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Original article

Three new lobarioid lichens (lichenized Ascomycota: Peltigeraceae) from Colombia in memory of Enrique Forero

Tres nuevos líquenes lobarioides (Ascomycota liquenizados: Peltigeraceae) de Colombia en memoria de Enrique Forero

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Abstract

We describe three new species of lobarioid Peltigeraceae from Colombia in memory of our mentor, colleague, and friend, Enrique Forero González, who recently passed away. Enrique was an outstanding Colombian scientist known for his contributions to botany, plant conservation, and the design of science policy. The three new species belong to *Lobariella, Sticta,* and *Yoshimuriella*, the country's three most species-rich genera of lobarioid Peltigeraceae. *Lobariella foreroana* sp. nov., from the department of Nariño, is similar to *L. reticulata* in overall morphology, including the loosely attached thallus, but more delicate, with much narrower apically partly dissected lobes and methylgyrophorate as additional secondary substance. *Sticta henrici* sp. nov., from Tolima, is similar to *S. granatensis* but deviates in the distinctly pilose apothecial margins. Finally, *Yoshimuriella enfogoa* sp. nov., from Cundinamarca, is similar to *Y. subcorrosa* but differs in the continuous lower tomentum and the phylogeny. The distinctiveness of these new species is based on the diagnostic morphological features supported by molecular data of the fungal ITS barcoding marker.

Keywords: *Lobariella*; New species; *Sticta*; *Yoshimuriella.*

Resumen

Describimos tres nuevas especies de Peltigeraceae lobarioides de Colombia en memoria de nuestro mentor, colega y amigo, el recién fallecido Prof. Dr. Enrique Forero González. Enrique fue uno de los científicos colombianos más destacados por sus aportes a la botánica, la conservación de plantas y el diseño de política científica en el país. Las tres nuevas especies pertenecen a *Lobariella*, *Sticta* y *Yoshimuriella*, respectivamente, los tres géneros de Peltigeraceae lobarioides más diversos en Colombia. *Lobariella foreroana*, de Nariño, es similar a *L. reticulata* en su morfología general, incluso el talo ligeramente adherido, pero en general es más delicado, con lóbulos mucho más estrechos, apicalmente parcialmente divididos y con giroforato de metilo como sustancia secundaria adicional. *Sticta henrici*, del Tolima, es similar a *S. granatensis*, pero se desvía en los márgenes apoteciales claramente pilosos. Por último, *Yoshimuriella enfogoa*, de Cundinamarca, es similar a *Y. subcorrosa*, pero difiere en el tomento inferior continuo y en la filogenia. La distinción de las nuevas especies se basa en características morfológicas diagnósticas respaldadas por datos moleculares del marcador de código de barras de hongos IS.

Palabras clave: *Lobariella*; Nuevas especies; *Sticta*; *Yoshimuriella.*

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Introduction

In the most recent global ranking, Colombia is the world's third most biodiverse country, after Brazil and China (**Butler**, 2019). These listings are generally based on vascular plants and vertebrates, leaving aside the most speciose organisms, namely arthropods (especially insects) and fungi. The recently published *Catalogue of Fungi of Colombia* (**de Almeida et al.**, 2022) is the first compilation of the country's fungi, listing 7,241 known species. In a contextual assessment of the diversity of Colombian fungi, **Gaya *et al.*** (2022) estimated around 68,000 known insect species, by far the most diverse group in Colombia, followed by vascular plants, with 26,150 (**Bernal *et al.***, 2016a,b, 2019; **Negrão *et al.***, 2022). Fungi appear fourth on the list, closely after by vertebrates, with an updated 7,607 species. Lichens is the richest group of fungi from Colombia known so far, with 2,670 species, placing it ninth in the global ranking (**Moncada *et al.***, 2022). However, about 3,600 species are expected to occur in Colombia (**Lücking *et al.***, 2009), likely from understudied regions like Chocó, Orinoquia, and the Amazon. Indeed, in a thorough study of lichens from the Colombian Amazon housed in the herbarium of the *Instituto Amazónico de Investigaciones Científicas* (SINCHI), **Lücking *et al.*** (2023) listed 666 species, increasing to 2,774 those registered for Colombia.

Peltigeraceae include the most conspicuous and spectacular macrolichens. Lobarioid species, previously separated in the Lobariaceae family and now classified as Lobarioideae subfamily within Peltigeraceae (**Kraichak *et al.***, 2018; **Lücking**, 2019; **Lumbsch & Leavitt**, 2019), are particularly abundant and diverse in tropical montane ecosystems and temperate rain forests. In the tropical montane ecosystems of the Colombian northern Andes, macrolichen communities are dominated by the lobarioid genera *Sticta* (105 species), *Lobariella* (24), *Yoshimuriella* (9), *Pseudocyphellaria* (7), *Emmanuelia* (4), *Crocodia* (3), and *Podostictina* (1), listed in descending order of species richness, for a current total of 153 species (**Moncada & Forero**, 2006; **Moncada *et al.***, 2013a, 2022; **Simon *et al.***, 2020). These impressive numbers became evident only recently, with the advent of molecular phylogenetic approaches, revealing a great deal of hidden diversity in this group of lichens (**Moncada *et al.***, 2013a, 2014; **Lücking *et al.***, 2017; **Simon *et al.***, 2020). For comparison, the last checklist published before the onset of molecular studies (**Sipman *et al.***, 2008) listed only 60 species and infraspecific taxa corresponding to these genera, classified at the time in *Lobaria* s.lat., *Lobariella*, *Pseudocyphellaria* s.lat., and *Sticta*. However, the list of 153 species currently known will probably increase. Ongoing molecular phylogenetic approaches and collections reveal lobarioid Peltigeraceae species in Colombia new to science. In unpublished data sets curated by the authors, no less than 30 species of *Sticta*, 27 of *Lobariella*, and 15 of *Yoshimuriella* await formal description. Three of them are described here.

Materials and methods

The material for the present study was collected between 2012 and 2021 in Cundinamarca, Nariño, and Tolima. The specimens were studied at The Field Museum (Chicago, U.S.A.), the Botanischer Garten und Botanisches Museum Berlin, the Freie Universität Berlin, the Universidad del Tolima (Ibagué, Colombia), and the Universidad Distrital Francisco José de Caldas (Bogotá, Colombia) using standard techniques of light microscopy and thin-layer chromatography (**Orange *et al.***, 2001). We used standardized templates optimized for morphological, anatomical, and chemical characters to describe each species (**Moncada & Lücking**, 2012; **Moncada *et al.***, 2013a, b, 2015). Specimens are deposited in the cited herbaria.

New ITS sequences were generated via Sanger sequencing following previously published protocols (**Lücking *et al.***, 2017). The sequences were then assembled with those selected from GenBank (**Table 1**), based on previous studies of the three genera (**Moncada *et al.***, 2013a, 2014), except for the genus *Yoshimuriella*, whose sequences were mostly newly generated. After the initial assessment of their placement restricted to the clades containing the target species, sequences were aligned with MAFFT 7.294 using the --auto option (**Katoh & Standley**, 2013), and then manually corrected to finally obtain an alignment length of 550 bases for *Lobariella* (64 terminals), 555 for *Sticta* (31 terminals), and 601 for *Yoshimuriella* (58 terminals; Supplementary Files S1, S2, S3). The data sets were subjected to maximum likelihood search using RAxML 8.2.8 (**Stamatakis**, 2014), with non-parametric bootstrapping using 1,000 pseudoreplicates under the universal GTRGAMMA model.

