–11(–12.6) × 2–*2.4*–2.5(–3.1) µm ($n = 40$, from 3 pop.); cylindric-clavate to fusiform-clavate (pediform), medium curved, aseptate (over-mature 1-septate), hyaline, thin-walled, with tiny guttules, f.g. 1–10 %. Paraphyses uninflated cylindric to obtusely sublanceolate, hyaline, 3- or 4-septate; terminal cell *(16.4–)17.6–25.6(–29.6) × 1.9–3 µm {3}, cell below *10.6–13.8(–14.5) × 1.6–2.4 µm {3}; not branched, thin-walled, with low-refractive guttules in tap

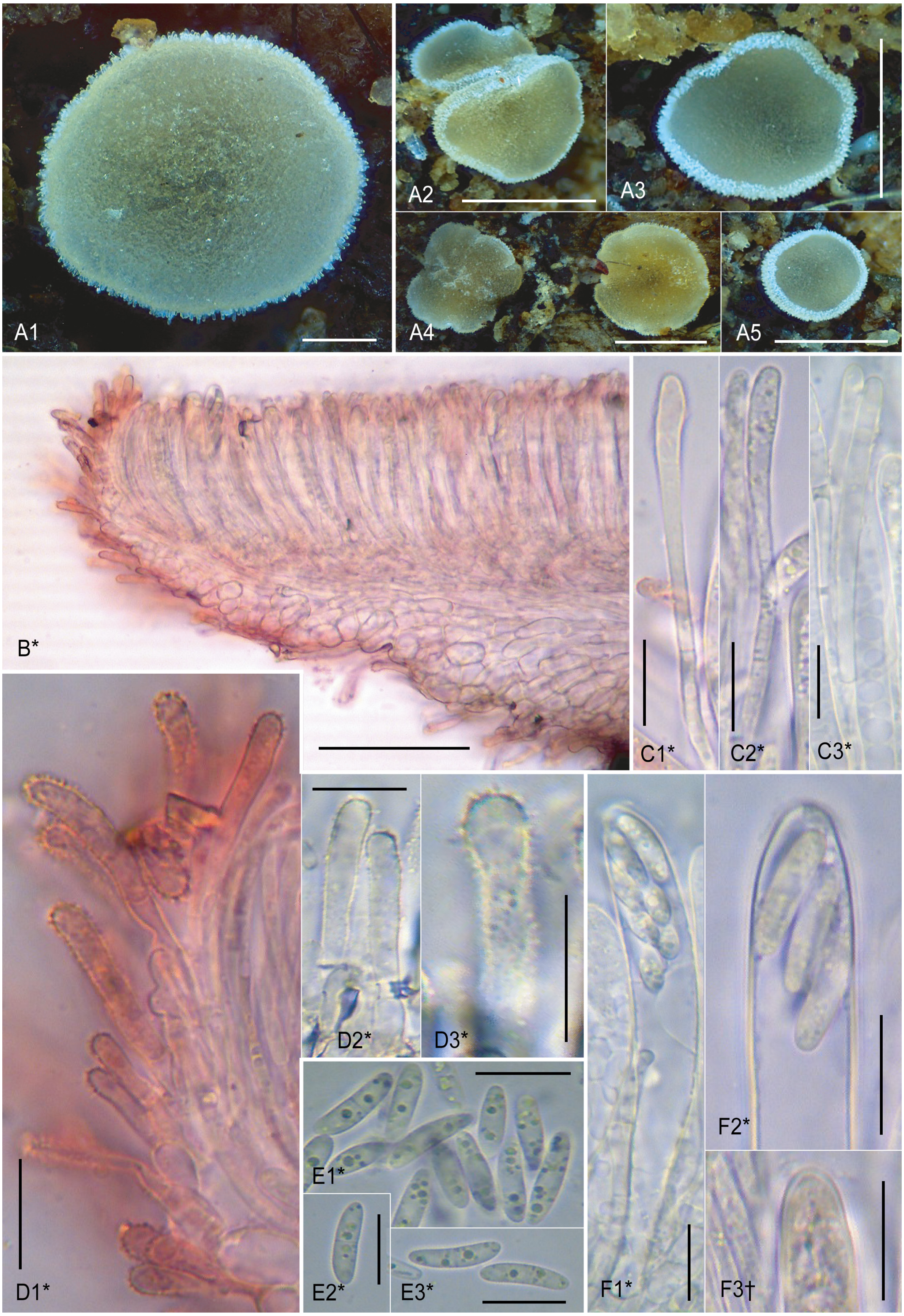

Fig. 4. Morphological features of *Cistella mali*. – A: fresh apothecia; B: excipular tissues in section; C: paraphyses; D: hairs; E: ascospores; F: asci. – Scale bars: A2–5 = 500 µm; A1 = 100 µm; B = 50 µm; C1–3, D1–3, E1–3, F1–3 = 10 µm. – Mounted in: B, C1, D1 = CR; C2, 3, D2, 3, E1–3, F1, 2 = H_2O; F3 = MLZ. – All photos from TFC Mic. 23830.

