

## *Isalonactis*, a new genus of *Roccellaceae* (*Arthoniales*), from southern Madagascar

Damien ERTZ, Anders TEHLER, Eberhard FISCHER, Dorothee KILLMANN,  
Tahina RAZAFINDRAHAJA and Emmanuël SÉRUSIAUX

**Abstract:** The new genus and species *Isalonactis madagascariensis* is characterized by a crustose, non-corticate, often sorediate thallus containing psoromic acid, tiny white pruinose ascomata with a thalline margin, an inconspicuous excipulum, a pale brown hypothecium, 3-septate hyaline ascospores and curved filiform conidia. Phylogenetic analyses using nuLSU and *RPB2* sequences place *Isalonactis* in the *Roccellaceae*, close to the genera *Lecanactis* and *Chiodecton*. The new species was collected on sheltered siliceous rocks in the dry landscape of the Isalo Massif (S Madagascar). *Dermatiscum thumbergii* is newly recorded from Madagascar.

**Key words:** Africa, Arthoniomycetes, desert, *Lecanactis*, lichen, phylogeny, taxonomy

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### Introduction

Madagascar is a large island situated in the Indian Ocean at a minimum distance of 400 km from the African continent. It is well known for its remarkable biodiversity including many endemic taxa (Goodman & Benstead 2003). Despite the island being one of the most important biodiversity hotspots (Myers *et al.* 2000), its lichen flora remains very poorly studied with only 157 species included in the only available checklist (Aptroot 2013). This number contrasts with the 463 lichen taxa reported recently from

the neighbouring and much smaller island of Reunion (van den Boom *et al.* 2011). During a field trip in 2008, five of the authors (DE, EF, DK, TR and ES) were able to prospect several biomes, for example montane rainforests, dry forests, semideserts with rock outcrops, and detected numerous new records for the island. Most of these were widespread species not confined to Madagascar. However, the study of our material enabled us to describe the new lichen genus *Savoronala* Ertz *et al.*, forming stipes producing sporodochia and thriving on *Erica* stumps and branches in heathlands in coastal sand dunes (Ertz *et al.* 2013). New lichen species were also discovered such as *Syncesia madagascariensis* Ertz *et al.*, one of the few species of the genus having ascospores with more than three septa (Ertz *et al.* 2010), and *Dirina madagascariensis* Tehler *et al.*, a cryptic species revealed by a detailed phylogenetic study of the genus (Tehler *et al.* 2013a). Further study of our material revealed a puzzling sorediate crustose member of the *Roccellaceae* collected in the semidesert landscape of the Isalo Massif. The aim of the present paper is to describe it and assess its phylogenetic position.

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D. Ertz (corresponding author): Jardin Botanique National de Belgique, Département Bryophytes-Thallophytes, Domaine de Bouchout, B-1860 Meise, Belgium. Email: damien.ertz@br.fgov.be

A. Tehler: Naturhistoriska riksmuseet, Enheten för kryptogambotantik, Box 50007, S-104 05 Stockholm, Sweden.

E. Fischer and D. Killmann: Institute for Integrated Natural Sciences, Department of Biology, University of Koblenz-Landau, Universitätsstraße 1, D-56070 Koblenz, Germany.

T. Razafindrahaja: Département Botanique, Parc de Tsimbazaza, B.P. 4096, Antananarivo 101, Madagascar.

E. Sérusiaux: Evolution and Conservation Biology, University of Liège, Sart Tilman B22, B-4000 Liège, Belgium.

## Material and Methods

Specimens were studied using an Olympus SZX12 stereomicroscope and an Olympus BX51 microscope. Hand-cut sections were investigated using light microscopy on material mounted in water and 5% KOH. Measurements of ascospores and conidia refer to material examined in water, those of asci to material examined in K/I. Ascospore measurements are indicated as (minimum–)  $\bar{x}$  – SD –  $\bar{x}$  + SD (–maximum), where  $\bar{x}$  is the mean value and SD standard deviation, followed by the number of measurements ( $n$ ). Chemical reactions were tested using KOH (K) and Lugol's reagent either without (I) or with (K/I) pre-treatment with K. Thin-layer chromatography (TLC) of acetone extracts was performed in solvent systems C and G (Orange *et al.* 2001).