Table 1. Specimens and sequence data used for the phylogenetic analyses. Newly generated sequences are indicated in boldface and include voucher information.

Genus	Species	Lab Code	GB Accession	Country	Voucher
Lobariella	*angustata*		KC011030	Colombia	
Lobariella	*angustata*		KC011031	Colombia	
Lobariella	*angustata*		KY769437	Colombia	
Lobariella	*auriculata*		KY769449	Colombia	
Lobariella	*auriculata*		KY769451	Colombia	
Lobariella	*auriculata*		KY769456	Colombia	
Lobariella	*botryoides*		KC011033	Colombia	
Lobariella	*botryoides*		KY769439	Colombia	
Lobariella	*botryoides*		KY769460	Colombia	
Lobariella	*crenulata*		KC011034	Colombia	
Lobariella	*crenulata*		KY769453	Colombia	
Lobariella	*crenulata*		KY769454	Colombia	
Lobariella	*discretopallida*		KC011043	Colombia	
Lobariella	*discretopallida*		KC011044	Colombia	
Lobariella	*discretopallida*		KC011046	Colombia	
Lobariella	*flavomedullosa*		KY769440	Colombia	
Lobariella	*flavomedullosa*		KY769441	Colombia	
Lobariella	*flavomedullosa*		KY769442	Colombia	
Lobariella	*flynniana*		KY769446	Hawaii	
Lobariella	*flynniana*		KY769447	Hawaii	
Lobariella	***foreroana***	**MON1927**	**OR527238**	**Colombia**	**Moncada 7596**
Lobariella	*nashii*		AF524902	México	
Lobariella	*pallida*		HQ650695	Costa Rica	
Lobariella	*pallida*		KC011039	Colombia	
Lobariella	*pallida*		KC011040	Colombia	
Lobariella	*pallida*		KC011044	Colombia	
Lobariella	*pallidocrenulata*		KC011050	Colombia	
Lobariella	*pallidocrenulata*		KC011054	Colombia	
Lobariella	*pallidocrenulata*		KC011055	Colombia	
Lobariella	*parmelioides*		KC011056	Colombia	
Lobariella	*parmelioides*		KC011057	Colombia	
Lobariella	*parmelioides*		KC011058	Colombia	
Lobariella	*pseudocrenulata*		KC011061	Colombia	
Lobariella	*pseudocrenulata*		KY769436	Colombia	
Lobariella	*pseudocrenulata*		KY769443	Colombia	
Lobariella	*reticulata*		KC011062	Colombia	
Lobariella	*reticulata*		KC011063	Colombia	
Lobariella	*reticulata*		KY769458	Colombia	
Lobariella	*robusta*		KY769467	Hawaii	

Genus	Species	Lab Code	GB Accession	Country	Voucher
Lobariella	*robusta*		KY769469	Hawaii	
Lobariella	*robusta*		KY769470	Hawaii	
Lobariella	*rugulosa*		KY769432	Costa Rica	
Lobariella	*rugulosa*		KY769433	Costa Rica	
Lobariella	*rugulosa*		KY769438	Costa Rica	
Lobariella	*sandwicensis*		KY769444	Hawaii	
Lobariella	*sandwicensis*		KY769445	Hawaii	
Lobariella	*sandwicensis*		KY769448	Hawaii	
Lobariella	*sipmanii*		KC011064	Colombia	
Lobariella	*sipmanii*		KC011065	Colombia	
Lobariella	*sipmanii*		KC011066	Colombia	
Lobariella	*soredians*		KC011067	Colombia	
Lobariella	*soredians*		KY769434	Colombia	
Lobariella	*soredians*		KY769435	Colombia	
Lobariella	*spathulifera*		KY769450	Colombia	
Lobariella	*spathulifera*		KY769452	Colombia	
Lobariella	*spathulifera*		KY777441	Colombia	
Lobariella	*stenroosiae*		AF524922	Brazil	
Lobariella	*stenroosiae*		KY769430	Costa Rica	
Lobariella	*stenroosiae*		KY769431	Costa Rica	
Lobariella	*subcrenulata*		HQ650696	Costa Rica	
Lobariella	*subcrenulata*		KY769457	Colombia	
Lobariella	*subcrenulata*		KY769459	Colombia	
Sticta	***henrici***	**MON7310**	**OR527233**	**Colombia**	**Rincón-Murillo 167**
Sticta	***henrici***	**MON7315a**	**OR527236**	**Colombia**	**Rincón-Murillo 166**
Sticta	***henrici***	**MON7315b**	**OR527237**	**Colombia**	**Rincón-Murillo 166**
Sticta	***henrici*** **(cyanomorph)**	**MON7309**	**OR527232**	**Colombia**	**Rincón-Murillo 167**
Sticta	***henrici*** **(cyanomorph)**	**MON7316a**	**OR527234**	**Colombia**	**Rincón-Murillo 166**
Sticta	***henrici*** **(cyanomorph)**	**MON7316b**	**OR527235**	**Colombia**	**Rincón-Murillo 166**
Sticta	*jaguirreana*		MG754195	Colombia	
Sticta	***jaguirreana***	**MON7296**	**OR527228**	**Colombia**	**Rincón-Murillo 34**
Sticta	***jaguirreana***	**MON7298a**	**OR527226**	**Colombia**	**Rincón-Murillo 118**
Sticta	***jaguirreana***	**MON7298b**	**OR527227**	**Colombia**	**Rincón-Murillo 118**
Sticta	***jaguirreana***	**MON7332**	**OR527229**	**Colombia**	**Rincón-Murillo 35**
Sticta	***jaguirreana***	**MON7683**	**OR527225**	**Colombia**	**Moncada 13048**
Sticta	***jaguirreana***	**MON7698**	**OR527224**	**Colombia**	**Moncada 13049b**
Sticta	***jaguirreana*** **(cyanomorph)**	**MON7697**	**OR527238**	**Colombia**	**Moncada 13049a**