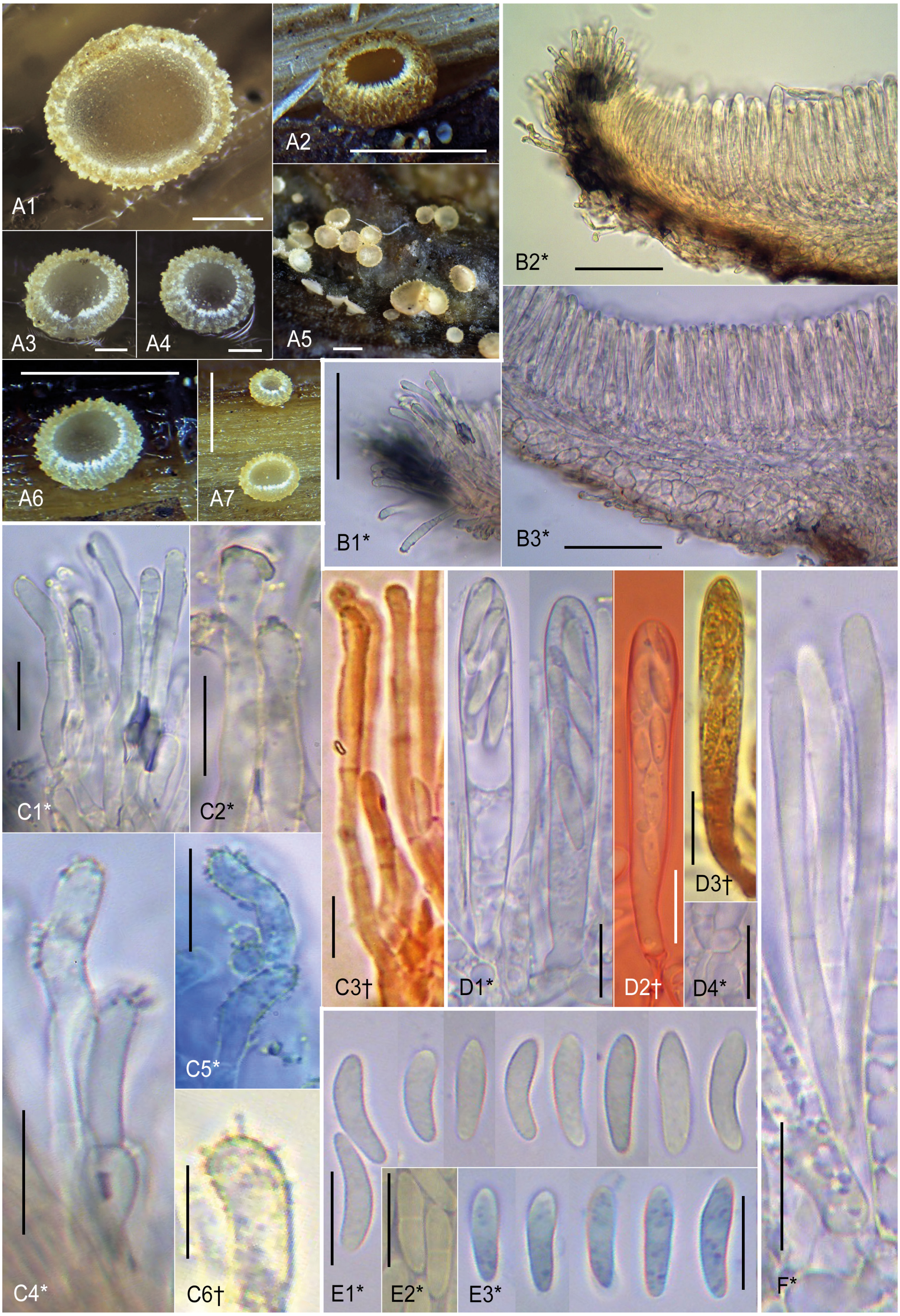

Fig. 5. Morphological features of *Cistella pediformis*. – A: fresh apothecia; B: excipular tissues in section; C: hairs; D: asci; E: ascospores; F: paraphyses. – Scale bars: A2, 5–7 = 500 µm; A1, 3, 4 = 100 µm; B1–3 = 50 µm; C1–5, D1–4, E1–3, F = 10 µm; C6 = 5 µm. – Mounted in: C3, D2 = CR; C5, E3 = CRB; B1, 3, C1, 2, 4, D1, 4, E1, F = H_2O; B2, E2 = LUG; C6, D3 = MLZ. – Photos: A5, C3 = TFC Mic. 19856; A1–4, 6, 7, B1–3, C1, 2, 4-6, D1–4, E1–3, F = TFC Mic. 23986.

water, clearly visible in CRB. Ectal excipulum at base and middle flanks *t. globulosa-angularis* to *t. prismatica*, *24.5–46 µm thick {3}; at margin and upper flank *t. prismatica*, *10.6–17.3 µm {3}; hyaline to light orange-yellow (70.l.OY), with exudates non-soluble in KOH. Ectal cells *(11.4–)12.8–15.1(–16.6) × (6.3–)7.7–9.3 µm {3} at middle flank, wall thickness *0.4–0.6 µm {3}; *9.5–14.7 × 3.1–3.9 µm {3} at margin.

Distribution and ecology — Only reported from the N hemisphere in Asia (China). Growing on unidentified herbaceous stems. Occurring in spring (Raitviir 1981, 2004; GBIF).