We used DNA sequences from two loci, the nuclear large subunit ribosomal RNA gene (nuLSU), and the second largest RNA polymerase subunit (*RPB2*), of which six were newly produced for this study (Table 1). Other sequences were mainly sampled from a previously published larger dataset of *Arthoniales* including the family *Roccellaceae* (Ertz & Tehler 2011), with a few additional sequences from Tehler *et al.* (2013b). The two datasets were analyzed both separately and combined. Extractions, amplifications and sequencing procedures generally follow Ertz *et al.* (2009, 2011). Alignments were carried out with ClustalW (2.1) from within the program Mesquite v.2.75 (<http://mesquiteproject.org>).

For the phylogenetic analyses, we used the programs T.N.T. Tree Analysis Using New Technology 1.1 (Goloboff *et al.* 2008) and MrBayes 3 (Ronquist & Huelsenbeck 2003). In all analyses gaps were treated as missing data.

The parsimony analyses used the New Technology search with sectorial search, ratcheting, drifting, tree fusing and driven search options in effect, all using default settings. Resampling tree searches was done with parsimony jackknifing (Farris *et al.* 1996) under the New Tech search as implemented in T.N.T. (Goloboff *et al.* 2008); 1000 replicates submitted to TBR branch swapping were conducted. In parsimony jackknifing, the data are internally resampled with a jackknifing technique to find well-supported groups. Resampling works by calculating a tree for each of a large number of subsamples (pseudoreplicates) of characters from the data, then finding a summary tree, which comprises the groups occurring in the majority of the trees for subsamples. The tree for each pseudoreplicate is found by parsimony analysis, and each pseudoreplicate is formed by randomly selecting characters from the data without replacement, each character having a fixed chance 1/e (about 36%) of being excluded. With this resampling technique, the actual number of characters used may vary from replicate to replicate. Groups found in less than 50% of the trees for pseudoreplicates were discarded, thus eliminating unjustified (poorly supported) resolution caused by ambiguous datasets.

In the Bayesian inference analyses, the best model for nucleotide substitutions was selected for each locus individually by applying the Akaike Information Criterion (AIC; Akaike 1973) and the program MrModeltest 2.2 (Nylander 2005) in conjunction with PAUP\* (Swofford 1998). The selection of substitution models supported the GTR+I+ $\Gamma$  model for both partitions. Posterior probabilities of trees and parameters in the substitution models were approximated with MCMC and Metropolis coupling using the program MrBayes 3.2.1 (Ronquist & Huelsenbeck 2003). The Bayesian analyses were run for 10 million generations with two independent runs and four chains of Markov chain Monte Carlo (MCMC). The burn-in and convergence diagnostics were estimated using the PSRF (potential scale reduction factor), where values closer to 1 indicated convergence between runs (Gelman & Rubin 1992), and TRACER (Rambaut & Drummond 2007), making sure that the ESS values were higher than 200. The final majority-rule tree obtained from the Bayesian analyses is based on 17 000 trees from the posterior of the two runs.

## Results

Altogether we analyzed nuLSU rDNA and RPB2 sequences from two newly sequenced samples of *Isalonactis madagascariensis* (newly described below) and one newly sequenced sample of *Chiodecton leptosporum* Müll. Arg., together with 43 samples representing 40 other already phylogenetically analyzed species of *Roccellaceae*. In addition, three outgroup species were chosen among the *Opegraphaceae* (Ertz & Tehler 2011; Tehler *et al.* 2013b). Parsimony jackknife analysis showed that the individual gene trees were topologically similar, with no conflicts detected, although the nuLSU tree was more poorly resolved.

Since there were no conflicts in tree topology between the trees received from the Bayesian inference and the Parsimony jackknife analyses, we chose for the sake of simplicity to plot the Parsimony jackknife frequencies directly onto the Bayesian tree which was more highly resolved (Fig. 1). In the Bayesian tree, *Isalonactis* (newly described below) appears as a monophyletic group in a sister group relationship with the genus *Lecanactis*, and the next larger group includes the genus *Chiodecton* as sister group. In the Parsimony jackknife tree (not shown), these three genera were left unresolved in a trichotomy.