Genus	Species	Lab Code	GB Accession	Country	Voucher
Sticta	*lobarioides*		KC732555	Colombia	
Sticta	*lobarioides* (cyanomorph)		KC732634	Colombia	
Sticta	*macrothallina*		KC732655	Colombia	
Sticta	*macrothallina*		KC732656	Colombia	
Sticta	*macrothallina* (cyanomorph)		KC732629	Colombia	
Sticta	*maculofuliginosa*		KC732456	Colombia	
Sticta	*maculofuliginosa*		KC732514	Colombia	
Sticta	*maculofuliginosa*		KC732515	Colombia	
Sticta	*neopulmonarioides*		KC732630	Colombia	
Sticta	*neopulmonarioides*		KC732631	Colombia	
Sticta	*neopulmonarioides*		KC732633	Colombia	
Sticta	*pseudolobaria*		KC732650	Colombia	
Sticta	*pseudolobaria*		KC732653	Colombia	
Sticta	***pseudolobaria***	**MON7676**	**OR527230**	**Colombia**	**Moncada 5273**
Sticta	***pseudolobaria***	**MON7696**	**OR527231**	**Colombia**	**Moncada 5295**
Sticta	*pseudolobaria* (cyanomorph)		KC732649	Colombia	
Sticta	sp.		ON986539	Puerto Rico	
Yoshimuriella	***corrosa***	**MON1105**	**OR527211**	**Colombia**	**Lücking 35874**
Yoshimuriella	***corrosa***	**MON1110**	**OR527210**	**Colombia**	**Lücking 35872**
Yoshimuriella	***corrosa***	**MON1778**	**OR527212**	**Colombia**	**Gonzáles 62**
Yoshimuriella	***deplanata***	**MON1121**	**OR527207**	**Colombia**	**Lücking s.n.**
Yoshimuriella	***deplanata***	**MON1797**	**OR527208**	**Colombia**	**Lücking 35826**
Yoshimuriella	***deplanata***	**MON3162**	**OR527209**	**Colombia**	**Coca 4902**
Yoshimuriella	*dissecta*		AF524920	Guyana	
Yoshimuriella	*dissecta*		AF524920	Guyana	
Yoshimuriella	*dissecta*		AF524920	Guyana	
Yoshimuriella	***enfogoa***	**MON0822**	**OR527213**	**Colombia**	**Lücking 35325**
Yoshimuriella	***enfogoa***	**MON0824**	**OR527214**	**Colombia**	**Lücking 35354**
Yoshimuriella	***enfogoa***	**MON6020**	**OR527215**	**Colombia**	**Silano JS18-060**
Yoshimuriella	*fendleri*		AF524915	Brazil	
Yoshimuriella	*fendleri*		AF524915	Brazil	
Yoshimuriella	*fendleri*		AF524915	Brazil	
Yoshimuriella	*fendleri*		AF524916	Brazil	
Yoshimuriella	*fendleri*		AF524917	Brazil	
Yoshimuriella	*fendleri*		AF524917	Brazil	
Yoshimuriella	*fendleri*		AF524918	Brazil	
Yoshimuriella	*fendleri* (cyanomorph)		AF524916	Brazil	
Yoshimuriella	*fendleri* (cyanomorph)		AF524918	Brazil	
Yoshimuriella	aff. *fendleri*		AF524919	Guyana	

Genus	Species	Lab Code	GB Accession	Country	Voucher
Yoshimuriella	***peltigera***	**MON1675**	**OR527217**	**Colombia**	**Silano 141**
Yoshimuriella	***peltigera***	**MON1676**	**OR527216**	**Colombia**	**Silano 142**
Yoshimuriella	**aff. *peltigera***	**MON1850**	**OR527221**	**Colombia**	**Moncada 7703**
Yoshimuriella	**aff. *peltigera***	**MON2089**	**OR527220**	**Colombia**	**Peláez 155**
Yoshimuriella	**aff. *peltigera***	**MON2261**	**OR527219**	**Colombia**	**Moncada 7589a**
Yoshimuriella	**aff. *peltigera***	**MON2263**	**OR527218**	**Colombia**	**Moncada 7587**
Yoshimuriella	**aff. *scrobiculata***	**MON1935**	**OR527177**	**Colombia**	**Moncada 7701**
Yoshimuriella	**aff. *scrobiculata***	**MON2489**	**OR527178**	**Colombia**	**Silano JSS P57a**
Yoshimuriella	**aff. *scrobiculata***	**MON5235**	**OR527180**	**Colombia**	**Rodríguez 692**
Yoshimuriella	**aff. *scrobiculata***	**MON5236**	**OR527176**	**Colombia**	**Rodríguez 705**
Yoshimuriella	**aff. *scrobiculata***	**MON5273**	**OR527183**	**Colombia**	**Rivera 11**
Yoshimuriella	**aff. *scrobiculata***	**MON5369**	**OR527182**	**Colombia**	**Rivera 108**
Yoshimuriella	**aff. *scrobiculata***	**MON5756**	**OR527181**	**Colombia**	**Moncada 11030**
Yoshimuriella	**aff. *scrobiculata***	**MON5771**	**OR527179**	**Colombia**	**Moncada 11046**
Yoshimuriella	***subcorrosa***	**MON6704**	**OR527185**	**México**	**Pérez 1302**
Yoshimuriella	***subcorrosa***	**MON6708**	**OR527186**	**México**	**Pérez 1209**
Yoshimuriella	***subcorrosa***	**MON6710**	**OR527188**	**México**	**Pérez 1247**
Yoshimuriella	***subcorrosa***	**MON6724**	**OR527187**	**México**	**Pérez 1250**
Yoshimuriella	***subcorrosa***	**MON6726**	**OR527184**	**México**	**Pérez 1235**
Yoshimuriella	*subdissecta*		KC011029	Colombia	
Yoshimuriella	***subdissecta***	**MON0885**	**OR527200**	**Colombia**	**Moncada & Lücking 35273**
Yoshimuriella	***subdissecta***	**MON0974**	**OR527189**	**Colombia**	**Moncada 4819**
Yoshimuriella	***subdissecta***	**MON4456**	**OR527196**	**Colombia**	**Lücking 39465**
Yoshimuriella	***subdissecta***	**MON4711**	**OR527201**	**Colombia**	**Moncada 10542**
Yoshimuriella	***subdissecta***	**MON5397**	**OR527202**	**Colombia**	**Lücking 35273**
Yoshimuriella	***subdissecta***	**MON5557**	**OR527197**	**Colombia**	**Patiño 62**
Yoshimuriella	***subdissecta***	**MON5750**	**OR527191**	**Colombia**	**Moncada 11024**
Yoshimuriella	***subdissecta***	**MON5755**	**OR527192**	**Colombia**	**Moncada 11029**
Yoshimuriella	***subdissecta***	**MON5767**	**OR527199**	**Colombia**	**Moncada 11042**
Yoshimuriella	***subdissecta***	**MON5794**	**OR527193**	**Colombia**	**Moncada 11068**
Yoshimuriella	***subdissecta***	**MON5801**	**OR527194**	**Colombia**	**Moncada 11075**
Yoshimuriella	***subdissecta***	**MON5891**	**OR527195**	**Colombia**	**Moncada 10940**
Yoshimuriella	***subdissecta***	**MON6119**	**OR527204**	**Colombia**	**Moncada 11498**
Yoshimuriella	***subdissecta***	**MON6188**	**OR527198**	**Colombia**	**Moncada 11482**
Yoshimuriella	***subdissecta***	**MON6307**	**OR527190**	**Colombia**	**Moncada 11789**
Yoshimuriella	***subdissecta***	**MON7313**	**OR527203**	**Colombia**	**Rincón-Murillo 124**
Yoshimuriella	***subdissecta***	**MON7426**	**OR527206**	**Colombia**	**Moncada 12388**
Yoshimuriella	***subdissecta***	**MON7430**	**OR527205**	**Colombia**	**Moncada 12394**

Results and discussion

Taxonomy of the new species

Lobariella foreroana B. Moncada & Lücking sp. nov.
MycoBank MB 849914
GenBank accession for holotype ITS: OR527238

Figures 1-3

Type: COLOMBIA. Nariño, Pasto, Laguna de la Cocha. Corregimiento El Encano, vereda Santa Teresita, Reserva Natural El Encanto Andino, sendero al Páramo. 01°04'12.3" N, 77°07'38.1" W, 2811 m; Andean forest with transition to Azonal Paramo, on the branch of a shrub, associated with *Leptogium* and bryophytes; 24 October 2013, *B. Moncada 7596 & R. Lücking* (UDBC: C-0016982, holotype!; B: B 60 0300501, isotype!).

Diagnosis: Similar to *Lobariella reticulata* in overall morphology, including the loosely attached thallus, but with more delicate, much narrower lobes that apically often bear lobules; unlike *L. reticulate*, also with methyl-gyrophorate as an additional secondary metabolite.