Remarks — Our samples show some deviating characters when compared to the original description in Raitviir (1981). There the asci are wider (†4.2–5.8 µm vs †3–4 µm), but if we pay attention to Raitviir's drawing (p. 4, fig. 5) such measurements are not possible. Using his ascospore drawing to re-measure the width of the asci, they can be up to 5.8 µm wide, which fits better to our data. In the original description, the asci are amyloid, whereas our collections show inamyloid asci. The inamyloidity in ascomycetes is correlated often with drought tolerance and ascospore dispersion (Sherwood 1981). Besides, there are some montane species that differ in their reaction in MLZ, e.g. *Lachnellula resinaria* (Cooke & W. Phillips) Rehm., and even a single hymenium can give a positive or negative reaction, e.g. *L. occidentalis* (G. G. Hahn & Ayers) Dharne (Baral & Matheis 2000). Also, according to Nannfeldt (1976), amyloid reaction is a plesiomorphic character in *Helotiales*, inamyloidity being apomorphic. Therefore, and considering the length of the hairs and the ecology of our samples, we prefer at the moment to keep our material under the name *C. pediformis*.

Specimens studied — Spain: Canary Islands: Tenerife: La Orotava, El Cabezón, 28°18'47"N, 16°35'33"W, 2040 m, meso-mediterranean summit broom scrub, in hollow, standing remains of inflorescence of *Echium wildpretii*, near the base, 29 Jan 2008, *LQ, EBT & JDA* (TFC Mic. 18956); idem, Guía de Isora, Punta los Roques, 28°13'58"N, 16°42'02"W, 2040 m, idem, in standing remains of inflorescence of *Ferula linkii*, near the base, 1 Mar 2008, idem (TFC Mic. 19285, 19287); idem, Corral Nuevo, 28°18'33"N, 16°34'01"W, 2000 m, Canary pine woodland with summit broom scrub, on bark of detached branch of *Descurainia bourgeauana*, deposited on ground, 28 Mar 2013, *LQ & CQ* (TFC Mic. 23986).

Cistella tenuicula (P. Karst.) Raschle in Nova Hedwigia 30: 665. 1979. – Fig. 6.

Description — Apothecia (0.3–)0.6–1.3(–1.7) mm in diam., 0.3–0.5 mm high, scattered to crowded, with broad attachment, greyish yellow (90.gy.Y) to brilliant orange-yellow (67.brill.OY), margin shortly hairy, whitish. Hairs cylindric to subclavate, (1 or)2- or 3-septate, straight to slightly sinuous, sometimes curved downwards or agglutinated in teeth by apical exudates, surface from scarcely echinulate-tuberculate at apex of large mature hairs to coarsely spiny-tuberculate in shorter hairs, spines 0.6–1.5(–2.4) × 0.3–0.6 µm {5}, not dissolving or changing in CR, KOH, LUG or MLZ; at upper flank *(36.8–)43–55.6(–64) × 2.5–3.6 µm {5}, at margin *(33.4–)42.3–56.3(–65.7) × 2.7–4.6 µm {5}. Asci *(75.6–)85–*88.8*–93(–113) × (7.6–)8.6–*8.8*–9.1(–9.9) µm (n = 76, from 5 pop.), †(62–)66.5–*68.7*–71(–76.4) × 6.2–*7.2*–7.5(–8.4) µm (n = 64, from 5 pop.); cylindric-clavate, 8-spored, 2-seriate, *pars sporifera* *36.5–66.4 µm, pore amyloid in MLZ and LUG with and without KOH pre-treatment; arising from croziers. Ascospores *(17.4)20.7–*22*–23.2(–26.2) × 3–*3.3*–3.4(–3.7) µm (n = 68, from 5 pop.), †14.8–*16.3*–19.2 × 2–*2.5*–2.9 µm (n = 56, from 5 pop.); cylindric to subcylindric, slightly curved, 3-septate, hyaline, thin-walled, frequently multiguttulate (rarely oligoguttulate), f.g. (2–)4–7(–12) %. Paraphyses uninflated cylindric to slightly clavate, hyaline, (2 or)3- or 4-septate; terminal cell *(16–)22.3–29(–33.7) × 2.5–3.8 µm {5}, cell below *(13.6–)15.7–19(–21) × 2–3 µm {5}; bifurcate at ascus base level, thin-walled, with low-refractive guttules in terminal cell. Ectal excipulum at base and middle flanks *t. globulosa-angularis* to *t. prismatica*, *33–51 µm {5} thick; at margin and upper flank *t. prismatica*, *16–25 µm {5}; hyaline to yellow-white (92. y White), without exudates, guttules sometimes visible at margin in CRB. Ectal cells *(11–)14.6–18.2(–26.7) × (5.4–)8–10(–12.5) µm {5} at middle flank, wall thickness *0.3–0.9 µm; *8.5–11(–12.1) × 3–5.6 µm {5} at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Finland, Germany, Switzerland), Asia and North America (Canada). Growing on hardwood (*Populus*), herbaceous stems (*Cerefolium* Fabr.) and leaves. Occurring in autumn (Raschle 1978; Huhtinen 1993; Hansen & Knudsen 2000; Raitviir 2004; GBIF).

Remarks — *Cistella tenuicula* is easily distinguished due to the length of the ascospores and the number of septa. Our samples match quite well the description of Raitviir (2004).