TABLE 1. *Specimens used in phylogenetic analyses of the Arthoniales. GenBank accession numbers in bold are new sequences from this study.*

Species	Locality	Year	Collector	Collection no.	Genbank Acc. No.	
					nuLSU	RPB2
<i>Austrorocella gayana</i>	Chile, Los Lagos, Chiloe Prov., Ancud	2009	<i>Anders Tehler</i>	9852	KF036031	KF036042
<i>A. gayana</i>	Chile, Los Lagos, Bahía Mansa	2009	<i>Anders Tehler</i>	9855-3	KF036032	KF036043
<i>Chiodecton natalense</i>	Zambia, SE of Mbala	2004	<i>Damien Ertz</i>	6576	EU704085	EU704014
<i>C. leptosporum</i>	Reunion, Saint-Denis	2012	<i>Damien Ertz</i>	17886	<b>KF831578</b>	<b>KF831579</b>
<i>Dendrographa decolorans</i>	Spain, Mallorca, Cala Figuera	2007	<i>Anders Tehler</i>	9019	HQ454603	HQ454743
<i>D. coniformis</i>	Mexico, Baja California, Ensenada, Pta Banda	2007	<i>Anders Tehler</i>	9083	HQ454590	HQ454730
<i>D. leucophaea</i>	Mexico, Baja California, Ensenada, Pta Banda	2007	<i>Anders Tehler</i>	9104	HQ454522	HQ454662
<i>Dictyographa varians</i>	Socotra, Sefflah	2008	<i>Anders Tehler</i>	9346	HQ454576	HQ454716
<i>Dirina candida</i>	Mallorca, Playa de Cala Santanyi	2007	<i>Anders Tehler</i>	9004	KC108261	KC108065
<i>D. catalinariae</i>	Mexico, Baja California, Ensenada, Pta Banda	2007	<i>Anders Tehler</i>	9087	GU137909	GU137543
<i>D. ceratoniae</i>	Mallorca, Ses Covetes	2007	<i>Anders Tehler</i>	9047	FJ638966	FJ639025
<i>D. massiliensis</i>	Sweden, Gotland, Hoburgen	2007	<i>Anders Tehler</i>	9211	KC108356	KC108163
<i>Enterographa crassa</i>	France, Pas-de-Calais	2003	<i>Damien Ertz</i>	5041	EU704088	EU704020
<i>E. hutchinsiae</i>	Belgium, Bohan-Membre	2006	<i>Damien Ertz</i>	10066	EU704089	EU704021
<i>Erythrodictyon granulatum</i>	Gabon, Makokou	2006	<i>Damien Ertz</i>	9908	EU704090	EU704022
<i>Isalonactis madagascariensis</i>	Madagascar, Isalo Massif	2008	<i>Damien Ertz et al.</i>	13021	<b>KF831576</b>	<b>KF831580</b>
<i>I. madagascariensis</i>	Madagascar, Isalo Massif	2008	<i>Damien Ertz et al.</i>	13024	<b>KF831577</b>	<b>KF831581</b>
<i>Lecanactis abietina</i>	Sweden, Uppland, Svartnö	2004	<i>Anders Tehler</i>	8550	EF081392	DQ987635
<i>L. borbonica</i>	Reunion, sud de Saint-Denis/Le Brûlé	2003	<i>Damien Ertz</i>	4780	EU704092	EU704024
<i>L. luteola</i>	Chile, Antofagasta Prov., Cerro Moreno	2009	<i>Anders Tehler</i>	9926	HQ454595	HQ454735
<i>Opegrapha vulgata</i>	Belgium, Roisin	2005	<i>Damien Ertz</i>	7564	EU704108	EU704044
<i>Rocella fuciformis</i>	Portugal, Estremadura, Cabo da Roca	2010	<i>Anders Tehler</i>	10200	KF036035	KF036046
<i>R. gracilis</i>	Peru, Dept. Pacasmayo, Cerro Chilco	2006	<i>Anders Tehler</i>	8892	FJ638983	FJ639042