Description: Thallus growing on branches of small shrubs, up to 5 cm across, loosely attached between and over bryophytes and other lichens. Green photobiont (*Symbiochloris*). Thallus outline is irregular, richly branched, with 3–5 ramifications for every 5 cm radius,

Figure 1. *Lobariella foreroana* B. Moncada & Lücking sp. nov. (holotype above, isotype below). **A.** Thallus in situ. **B.** Lobe tip showing reticulate pseudocyphellae and young apothecia. **C.** Lobe surface with marginally lobulate apothecia. Scale = 5 mm

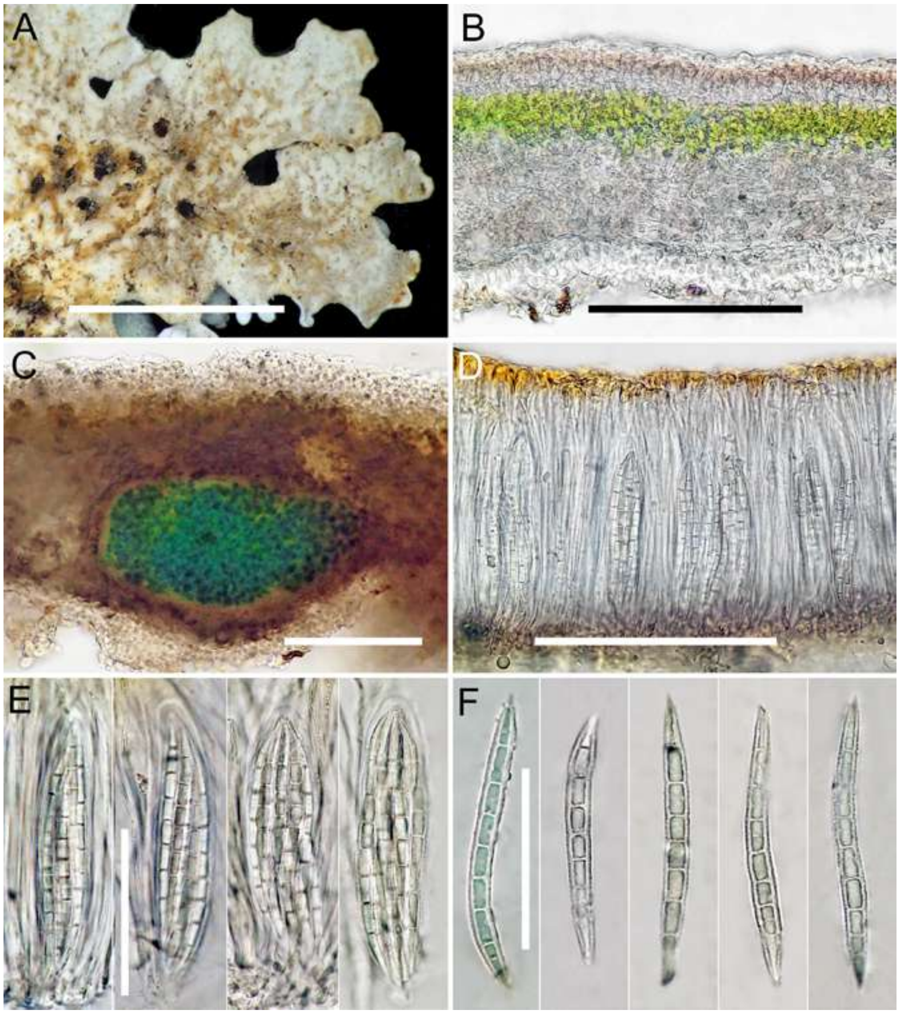

Figure 2. *Lobariella forereoana* B. Moncada & Lücking sp. nov. (isotype). **A.** Lobe underside showing tomentum. **B.** Section through thallus showing upper cortex, photobiont layer, medulla, and lower cortex. **C.** Section through thallus with internal cephalodium. **D.** Section of the hymenium with asci. **E.** Asci with ascospores. **F.** Ascospores. Scale in A = 5 mm, in B–C = 100 µm, in D = 120 µm, in E–F = 50 µm

branching anisotomous. Lobes truncate, horizontal to somewhat ascending, evenly spaced, their apices partially dissected into narrow, elongate lobules; lobe internodes up to 1 cm long, 2–3(–5) mm wide; terminal lobules up to 1 mm long and 0.2–0.3 mm wide. Upper surface uneven, bright green when fresh, pale gray when dry and becoming pale yellowish gray in the herbarium, slightly shiny; surface glabrous, without papillae or pruina, but with abundant maculae across the lobe surface, more distinct towards the lobe margins and tips, dense towards the lobe tips (about 15–30 per mm^2), more scattered towards the center (about 5–10 per mm^2), irregular to elongate and forming a reticulate pattern towards the periphery, 0.1–0.5 mm long and about 0.1 mm wide, developing into pseudocyphellae only towards the center; pseudocyphellae sparse, visible as they elongate to linear pores, 0.1–0.5 mm long and 0.05–0.1 mm wide, eventually forming fine cracks in the thallus surface towards the center. Vegetative propagules are absent (not to be confused with the thallus lobes that are apically dissected into lobules). Compact medulla, cream-colored to whitish, K−, C+ pink-red, KC+ pink-red fading rapidly and forming a yellow color, P−. Lower surface undulated, whitish cream-colored. Primary lower tomentum dense but short, whitish to cream-colored. Secondary lower tomentum is absent. Rhizines are scarce, up to 2 mm long, unbranched, whitish to cream-colored, covered with tomentum. Cyphellae and pseudocyphellae are absent (unlike the upper surface, which is pseudocyphellate). Cephalodia are not seen or not recognizable on the surface.

Upper cortex paraplectenchymatous, 20–25 µm thick, composed of (2–)3–4 cell layers; cells 5–10 µm diam., with cell walls around 1 µm thick and the lumina, 4–8 mm diam., covered by a hyaline epicortex. Algal layer 25–40 µm thick, with 3–5 µm diam cells; 50–130 µm thick medulla, composed of 2.5–3 µm thick hyphae encrusted with small crystals. Lower cortex paraplectenchymatous, 12–20 µm thick, composed of 1(–2) cell layers; cells, 6–10 µm diam., with cell walls about 2.5 µm thick. Internal cephalodia scattered, rounded to pear-shaped, up to 300 µm across; cyanobacterial photobiont in internal cephalodia not identified. Lower tomentum formed by individual unbranched septate, up to 50 µm long hyphae composed of globose cells 4–5 µm in diam. Rhizines are discrete, up to 0.5 mm long and 0.1 mm wide, unbranched, whitish to cream-coloured, apically sometimes darkened, composed of strongly agglutinated parallel hyphae covered with tomentum formed by short branches of the individual hyphae.

Apothecia abundant, cup-shaped, laminal to mostly submarginal, sessile, not constricted below, up to 3.5 mm in diam. and 500 µm high; disc orange(-brown), opaque; margin in section zeorine, proper margin indistinct, thalline margin thick, strongly prominent, conspicuously lobulate, greenish-grey; lobules (7–)10–20 per apothecium, spathulate to irregularly dissected and resembling the dissected thallus lobe tips. Proper excipulum in section composed of more or less parallel, partly branched hyphae with wide lumina resembling a prosoplectenchyma, 40–100 µm broad, colorless, laterally covered by a thalline layer; subhymenium 25–40 µm high, dirty-yellowish grey; hypothecium 25–40 µm high, pale yellowish. Hymenium 120–150 µm high, clear; epihymenium 10–15 µm high composed of strongly conglutinated hyphae, yellow-orange; asci narrowly clavate, 80–100 × 18–25 µm. Eight ascospores per ascus, bundled, narrowly fusiform, 75–90 × 5–6 µm, 7-septate, colorless, with somewhat thickened, minutely roughened wall.