Specimens studied — Spain: Canary Islands: Tenerife: La Orotava, near to Cañada de las Pilas, 28°15'08"N, 16°33'43"W, 2050 m, meso-mediterranean summit broom scrub, on the basal part of *Arrhenatherum calderae*, 6 Apr 2008, *LQ, EBT, JDA & al.* (TFC Mic. 20040, 20041); idem, el Portillo, 28°18'08"N, 16°31'57"W, 2050 m, idem (TFC Mic. 20690); idem, Narices del Teide, 28°14'44"N, 16°40'44"W, 2300 m, idem, 13 Dec 2008, idem (TFC Mic. 20994, 20995); idem, near to Asientos de Pedro Méndez, 28°13'38"N,

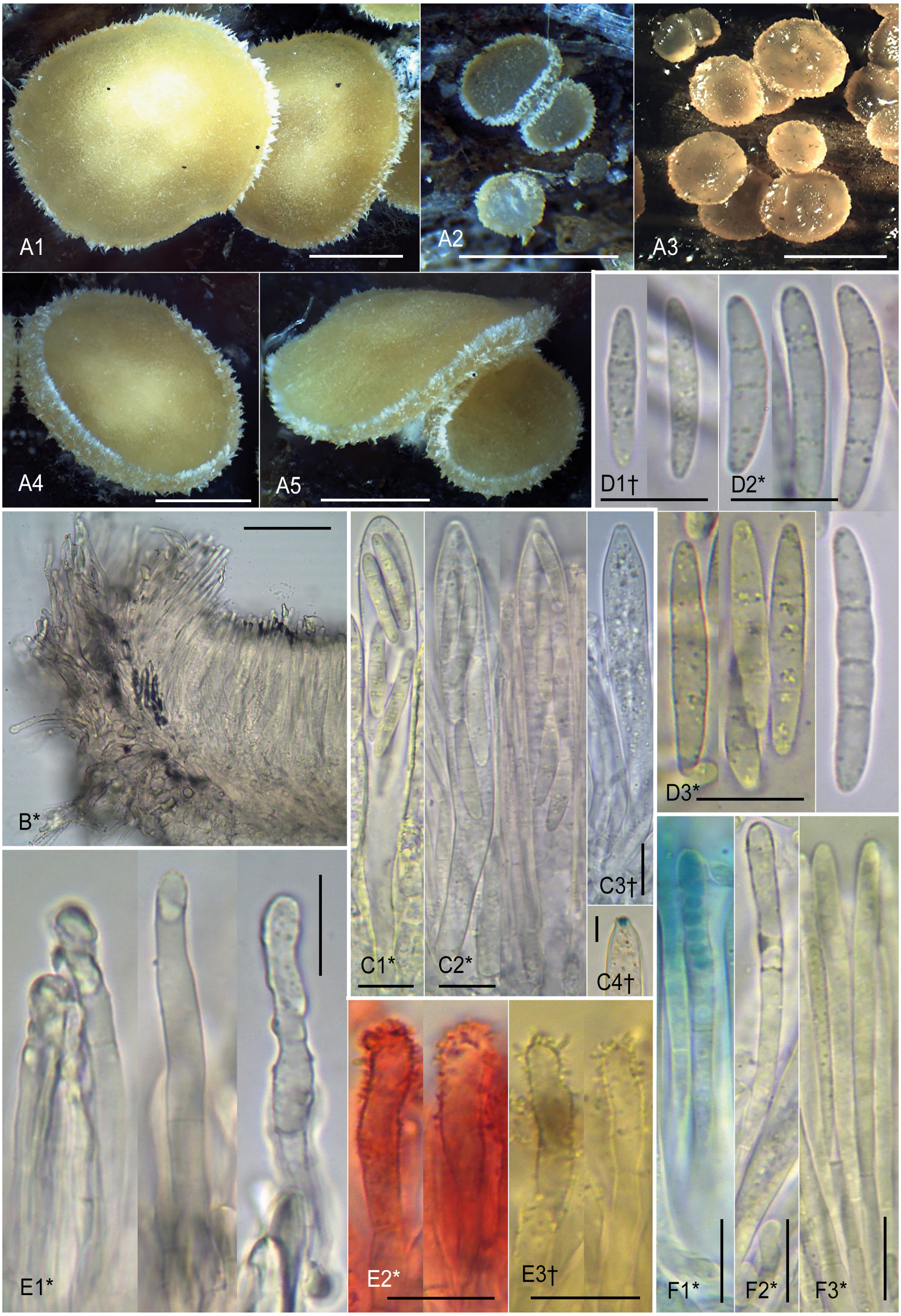

Fig. 6. Morphological features of *Cistella tenuicula*. – A: fresh apothecia; B: excipular tissues in section; C: asci; D: ascospores; E: hairs; F: paraphyses. – Scale bars: A1–5 = 500 µm; B = 50 µm; C1–3, D1–3, E1–3, F1–3 = 10 µm; C4 = 5 µm. – Mounted in: E2 = CR; F1 = CRB; B, C1, 2, D2, E1, F2, 3 = H_2O; C3, D1 = KOH; C4, D3 = LUG; E3 = MLZ. – Photos: A3 = TFC Mic. 22998; A2, C1, 4, D3, E2, 3, F1, 2 = TFC Mic. 23717; A1, 4, 5, B, C2–3, D1, 2, E1, F3 = TFC Mic. 23850.

16°40'14"W, 2080 m, idem, 13 Dec 2008, idem (TFC Mic. 21065); idem, Los Roques Blancos, 28°14'01"N, 16°39'00"W, 2320 m, idem, 18 Mar 2009, idem (TFC Mic. 21747, 21748); idem, Vilaflor, La Mesa, idem, 28°11'59"N, 16°38'23"W, 2460 m, 5 Apr 2009, idem (TFC Mic. 21976); idem, La Orotava, Cañada del Montón de Trigo, 28°13'27"N, 16°36'24"W, 2190 m, idem, 5 Nov 2012, *LQ & CQ* (TFC Mic. 23717, 23718, 23719, 23720); idem, Roques Blancos, 28°14'00"N, 16°38'23"W, 2190 m, idem, on detached remains of inflorescence of *Echium wildpretii*, 21 Feb 2013, idem (TFC Mic 23850).