<i>R. montagnei</i>	Kenya, Kilifi distr., Mida Creek	2007	<i>Anders Tehler</i>	9235-11	GU137967	GU137601
<i>R. phycopsis</i>	France, Var, Isles d'Hyeres, Isle de Port-Cros	2008	<i>Anders Tehler</i>	9511	KF036036	KF036047
<i>R. tinctoria</i>	Canary Islands, Tenerife, Buenavista del Norte	2001	<i>Anders Tehler</i>	8308	KF036037	KF036048
<i>Roccellina accedens</i>	Chile, Coquimbo Prov., Bahía Conchali,	2001	<i>Anders Tehler</i>	8451	EF081432	DQ987675
<i>R. cerebriformis</i>	Chile, Coquimbo Prov., 22 km N La Serena	2001	<i>Anders Tehler</i>	8386	HQ454585	HQ454725
<i>R. chalybea</i>	Chile, Valparaiso Prov., Los Molles, Punta Molles	2001	<i>Anders Tehler</i>	8355	HQ454589	HQ454729
<i>R. hypomecha</i>	South Africa, Western Cape Prov., Yzerfontein	1996	<i>Anders Tehler</i>	7785	EF081438	DQ987681
<i>R. inaequabilis</i>	Chile, Coquimbo Prov., Parque Nacional Fray Jorge	2001	<i>Anders Tehler</i>	8368	EF081439	DQ987682
<i>R. limitata</i>	Chile, Coquimbo Prov., Guanaqueros	2001	<i>Anders Tehler</i>	8375	EF081440	DQ987683
<i>R. mahuiana</i>	Chile, Valparaiso Prov., Rocas de Santo Domingo	2001	<i>Anders Tehler</i>	8459	HQ454596	HQ454736
<i>R. mollis</i>	Chile, Coquimbo Prov., Tongoy	2001	<i>Anders Tehler</i>	8372	EF081443	DQ987686
<i>R. portentosa</i>	Chile, Valparaiso Prov., Los Molles, Punta Molles	2001	<i>Anders Tehler</i>	8350	EF081446	DQ987689
<i>R. terrestris</i>	Chile, Antofagasta Prov., Cerro Moreno	2009	<i>Anders Tehler</i>	9917	HQ454598	HQ454738
<i>Schismatomma dirinellum</i>	Spain, Mallorca, Ses Covetes	2007	<i>Anders Tehler</i>	9051	HQ454611	HQ454751
<i>S. dirinellum</i>	Spain, Andalucia, Cádiz distr., N of Barbate	2009	<i>Anders Tehler</i>	9815-10	KF036039	KF036050
<i>S. pericleum</i>	Sweden, Uppland, Furusund	2004	<i>Anders Tehler</i>	8551	EF081451	DQ987694
<i>Sigridea californica</i>	Mexico, Baja California, Ensenada, Pta Banda	2007	<i>Anders Tehler</i>	9095	HQ454637	HQ454777
<i>S. californica</i>	Mexico, Baja California, Punta Banda	2007	<i>Anders Tehler</i>	9110	HQ454638	HQ454778
<i>Sparria endlicheri</i>	Belgium, Brûly-de-Pesche, vallée de l'Eau Noire	2008	<i>Damien Ertz</i>	12651	HQ454511	HQ454652
<i>Syncesia hawaiiensis</i>	USA, Hawaii, Hawaii, North Kona Distr., Kalaea	2010	<i>Anders Tehler</i>	10156-27	KF036040	KF036051
<i>S. intercedens</i>	Rwanda, forêt de Nyungwe	2007	<i>Damien Ertz</i>	11059	HQ454644	HQ454784
<i>S. madagascariensis</i>	Madagascar, Ambalamananakana, Ankazomivady	2008	<i>Damien Ertz</i>	12966	HQ454645	HQ454785
<i>S. myrtilcola</i>	Portugal, Azores, Terceira, Quatro Ribeiras	2010	<i>Anders Tehler</i>	10252	KF036041	KF036052