Pycnidia are visible as dark, shallow warts, about 0.2 mm diam. and 0.2 mm high; ostiole brownish. Conidia were not observed.

Secondary chemistry: Chemosyndrome A1a (according to **Moncada *et al.***, 2013): cortex with pseudocyphellarin A (minor), K+ yellow; medulla with gyrophoric acid (major), methyl-gyrophorate (major to minor), and *Lobariella* unidentified 1 (major to trace), K–, C+ pink-red.

Etymology: The species is named after Enrique Forero's surname.

Ecology and distribution: This new species is known so far from a single collection found in a small reserve of well-preserved Andean forest at around 2,800 m altitude in the southern Colombian Andes. It was found growing epiphytic on a shrub rather close to the ground.

Remarks: *Lobariella foreroana* is characterized by the overall delicate thallus with lobes finely dissected apically into lobules; the apothecial margins are also finely dissected into lobules, together with the pale underside (**Figures 1,2**). Given the absence of isidia or phyllidia, the abundance of apothecia, and the chemistry, the new species comes closest to *L. crenulata* (Hook.) Yoshim., *L. pallida* (Hook.) B. Moncada & Lücking, *L. pallidocrenulata* B. Moncada & Lücking, *L. parmelioides* B. Moncada & Lücking, and *L. reticulata* B. Moncada & Lücking (**Moncada *et al.***, 2013a). Among these, *L. pallida* and *L. pallidocrenulata* differ in the much broader lobes (up to 20 mm) and *L. pallida* in the hypermaculate thallus. *Lobariella crenulata*, *L. parmelioides*, and *L. reticulata* also have broader lobes (5–10 mm) that do not become finely dissected. The first two also differ in the abundant pseudocyphellae, whereas *L. reticulata* lacks methyl-gyrophorate.

Phylogenetically, *L. foreroana* forms a separate clade close to the *L. pallida* complex, but this relationship is not supported. It is phylogenetically quite distinct from the other four phenotypically similar species discussed above (**Figure 3**).

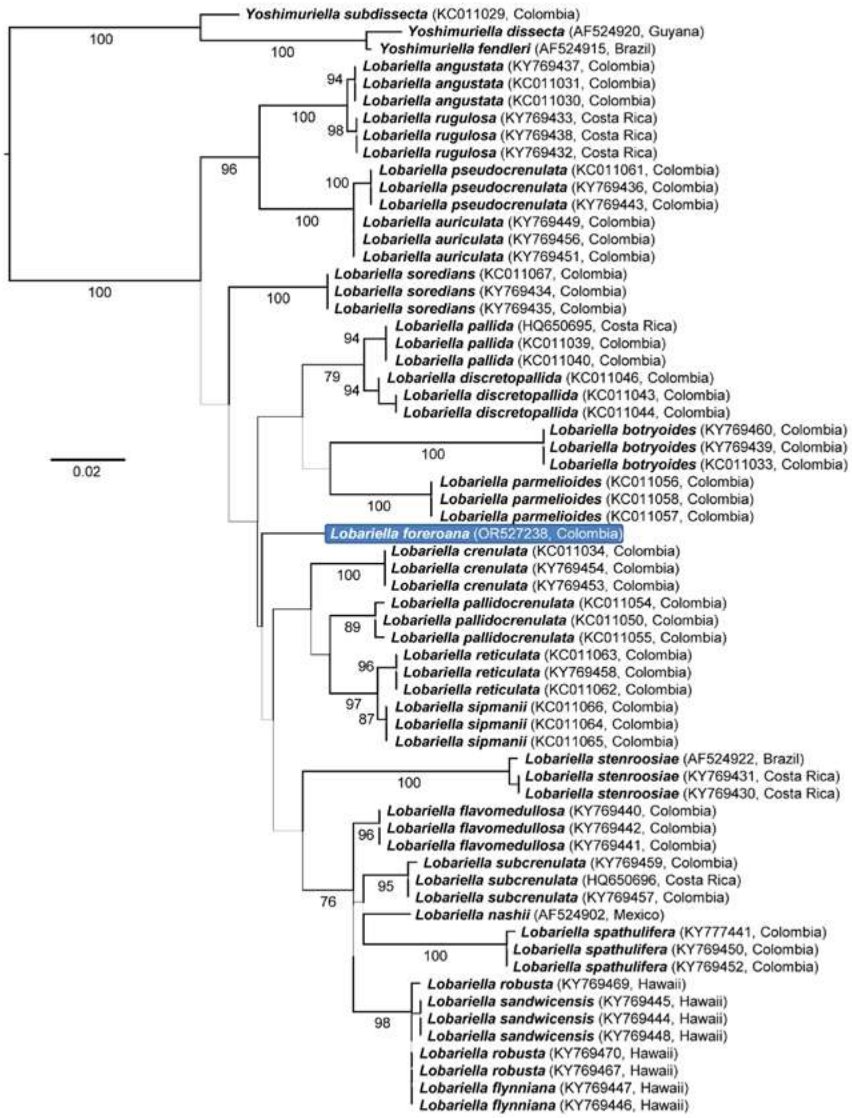

Figure 3. Phylogenetic position of *Lobariella foreroana* based on maximum likelihood analysis of the fungal ITS barcoding marker. Values below branches indicate bootstrap support equal to or greater than 70%.

Sticta henrici B.Moncada, D.Rincón & Lücking sp. nov.

Mycobank MB 849915
GenBank accession for holotype ITS: OR527234, OR527235, OR527236, OR527237

Figures 4-8

Type: COLOMBIA. Tolima: Eastern flank of the Colombian Cordillera Central, in the city of Ibagué, Cerro Machín volcano, located 17 km from the urban area, specifically in the rural sector between the Corregimiento of Tapias and Toche, which belongs to the city, on Finca La Secreta, 4°29›11›› N, 75°22’54’’ W, at 2410 m alt., in a cloud forest dominated by the tree species *Hedyosmum bonplandianum*, *Weinmannia pubescens*, *Clusia multiflora*, and *Myrcia popayanensis*; 11 July 2021, D. Rincón-Murillo *166* (UDBC: C-0025000, holotype!; B: B 60 0300502, isotype!), D. Rincón-Murillo *167* (UDBC: C-0025001, B: B 60 0300503, paratypes!).