Hyphodiscus hymeniophilus (P. Karst.) Baral in Z. Mykol. 59: 7. 1993. – Fig. 7.

Description — Apothecia (0.2–)0.3–0.4 mm in diam., 0.1–0.2 mm high, scattered to gregarious, sessile to subsessile, strong yellow (84.s.Y) to greyish brown (61.gy.Br) when fresh, deep greyish yellow-brown (81.d.gy.yBr) when dry; margin minute downy with vivid yellow (82.v.Y) incrustation. Hairs medium to strongly clavate, 0- or 1-septate, sinuous close to margin, rarely projecting, surface coarsely warty, warts 0.5–1.0 × 0.5–0.8 µm, without change in KOH, MLZ or CR; at upper flank *(13.1–)15.5–23(–28) × 3–4.4 µm {3}, at margin *(13.7–)16.2–22.2(–24.5) × 3.5–5.3(–6.2) µm {3}. Asci *(34.8–)39.7–*43*–46.3(–50) × 4.7–*5.6*–5.9(–7.1) µm (n = 30, from 3 pop.), †(23–)27.8–*32*–36.7 × 3.5–*4*–4.8 µm (n = 24, from 3 pop.); clavate, 8-spored, 2- or 3-seriate, *pars sporifera* *11–15 µm, pore hemiamyloid (type rr) in LUG without KOH pre-treatment, amyloid after pre-treatment; arising from croziers. Ascospores *(4.1–)5.4–*5.6*–5.8(–6.9) × (1.8–)2.3–*2.4*–2.5(–2.9) µm (n = 30, from 3 pop.), †3.2–*4.1*–4.8 × 1.5–*1.8*–2.2 µm (n = 26, from 3 pop.); ellipsoid to fusoid, straight, aseptate, hyaline, thin-walled, with 2 guttules (*0.7–1.1 µm in diam.), f.g. (7–)12–20(–30) %. Paraphyses uninflated cylindric to slightly clavate, hyaline, 1- or 2-septate; terminal cell *(14.2–)17.2–21(–22.4) × 1.8–2.6 µm {3}, cell below *(6.7–)8.4–10.5(–11.6) × 1.7–2.7 µm {3}; simple, thin-walled, with scanty guttules in terminal cell. Ectal excipulum *t. prismatica* to *t. porrecta*, at base *46.6–90.8 µm thick {3}; at margin and upper flank *10.2–21.6 µm {3}; hyaline to strong yellow-brown (74.s.yBr) near outer layer cells, with thick gelatinous walls, without exudates or guttules. Ectal cells *(10–)15.1–21.1(–23.3) × 4–6.3 (–7.3) µm {3} at middle flank, wall thickness *0.6–1 µm; *7.8–11(–12.4) × 2.9–4.5 µm {3} at margin.

Distribution and ecology — Reported from the N hemisphere in Europe (Czech Republic, Denmark, Finland, France, Germany, Netherlands, Norway, Russia, Sweden, Switzerland) and Asia (Japan). Growing on hardwood (*Fagus* L., *Salix* L.) and softwood (*Picea* A. Dietr.). Occurring in all seasons (Baral 1993; Hosoya 2002; GBIF).

Remarks — We only observe one difference with respect to descriptions in Hosoya (2002) and Raitviir (2004). Our samples show a typical hemyamyloid reaction of the ascus plug (red) in LUG without KOH-pre-treatment, which is according to explanations in Baral (1987). Hosoya (2002) reported an inamyloid reaction in MLZ without KOH pre-treatment. Raitviir (2004) reported an amyloid reaction in MLZ without indicating if the sample was pre-treated with KOH.

Specimens studied — Spain: Canary Islands: Tenerife: La Orotava, Lomo Chillero, 28°21'19"N, 16°30'51"W, 1180 m, humid Canary pine woodland, on wood in detached branch of *Erica arborea*, 17 May 2012, *LQ & CQ* (TFC Mic. 23461); idem, Lomo Tieso, 28°19'08"N, 16°33'29"W, 1790 m, Canary pine woodland with summit broom scrub, on wood of *Spartocytisus supranubius*, 12 Oct 2012, idem (TFCMic. 23665); idem, Santa Cruz de Tenerife, Piedra Chinobre, 28°33'30"N, 16°10'29"W, 900 m, *Erica platycodon* ridge-crest evergreen forest, in detached branch of *Laurus novocanariensis*, on hymenophore of dead *Hymenochaete* Lév. sp., 7 Apr 2013, idem (TFCMic. 24046).

Discussion

One genus and seven species are new to the Canary Islands (*Cistella*; *C. dentata*, *C. grevillei*, *C. hungarica*, *C. mali*, *C. pediformis*, *C. tenuicula*, *Hyphodiscus hymeniophilus*), as well as to the Macaronesian Region. All of them have a Holarctic distribution, and only two species have been reported outside this area: *C. dentata* in Australia and *C. grevillei* in the Antarctic Peninsula. Hitherto, these Canarian localities are the southernmost records of some of these taxa. With our findings, the area of distribution is extended considerably. The substrates and phenology of these species in the Canary Islands fit with the previous data reported in the bibliography. *Cistella grevillei*, *C. hungarica* and *C. pediformis* grow on herbaceous stems and occur from spring to summer, *C. grevillei* in autumn too. However, in the Canaries they have an earlier phenological range (from autumn to spring). *Cistella dentata* and *C. tenuicula* have been reported on hardwood, herbaceous stems and *C. tenuicula* even on leaves; *C. dentata* has been reported as appearing throughout the year and *C. tenuicula* only in autumn. In the Canaries, however, *C. dentata* has been found only in autumn on hardwood, whereas *C tenuicula* grows only on herbaceous stems from autumn to spring. *Cistella mali* has been found only on wood of *Pyrus malus* L. in Europe; however, our sample was collected on a succulent plant (*Euphorbia canariensis*). This phenomenon, i.e. change of substrate type, has been observed with some species of the genus *Orbilia* Fr. (Quijada & al. unpublished). The ecological data of *H. hymeniophilus* in the Canary Islands do not differ from those found in other parts of