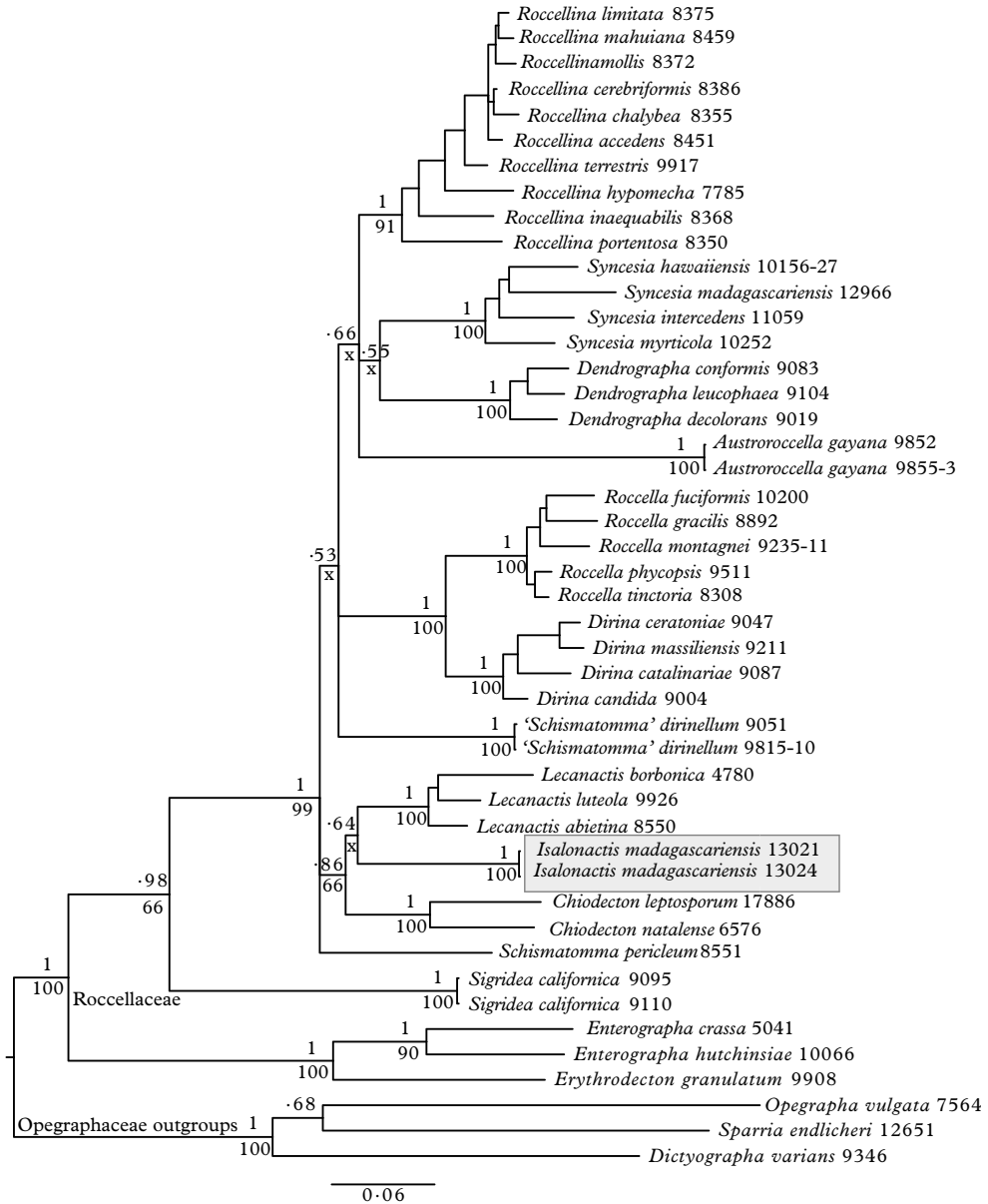


FIG. 1. Two-locus (nuLSU + RPB2) majority-rule tree received from Bayesian analysis showing the proposed phylogenetic relationships among 46 specimens representing 37 species of *Roccellaceae* with three species of *Opegraphaceae* (*Opegrapha vulgata*, *Dictyographa varians* and *Sparria endlicheri*) chosen as outgroups. Bayesian posterior probability values shown above nodes. Parsimony jackknife frequencies received from parsimony analyses were plotted below nodes (x = frequency below 50%). For readability, values and frequencies are shown for genera and larger groups only. Collecting numbers of the authors following the species names act as specimen and sequence identifiers. Species within single quotes are names for which we regard recombination in a more appropriate genus as premature and thus the old name is retained.

**Isalonactis madagascariensis Ertz, Tehler, Eb. Fisch., Killmann, Razafin. & Sérus. gen. et sp. nov.**

Mycobank No.: MB807014 (genus) and MB807015 (species)

Taxon belonging to the *Roccellaceae* and characterized by the combination of the following characters: crustose, non-corticate, cracked to areolate thallus *c.* 0.2–0.7 mm thick containing psoromic acid, tiny ascomata having a thalline margin, a white pruinose hymenial disc, an inconspicuous excipulum and a pale brown hypothecium, 3-septate hyaline ascospores of (20.0–)22.5–27.0 (–29.0) × (4.5–)5.0–5.5(–6.0) μm, and curved to sickle-shaped filiform conidia.

Type: Madagascar, Isalo Massif near ANGAP house and National Park border, 851 m alt., 22°37'8.1''S, 45°21'42.6''E, Mesozoic sandstone cliffs with *Coleochloa setifera*, *Ischnolepis tuberosa* and *Pachypodium gracilius*, on sheltered rock, 7 October 2008, D. Ertz 13024, E. Fischer, D. Killmann, T. Razafindrahaja & E. Sérusiaux (BR—holotype; S—isotype).

(Fig. 2)

*Thallus* epilithic, thin, non-corticate, *c.* 0.2–0.7 mm thick, smooth, finely cracked to areolate, pale cream, matt; presence of numerous hyaline crystals 0.5–3.0 μm diam. covering the hyphae, dissolving in K (polarized light); *prothallus* absent or dark brown, up to 0.5 mm wide. *Photobiont* *Trentepohlia*; cells 11–20 × 8–12 μm.