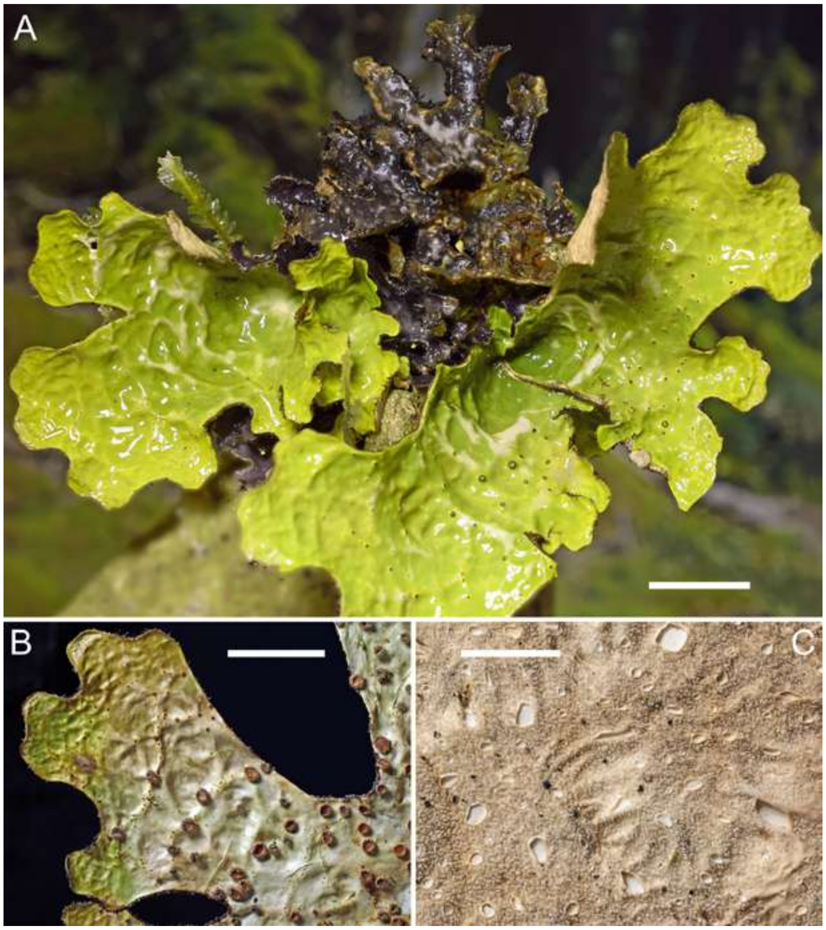

Figure 4. *Sticta henrici* B. Moncada, D. Rincón & Lücking sp. nov. (isotype; chloromorph). **A.** Thallus with chloromorph and cyanomorph. **B.** Lobe with apothecia. **C.** Thallus underside with tomentum and cyphellae. Scale in A–B = 10 mm, in C = 5 mm

Diagnosis: Similar to *Sticta granatensis* Nyl., but differing in the distinctly pilose apothecial margins.

Description (chloromorph): Thallus growing on tree bark, up to 30 cm across, loosely attached between and over bryophytes and other lichens; stipe absent. Primary photobiont green (*Symbiochloris*). Thallus rounded to irregular in outline, moderately branched, with 3–5 ramifications for every 5 cm radius, branching anisotomous to nearly dichotomous at the lope tips. Lobes truncate, horizontal to somewhat ascending, disjunct to partially imbricate, plane to slightly involute along the margins, with their tips obtuse and their margins entire, not thickened; lobe internodes 10–20(–30) mm long, 10–20 mm broad, subcoriaceous, tough. Upper surface shallowly scrobiculate, bright green when fresh, yellowish green to light brownish in the herbarium, slightly shiny, with the margin of the same color; surface glabrous, with scattered papillae towards the lobe tips, without pruina, maculae absent or indistinct. Genuine cilia are absent, but tomentum darkens along the lobe margins and shortly projects from below resembling short and dense cilia. Vegetative propagules are absent. Medulla is compact, cream-colored, K–, C–, KC–, P–. Lower surface undulate, with areas of distinct, short ridges arranged parallel to the lobe orientation, cream-colored. Primary lower tomentum dense, thin, pubescent, cream-colored, darkening along the lobe margins. Secondary lower tomentum absent. Rhizines are sparse, clustered, simple, up to 3 mm long. Cyphellae abundant, 21–40 per cm^2

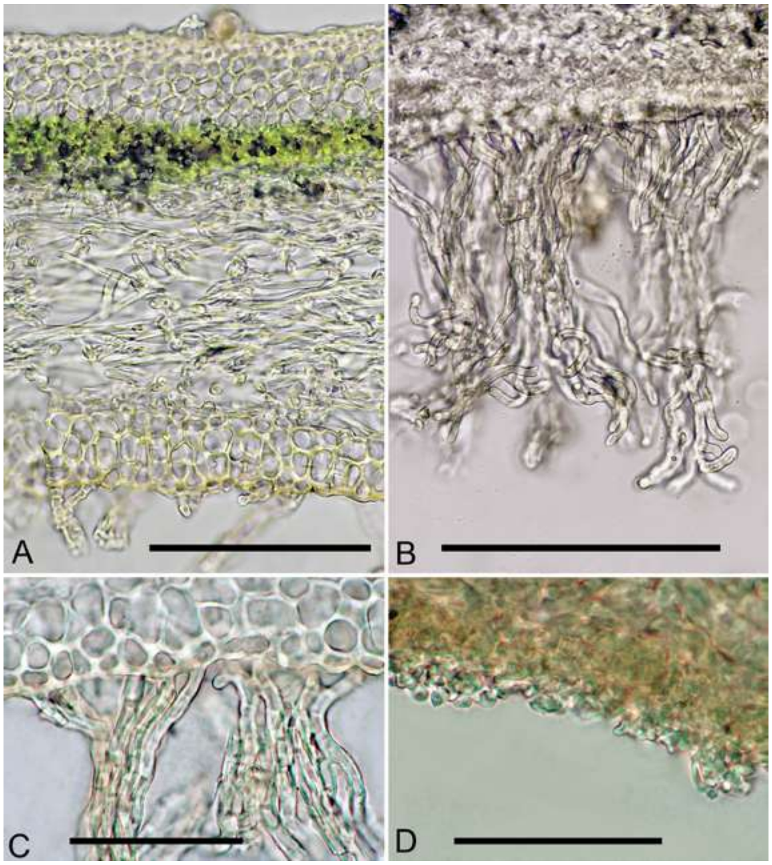

Figure 5. *Sticta henrici* B. Moncada, D. Rincón & Lücking sp. nov. (isotype; chloromorph). **A.** Section through thallus showing upper cortex, photobiont layer, medulla, and lower cortex. **B–C.** Lower cortex with tomentum and rhizines. **D.** Surface of cyphellae membrane. Scale in A–B = 100 µm, in C–D = 50 µm

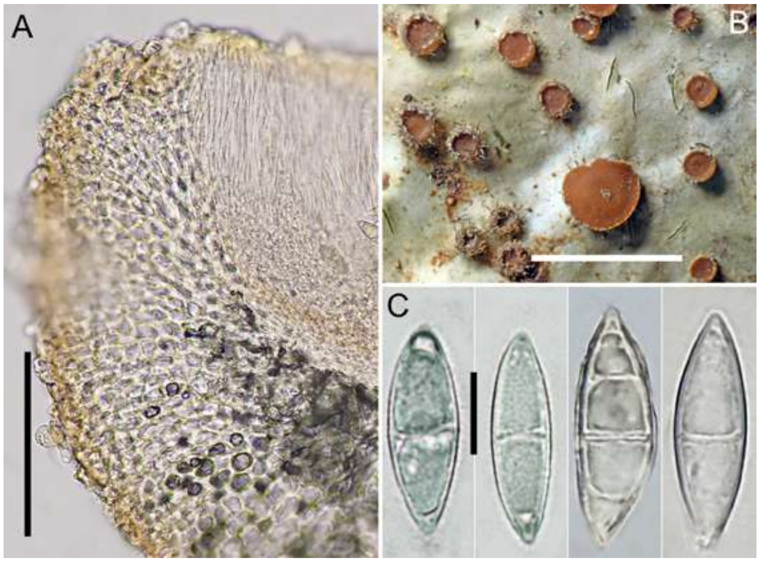

Figure 6. *Sticta henrici* B. Moncada, D. Rincón & Lücking sp. nov. (isotype; chloromorph). **A.** Section through apothecial margin showing the proper excipulum. **B.** Thallus surface with apothecia. **C.** Ascospores. Scale in A = 100 µm, in B = 5 mm, in C = 10 µm

towards the thallus center and 61–100 per cm^2 towards the margin, dispersed, rounded to angular, shallowly urceolate with wide pore, immersed-erumpent, below the level of the tomentum, their margins slightly raised, darker cream-colored and not covered by tomentum; pore 1–2.5 mm in diam. towards the thallus center; basal membrane glabrous but appearing pruinose, cream-colored, K–, C–, KC–, P–.