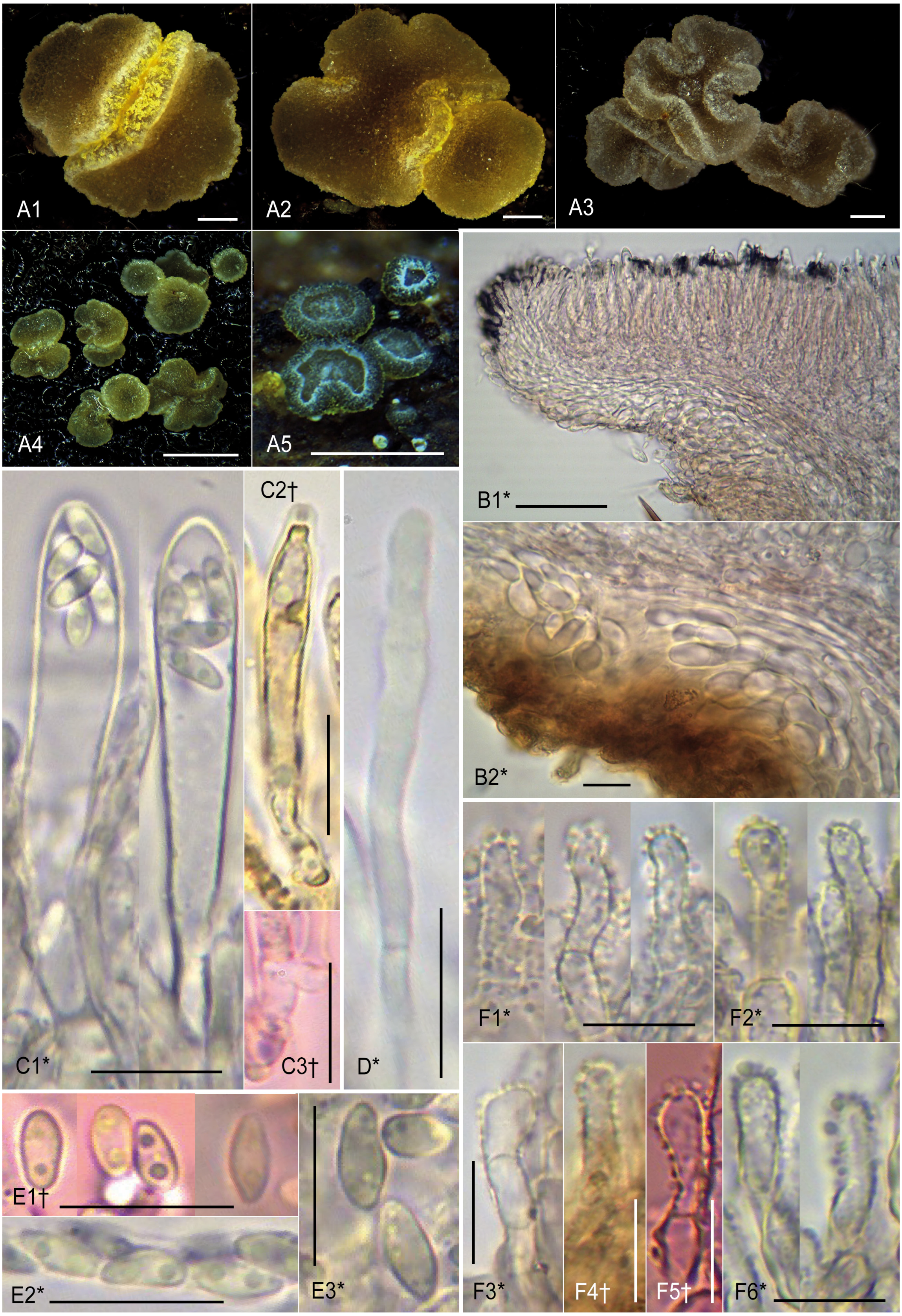

Fig. 7. Morphological features of *Hyphodiscus hymeniophilus*. – A: apothecia; fresh apothecia (1, 2, 4); dry apothecia (3, 5); B: excipular tissues in section; C: asci; D: paraphyses; E: ascospores; F: hairs. – Scale bars: A4, 5 = 500 µm; A1–3 = 100 µm; B1 = 50 µm; B2, C1–3, D, E1–3, F1–6 = 10 µm. – Mounted in: C3, E1, F5 = CR; B1, C1, D, E2, 3, F1–3, 6 = H_2O; B2 = LUG; C2, F4 = MLZ. – Photos: A1–4, B1, 2, C1–3, D, E2, F3, 4 = TFC Mic. 24046; A5, E1, F2, 5, 6 = TFC Mic. 23665; E3, F1 = TFC Mic. 23461.

the world. The phenological differences in the Canary Islands could be explained due to the mild temperatures throughout the year. In fact, summer is the unfavourable season to collect these species because of the absence of precipitation and the increase in temperature.