*Ascomata* apothecioid, circular to irregular in outline, sometimes with an undulated or folded margin, scattered, erumpent, semi-immersed to sessile, not or slightly constricted at the base, usually one per areole, (0.2–)0.3–0.5(–0.8) mm diam., with a thin non-corticate thalline margin of 50–70 μm thick, level with the hymenial disc, of the same colour as the thallus; hymenial disc exposed, pale brown, covered by a white pruina. *Exciple* inconspicuous. *Hymenium* 85–110 μm tall, hyaline, not interspersed with oil droplets, I+ red, K/I+ blue; *epihymenium* pale to dark reddish brown, K– (but reddish tinge disappearing); *hypothecium* 75–150 μm tall, pale to dark brown, I– (orange), K– (but reddish tinge disappearing). *Paraphysoids* sparsely branched in the hymenium, richly branched in the epihymenium, 2 μm thick, not or only slightly enlarged at apices; apices dark brown, 5–15 μm long. *Asci* clavate, 55–

65 × 15–16 μm, 8-spored, K/I– except for an amyloid (blue) endoascus layer in the upper part. *Ascospores* (20.0–)22.5–27.0 (–29.0) × (4.5–)5.0–5.5(–6.0) μm (*n* = 23), (2–)3-septate, septation starting with one median septum, not constricted at septa, cells more or less equal in size; gelatinous sheath absent (at ×1000).

*Pycnidia* immersed in the thallus, visible as pale to dark brown punctiform spots 40–70 μm diam, *c.* 200 × 100 μm; pycnidia wall very thin, hyaline to pale brown; *conidia* filiform, slightly curved to sickle-shaped, 12–23 × 1 μm.

*Chemistry.* Thallus K–, C–, P+ yellow, UV– or ± pale cream; TLC (solvents C and G): psoromic acid (specimens tested: holotype and Ertz 13021).

*Etymology.* *Isalonactis* refers to the remarkable Isalo Massif (type locality) and the close relationship to the genus *Lecanactis*.

*Ecology and distribution.* *Isalonactis madagascariensis* is known only from the type locality in Madagascar, situated 180 km from the nearest coast. It grows on sheltered siliceous rocks in an arid landscape, with a poorly-developed *Roccella montagnei*, a fruticose species widely distributed in the Palaeotropics and having a preference for coastal habitats (Tehler *et al.* 2010, including two specimens sequenced from the Isalo Massif). Other lichens collected from the same locality are *Xanthoparmelia tananarivensis* (Gyeln.) Hale, and members of the genera *Buellia*, *Caloplaca*, *Pertusaria*, *Pyxine*, *Parmotrema*, *Toninia*, *Usnea* and *Xanthoparmelia*. The type locality is situated just outside Isalo National Park which forms a Jurassic sandstone massif. The rocks have been subjected to erosion and form steep slopes and canyons. Isalo Massif is famous for its endemics. In addition to widespread Malagasy endemics such as *Coleochloa setifera* (Ridl.) Gilly (*Cyperaceae*) and *Ischnolepis tuberosa* Jum. & H. Perrier (*Rubiaceae*), numerous local endemic plant species are known from this area. Among palms (Dransfield & Beentje 1995), *Ravenea rivularis* Jum. & H. Perrier, *R. glauca* Jum. & H. Perrier and *Dypsis omilahensis*