Upper cortex paraplectenchymatous, 20–30 µm thick, composed of two different cell layers, the upper layer formed by a single layer of cells, 4–5 mm thick, with cell walls 1.5–2 µm thick and the lumina 1.5–2 µm in diam.; lower layer formed by 3–5 layers of cells; cells 4–7 µm diam., with the cell walls around 1 µm thick and the lumina 3–6 mm in diam. Algal layer 20–30 µm thick, with the cells 3–5 µm in diam. Medulla 120–160 µm thick, composed of 3–4 µm thick hyphae, without crystals. Lower cortex paraplectenchymatous, 15–25 µm thick, composed of 3–4 cell layers; cells 4–8 µm in diam., with the cell walls about 1 mm thick. Internal cephalodia not observed. Lower principal tomentum 100–150 µm long, composed of discrete, 30–50 µm broad fascicles of 13–20 hyphae, hyphae unbranched to occasionally branched, septate, with their tips free or often only loosely bundled. Lower secondary tomentum absent. Rhizines formed by conglutinate, brownish hyphae. Cavity of the cyphellae 100–150 µm deep; cells of the basal membrane without papillae but some with an irregularly protruding to subglobose shape resembling papillae.

Apothecia abundant, disc-shaped, laminal to submarginal, sessile, not constricted below, up to 3 mm in diam. and 500 µm high; disc orange to orange-brown, opaque; margin entire to slightly verrucose, distinctly pilose; in young apothecia darker grey-brown and with dense, darkened hairs; in mature apothecia, cream-colored and with scattered, pale hairs in section biatorine. Proper excipulum distinctly paraplectenchymatous, 70–100 µm broad, colorless but outermost layer orange; subhymenium 25–40 µm high, dirty yellowish gray; hypothecium 30–70 µm high, pale yellowish. Hymenium 120–140 µm high, clear; epihymenium up to 5 µm high, colorless to pale orange; asci narrowly clavate, 90–100 × 15–18 µm. Eight ascospores per ascus, irregularly biseriate, broadly fusiform, 25–30 × 7–8 µm, for a long time remaining 1-septate but eventually becoming 3-septate, colorless.

Pycnidia are visible as brownish, immersed dots, about 0.05–0.1 mm diam. and 0.1 mm high; ostiole brownish. Conidia are bacilliform to narrowly dumbbell-shaped, 3–4 × 0.7–1 µm, colorless.

Secondary chemistry: No substances detected by TLC.

Description (cyanomorph): Primary photobiont cyanobacterial (*Nostoc*). Stipe absent. Thallus palmate to irregular, up to 10 cm diam., or individual cyanobacterial lobes emerging from green lobes, richly branched, with 10–20 ramifications for every 5 cm radius, branching anisotomous. Lobes truncate, horizontal to ascending, spaced apart to contiguous, somewhat involute, with their tips obtuse and their margins entire, not or slightly thickened; lobe internodes 2–5 mm long, 3–5 mm broad, subcoriaceous. Upper surface rugose to shallowly scrobiculate, bluish-green when fresh, light (bluish) gray in the herbarium, opaque, with the margin of the same color; surface glabrous, without papillae, without pruina, without true maculae, although paler spots are occasionally observed that are apparently caused by discoloration and not the absence of algae. Cilia abundant and dense, fasciculate to partly minutely squarrose, dark brown to blackish brown, up to 1 mm long. Vegetative propagules are absent. Medulla is compact, cream-colored, K–, C–, KC–, P–. Lower surface undulate, distinctly ridged, cream-colored to brownish. Primary lower tomentum dense, thin, fasciculate, light to medium brown. The secondary lower tomentum is absent. Rhizines are scattered, simple, up to 10 mm long. Cyphellae are abundant, 1–10 per cm^2 towards the thallus center and 21–40 per cm^2 towards the margin, dispersed, rounded to angular, shallowly urceolate with wide pore, immersed-erumpent, below the level of the tomentum, their margins slightly raised, brownish and not covered by tomentum; pore 0.5–2 mm diam. towards the thallus center; basal membrane glabrous but appearing pruinose, cream-colored, K–, C–, KC–, P–.

Apothecia were not observed.

Upper cortex paraplectenchymatous, 30–40 µm thick, composed of two different cell layers, the upper layer formed by a single layer of cells, 5–7 mm thick, with cell walls 1.5–2 µm thick and the lumina 2–3 µm in diam.; the lower layer formed by 3–4 cell layers; cells 5–10 µm in diam., with cell walls around 1 µm thick and the lumina 3–8 mm in diam. Algal layer 25–40 µm thick, with the cells 3–4 µm in diam., arranged in irregular clusters within a gelatinous matrix. Medulla 100–150 µm thick, composed of 3–4 µm broad hyphae, without crystals. Lower cortex paraplectenchymatous, 20–30 µm thick, composed of 3–4 cell layers; cells 4–8 µm diam., with the cell walls about 1 mm thick. Lower principal tomentum formed by hyphae unbranched to occasionally branched, septate, with their tips free or often only loosely bundled, hyphae 150–200 µm long in discrete 30–50 µm broad fascicles of 13–20 hyphae. The lower secondary tomentum is absent. Rhizines are formed by conglutinate, brownish hyphae. Cavity of the cyphellae 100–150 µm deep; cells of the basal membrane without papillae but some cells with irregularly protruding to subglobose shape resembling papillae.

Pycnidia were not observed.

Etymology: The epithet is based on the Latin *Henricus* of the name Enrique.

Ecology and distribution: This new species is known from two collections found in the Andean forest of the Cerro Machín volcano, between 2100 m and 2800 m altitude. It was found growing on the bark of *Myrcia popayanensis*, surrounded by dense mats of *Porotrichum* dendroid mosses and *Plagiochila* foliose liverworts. Remarkably, the species grew somewhat exposed to sulfur dioxide emitted by the fumaroles from the volcano.

Remarks: *Sticta henrici* is characterized by the weakly scrobiculate thallus with pilose apothecia and a pale underside with rather large cyphellae becoming angular (**Figure 4**). Its cyanomorph is quite robust with distinctly ciliate lobes but lacks vegetative propagules (**Figure 7**). The new species is part of a clade of several species forming conspicuous green-algal lichens (chloromorphs) associated with typically more delicate, foliose cyanomorphs (**Figure 8**). Other species in this clade include *S. jaguirreana* B. Moncada, A. Suárez & Lücking, *S. lobarioides* B. Moncada & Coca, *S. maculofuliginosa* B. Moncada & Lücking (only cyanomorph known), *S. neopulmonarioides* B. Moncada & Coca, and *S. pseudolobaria* B. Moncada & Coca (**Moncada & Lücking**, 2012; **Moncada *et al.***, 2013b, 2015). Within the clade, *S. henrici* is characterized by its shallowly scrobiculate surface, pilose apothecia, pale lower tomentum, and plane cyphellae becoming large and angular. In comparison, *S. lobarioides* forms narrower lobes with a faveolate (both morphs) and maculate (cyanomorph) surface, a sparse tomentum becoming dark brown, smaller cyphellae, and glabrous apothecial margins. *Sticta neopulmonarioides* differs from the new species in the same way as *S. lobarioides*, but additionally, it has very narrow, linear lobes, and the delicate cyanomorph bears phyllidia. *Sticta pseudopulmonaria* also deviates in the faveolate lobe surface, small cyphellae, and glabrous apothecial margins but agrees in the pale lower tomentum; its cyanomorph is similar to that of the new species in the conspicuous marginal, dark cilia but it differs by the presence of distinct maculae. The cyanomorphs of *S. jaguirreana* and *S. maculofuliginosa* differ from the cyanomorph of *S. henrici* primarily because of the formation of isidia.