All known species of *Cistella* appear mainly in arid-semiarid to dry ecosystems, with only one report in *Euphorbia* scrub (c. 180 m) and humid Canary pine woodland (c. 1430 m). Nevertheless, they appear abundantly in meso-oromediterranean summit broom scrub (2000–2400 m) on several endemic plants (*Arrhenatherum calderae* A. Hansen, *Descurainia bourgeauana*, *Echium wildpretii*, *Euphorbia canariensis*, *Ferula linkii* Webb, *Spartocytisus supranubius*). All known species of *Hyphodiscus* appear in Canary pine woodland or evergreen laurel forest between 900–1800 m; also the previously reported species in this genus inhabit the same ecosystems (Galán & Raitviir 2004; Pärtel & Põldmaa 2011).

Key to *Cistella* and *Hyphodiscus* in the Canary Islands (based on living material)

1. Ectal excipulum at base and flanks of *t. prismatica* to *t. porrecta*, cells with strongly gelatinized walls . . **2**
– Ectal excipulum at base and flanks of *t. angularis* to *t. prismatica*, cells without gelatinized walls **4**
2. Disc olivaceous, hairs > 25 μm long; on *Stereum* . . . . ***Hyphodiscus stereicola*** Raitv. & al.
– Disc yellow to greyish brown, hairs ≤ 25 μm long; on wood or fruit bodies of fungi **3**
3. Mean ascospore length < 7 μm . . . . ***Hyphodiscus hymeniophilus***
– Mean ascospore length > 7 μm . . . . ***Hyphodiscus pinastri***
4. Ascospores 3-septate, > 15 μm long . . . . ***Cistella tenuicula***
– Ascospores 0- or 1-septate, < 15 μm long **5**
5. Asci inamyloid **6**
– Asci amyloid **7**
6. Mean ascus length < 54 μm; ascospores with 2 or more large guttules (≥ 0.4 μm), cylindric to subcylindric; in *Euphorbia* scrub near coast . . . . ***Cistella mali***
– Mean ascus length > 54 μm; ascospores without guttules or with small guttules (< 0.4 μm), cylindric-clavate to pediform, strongly curved in the narrower part; in meso-oromediterranean summit broom scrub . . . . ***Cistella pediformis***
7. Apothecia with dentate margin; mean ascus length > 52 μm . . . . ***Cistella dentata***
– Apothecia without dentate margin; mean ascus length < 52 μm **8**
8. Ascospores *8–9.8 × 1.6–2.1 μm, multiguttulate at poles . . . . ***Cistella grevillei***
– Ascospores *6.3–7.5 × 2–2.5 μm, without guttules . . . . ***Cistella hungarica***

Acknowledgements

The authors thank J. Díaz-Armas, J. L. Rodríguez-Armas, I. Pérez-Vargas, R. Negrín and C. Quijada for their help with the field work. We also thank Hans Otto Baral for his helpful suggestions and Yaiza Rodríguez Mesa for the English revision of the manuscript. This study was partly funded by the Canarian Government (PhD-Grant BOC nº 086/29 April – FSE), and also by the Autonomous Agency of National Parks (Government of Spain), project nº 811009/SICOEN. Two anonymous reviewers are thanked for their comments on an earlier draft of this paper.

References

Anonymous 1976: ISCC-NBS Color-name charts illustrated with centroid colors. Inter-Society Color Council. – Washington: National Bureau of Standards.

Baral H. O. 1987: Lugol's solution/IKI versus Melzer's reagent: hemiamyloidity, a universal feature of the ascus wall. – Mycotaxon **29:** 399–450.

Baral H. O. 1992: Vital versus herbarium taxonomy: morphological differences between living and dead cells of ascomycetes, and their taxonomic implications. – Mycotaxon **44:** 333–390.

Baral H. O. 1993: Beiträge zur Taxonomie der Discomyceten 3. – Z. Mykol. **59:** 3–22.

Baral H. O. & Marson G. 2005: In vivo veritas. Over 10 000 images of fungi and plants (microscopical drawings, water colour plates, photo macro- & micrographs), with materials on vital taxonomy and xerotolerance, ed. 3. – Privately distributed DVD-ROM.

Baral H. O. & Matheis W. 2000: Über sechs selten berichtete weißhaarige Arten der Gattung *Lachnellula* (*Leotiales*). – Z. Mykol. **66:** 45–66.

Beltrán-Tejera E. 2010: Fungi. – In: Arachavaleta M., Rodríguez S., Zurita N. & García A. (ed.), Lista de especies silvestres de Canarias (Hongos, plantas y animales terrestres) 2009. – Santa Cruz de Tenerife: Gobierno de Canarias.

Cheype J. L. 2004: Contribution à la connaissance des champignons de la haute vallée de l'Arve (Haute-Savoie) 3e note: deux discomycètes inoperculés au poil. – Bull. Mycol. Bot. Dauphiné-Savoie **173:** 29–36.

Del Arco M. J., González-González R., Garzón-Machado V. & Pizarro-Hernández B. 2010: Actual and potential natural vegetation on the Canary Islands and its conservation status. – Biodivers. & Conservation **19:** 3089–3140.