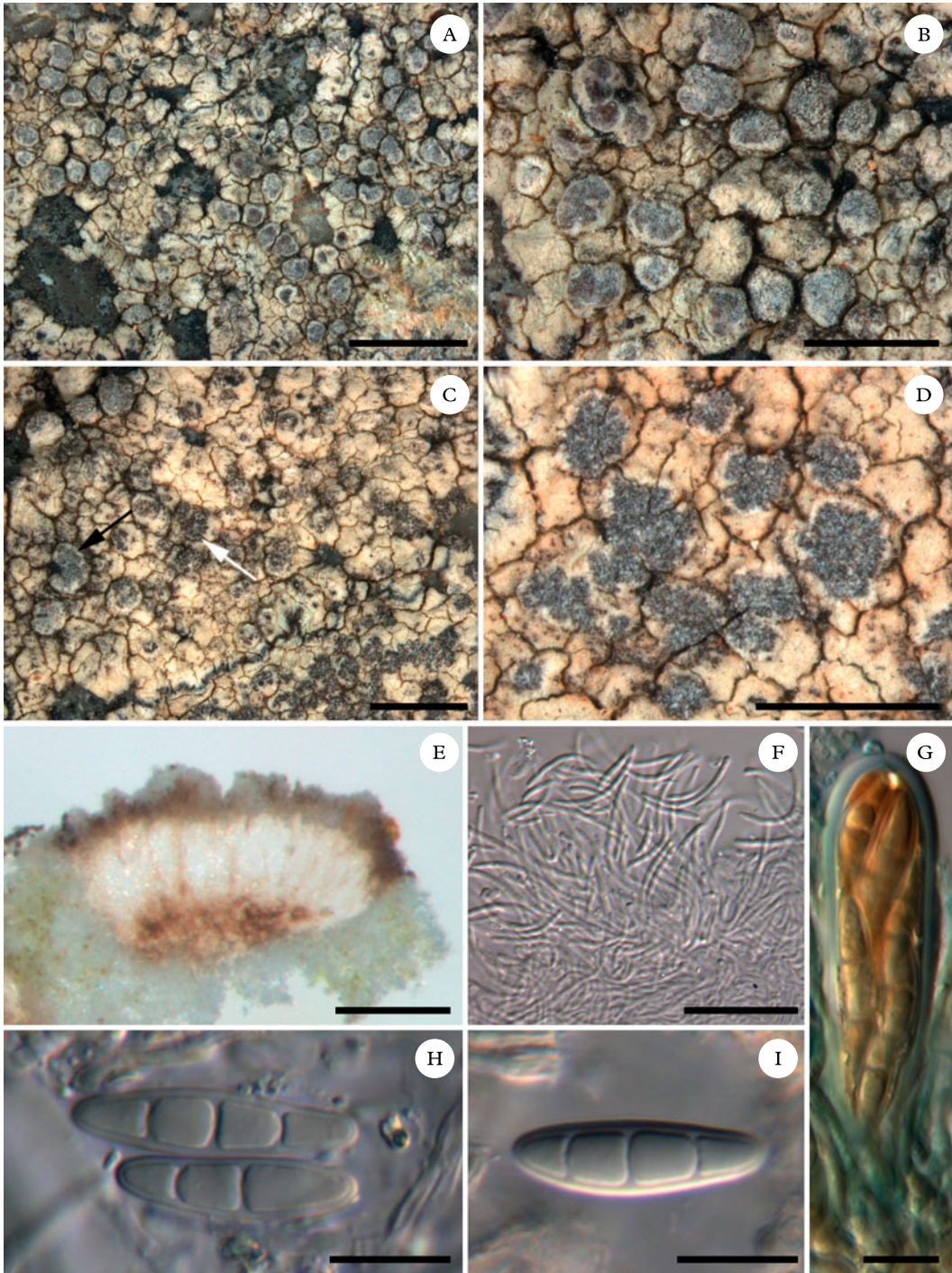


FIG. 2. A–I, *Isalonactis madagascariensis* (A–C, E–I, holotype; D, Ertz 13021). A & B, thallus and apothecia; C, thallus bearing both soredia (white arrow) and apothecia (black arrow), and separated by a black, prothallus border-line from a sorediate thallus at the lower right corner of the photograph; D, thallus and soredia; E, section through an apothecium in water; F, conidia in water; G, ascus in KI; H & I, ascospores in water. Scales: A = 2 mm; B–D = 1 mm; E = 250  $\mu$ m; F = 20  $\mu$ m; G–I = 10  $\mu$ m. In colour online.

(Jum. & H. Perrier) Beentje & J. Dransf. are almost restricted to Isalo. As members of the endemic families *Asteropeiaceae* and *Sarcolaenaceae*, the following shrubs are either endemic to Isalo or found in few other localities: *Asteropeia labatii* G. E. Schatz *et al.*, *Perrierodendron occidentale* (Capuron) J. F. Leroy *et al.*, *Sarcolaena isaloensis* Randrianasolo & J. S. Miller, *S. oblongifolia* F. Gérard, *Schizolaena isaloensis* Rabehevitra & Lowry, *Xerochlamys undulata* Hong-Wa and *X. villosa* F. Gérard (Ramananjanahary *et al.* 2010). Endemic or near endemic *Xerophyta*-species (*Velloziaceae*) are *Xerophyta croatii* Phillipson & Lowry, *X. isaloensis* Phillipson & Lowry, *X. schatzii* Phillipson & Lowry and *X. setosa* Phillipson & Lowry (Behnke *et al.* 2013). The sandstone rock outcrops are especially famous for numerous endemic succulents such as *Pachypodium gracilius* (H. Perrier) Rapan., *Aloe isaloensis* H. Perrier, *Ceropegia dimorpha* Humbert, *C. pseudodimorpha* Rauh, *Cynanchum macrolobum* Jum. & H. Perrier and *C. rauhiannum* Descoings (Rauh 1995, 1998). The Isalo Massif also harbours a large number of endemic species of amphibians and reptiles (Crottini *et al.* 2008). It must be noted that the very peculiar *Dermaticum thunbergii* (Ach.) Nyl. was found in a similar dry landscape, on a granitic inselberg opposite Anja Nature Reserve [12 km S of Ambalavao, 21°50'45.4"S, 46°50'21.8"E, 972 m, 5 October 2008, Ertz 12987 (BR), *Sérusiaux* s. n.(LG)]. This member of *Physciaceae* was only known from the southern part of continental Africa. It is newly recorded here from Madagascar.