Del Arco M. J., Wildpret W., Pérez P. L., Rodríguez O., Acebes J. R., García A., Martín V. E., Reyes J. A., Salas M., Bermejo J. A., González R., Cabrera M. V. & García S. 2006. Mapa de vegetación de Canarias. – Santa Cruz de Tenerife: GRAFCAN.

Dennis R. W. G. 1949: A revision of the British *Hyaloscyphaceae*, with notes on related European species. – Mycol. Pap. Commonw. Mycol. Inst. **32:** 1–97.

Galán R. & Raitviir A. 2004: Deux *Hyaloscyphaceae* Jaunes (*Ascomycetes*, *Helotiales*). – Bull. Soc. Mycol. France **120:** 187–198.

Gamundi I. J. & Spinedi H. A. 1988: New species and interesting collections from Danco Coast, Antarctic Peninsula. – Mycotaxon **33:** 467–482.

GBIF [The Global Biodiversity Information Facility]: GBIF Backbone Taxonomy, 2013-07-01. – Published at http://www.gbif.org/dataset/d7dddbf4-2cf0-4f39-9b2a-bb099caae36c [accessed 30 Jan 2015].

Han J. G., Hosoya T., Sung G. H. & Shin H. D. 2014: Phylogenetic reassessment of *Hyaloscyphaceae* sensu lato (*Helotiales*, *Leotiomycetes*) based on multigene analyses. – Fungal Biol. **118:** 150–167.

Hansen L. & Knudsen H. (ed.) 2000: Nordic macromycetes. Vol. 1. Ascomycetes. – Helsinki: Helsinki University Printing House.

Hosoya T. 2002: *Hyaloscyphaceae* in Japan (6): the genus *Hyphodiscus* in Japan and its anamorph *Catenulifera* gen. nov. **–** Mycoscience **43:** 47–57.

Hosoya H., Han J. G, Sung G. H., Hirayama Y., Tanaka K., Hosaka K., Tanaka I. & Shin H. D. 2011: Molecular phylogenetic assessment of the genus *Hyphodiscus* with description of *Hyphodiscus hyaloscyphoides* sp. nov. – Mycol. Progr. **10:** 239–248.

Huhtinen S. 1989: A monograph of *Hyaloscypha* and allied genera. – Karstenia **29:** 45–252.

Huhtinen S. 1993: Some hyaloscyphaceous fungi from tundra and taiga. – Sydowia **45:** 188–198.

Huhtinen S., Laukka T., Döbbeler P. & Stenroos S. 2010: Six novelties to European bryosymbiotic discomycetes. – Nova Hedwigia **90:** 413–431.

Huhtinen S. & Söderholm U. 1997: *Cistella spicicola* (*Hyaloscyphaceae*, *Leotiales*), a new species on *Lycopodium*. – Österr. Z. Pilzk., N.S. **6:** 1–5.

Kanouse B. B. 1947: A survey of the discomycete flora of the Olympic National Park and adjacent areas. – Mycologia **39:** 635–689.

Kirk P. M., Cannon P. F., Minter D. W. & Stalpers J. A. 2008: Ainsworth and Bisby's dictionary of the fungi, ed. 10. – United Kingdom: CAB International.

Kutorga E. & Raitviir A. 2006: A checklist of Lithuanian hyaloscyphaceous fungi (*Ascomycetes*). – Folia Cryptog. Estonica **42:** 57–66.

Lumbsch H. T. & Huhndorf S. M. 2009: Outline of *Ascomycota* 2009. – Fieldiana, Life Earth Sci. **1** [Myconet **14**]**:** 1–64.

Nannfeldt J. A. 1932: Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten. – Nova Acta Regiae Soc. Sci. Upsal., ser. 4, **8(2):** 1–368.

Nannfeldt J. A. 1976: Iodine reactions in ascus plugs and their taxonomic significance. – Trans. Brit. Mycol. Soc. **67:** 283–287.

Pärtel K. & Põldmaa K. 2011: A new species of *Hyphodiscus* (*Helotiales*) on *Stereum*. – Mycotaxon **115:** 11–17.

Persoon C. H. 1798: Icones et descriptiones fungorum minus cognitorum [fasc. **1**]. – Leipzig.

Phillips W. 1891: Omitted discomycetes. – Grevillea **19:** 106–107.

Quijada L., Baral H. O. & Beltrán-Tejera E. 2012: New species of *Orbilia* (*Orbiliales*) from arid ecosystems of the Canary Islands (Spain). – Nova Hedwigia **96:** 237–248.

Raitviir A. 1970: Synopsis of the *Hyaloscyphaceae*. – Scripta Mycol. **1:** 1–115.

Raitviir A. 1981: New species of *Hyaloscyphaceae* from the Middle Asia. – Folia Cryptog. Estonica **12:** 1–8.

Raitviir A. 2004: Revised synopsis of the *Hyaloscyphaceae*. – Scripta Mycol. **20:** 1–133.

Raschle P. 1978: Neufunde und Neukombinationen von *Hyaloscyphaceae* Nannfeldt (*Helotiales*). – Nova Hedwigia **30:** 653–672.

Sherwood M.A. 1981: Convergent evolution in discomycetes from bark and wood. – Bot. J. Linn. Soc. **82:** 15–34.

Spooner B. M. 1987: *Helotiales* of Australasia: *Geoglossaceae*, *Orbiliaceae*, *Sclerotiniaceae*, *Hyaloscyphaceae*. – Biblioth. Mycol. **116:** 1–711.

Zhuang W. Y. 1988: Notes on *Lachnellula theiodea*. – Mycotaxon **31:** 411–416.