*Notes.* As shown in our phylogenetic tree (Fig. 1), *Isalonactis madagascariensis* is most closely related to the genera *Lecanactis* and *Chiodecton*. It differs from *Lecanactis* by apothecia having a thalline margin with a pale brown hypothecium, whereas species of *Lecanactis* have a lecideine exciple with a usually dark brown to carbonized hypothecium. No species of *Lecanactis* are known to be sorediate. In the holotype specimen of *Isalonactis madagascariensis*, thalli might have either apothecia or soredia, but one thallus has both (Fig. 2C). In the specimen Ertz

13021, thalli are sorediate but one thallus has both soredia and apothecia, clearly indicating that sterile, sorediate morphs and fertile morphs are conspecific. Psoromic acid is rare in the genus *Lecanactis*, being known only in two species *L. californica* and *L. dilleniana* (Egea & Torrente 1994), but sequences obtained from the latter suggest that it belongs to another genus (D. Ertz, A. Tehler, M. Irestedt, A. Frisch, G. Thor & P. van den Boom, unpublished data). The ascomata of *Isalonactis* being sometimes undulated with a strongly folded margin might be reminiscent of the genera *Chiodecton* or *Syncesia*. However, *Chiodecton* species (represented in our phylogenetic tree by the only species for which sequences are currently available, i.e. *C. natalense*, and by a newly sequenced species, *C. leptosporum*) differ from our new genus by perithecioid to lirelliform ascomata aggregated into stroma-like structures, obovate or slightly biclavate ascospores and a different chemistry, roccellic acid (Thor 1990). The generic type, *C. sphaerale* Ach., still needs to be sequenced in order to confirm the phylogenetic position of the genus *Chiodecton*. However, that species has long, narrow (30–37 × 2–3 µm) and obovate ascospores, and roccellic acid in the thallus (Thor 1990). Therefore it is most probably not congeneric with *Isalonactis*. The genus *Syncesia* forms a distinct, quite distantly related lineage to our new genus (Fig. 1; the generic type, *S. myrticola*, being included) and differs usually by curved, longer and slender ascospores in addition to a different chemistry (presence of protocetraric and roccellic acids in nearly all species, including the generic type) (Tehler 1997). The new genus and species might be reminiscent of the genus *Sigridea* due to the 3-septate ascospores lacking a gelatinous sheath, the thalline margin and the presence of psoromic acid. However, species of the latter genus differ from *Isalonactis madagascariensis* by a carbonized hypothecium and much shorter, up to 7 µm conidia (Tehler 1993). Moreover, the generic type of *Sigridea* (*S. californica*) is phylogenetically not related to our new genus (Fig. 1). The sorediate thalli of

our new taxon is similar to *Fulvophyton sore-diata* (Sparrius *et al.*) van den Boom, but that species has immersed ascomata and very different ascospores, being (4–)6–8-septate, 20–35 × 5–7 µm with a distinct gelatinous sheath *c.* 3.5 µm wide (van den Boom & Giralt 2012). We also checked that no older generic names of *Arthoniales* were available to accommodate our new species.

*Additional specimen examined. Madagascar:* Isalo Massif near ANGAP house and National Park border, 851 m alt., 22°37'8.1"S, 45°21'42.6"E, Mesozoic sandstone cliffs with *Coleochloa setifera*, *Ischnolepis tuberosa* and *Pachypodium gracilius*, on sheltered rock, 7 October 2008, D. Ertz 13021, E. Fischer, D. Killmann, T. Razafindrahaja & E. Sérusiaux s. n. (BR, LG).

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