Initial blast search of the ITS sequences of the new species suggested a potentially close relationship to a hitherto unnamed specimen from Puerto Rico (**Mercado-Díaz *et al.***, 2020, 2023); however, in the phylogeny, that specimen is distant within this clade (**Figure 8**).

Morphologically most similar to the new species is *Sticta granatensis* Nyl., also described from Colombia (**Nylander**, 1874; **Moncada**, 2012). It agrees in the scrobiculate (not faveolate) lobe surface, the pale lower tomentum, and the large, flat, angular cyphellae but has apothecia that are consistently glabrous.

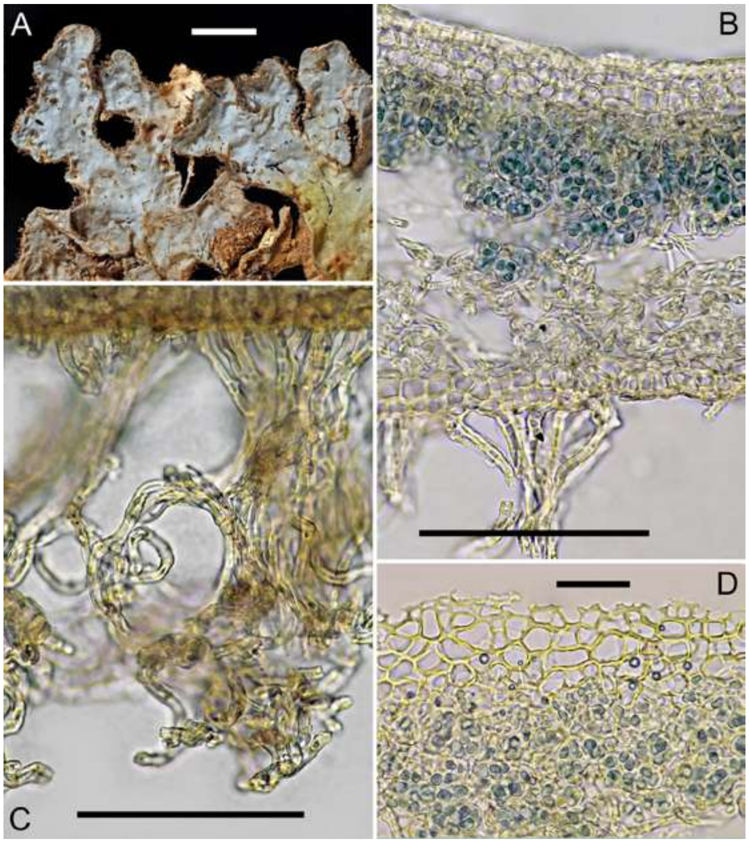

Figure 7. *Sticta henrici* B. Moncada, D. Rincón & Lücking sp. nov. (isotype; cyanomorph). **A.** Thallus lobes. **B.** Section through thallus showing upper cortex, photobiont layer, medulla, and lower cortex with tomentum. **C.** Lower tomentum. **D.** Upper cortex and photobiont layer. Scale in A = 5 mm, in B = 100 µm, in C = 30 µm, in D = 10 µm

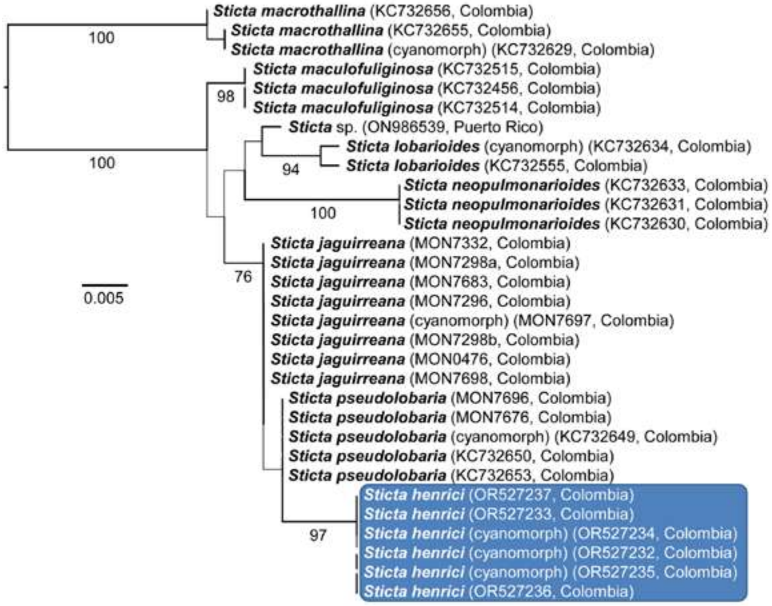

Figure 8. Phylogenetic position of *Sticta henrici* based on maximum likelihood analysis of the fungal ITS barcoding marker. Values below branches indicate bootstrap support equal to or greater than 70%.

Yoshimuriella enfogoa B. Moncada & Lücking sp. nov.

Mycobank MB 849916
GenBank accession for holotype ITS: OR527213

Figures 9-11

Type: COLOMBIA. Cundinamarca: Cordillera Oriental, Vertiente Occidental, Junín, Vereda Potreritos, 20 km ESE of Guasca, Bosques Peña de Santa Bárbara Natural Reserve, campground 200 m above a *finca*; 04°49’ N, 73°45’ W, 2500 m; exposed pasture bordering montane rain forest, with granitic rocks and fence walls and scattered shrubs and trees, on tree bark; 9 November 2012, R. Lücking 35325 & B. Moncada (UDBC: C-0010777, holotype!; B: B 60 0300504, F, isotypes!), R. Lücking 35354 & B. Moncada (UDBC: C-0010781, B: B 60 0300505, paratypes!). El Colegio, Predios CAR Calandaima, 4°31’26.4” N, 74°24’22.7” W, 2057 m; on tree bark; July 2018, J. S. Silano JS18-060 (UDBC: C-0025654, paratype!).

Diagnosis: Similar to *Yoshimuriella subcorrosa* but differing in the continuous lower tomentum and 30 substitutions and 16 indels of the fungal ITS barcoding marker (substitutions: 5× A→C; 1× A→G; 3× C→A; 2× C→G; 4× C→T; 2× G→A; 1× T→A; 8× T→C; 4× T→G).

Description: Thallus growing on tree bark, up to 20 cm across, loosely attached. Primary photobiont green (*Symbiochloris*). Thallus forming rather regular rosettes, moderately branched, with 3–5 ramifications for every 5 cm radius, branching anisotomous. Lobes truncate to rounded, contiguous to somewhat imbricate, plane, their apices incised; lobe internodes up to 1.5 cm long, 10–15 mm wide. The upper surface plane is bright green when fresh, pale grey when dry, becoming pale yellowish grey in the herbarium, and slightly shiny; surface glabrous, without papillae, pruina, or maculae. Phyllidia (resembling tiny lobules but differing in the absence of a lower tomentum) are abundant along the lobe margins and cracks in the thallus, sometimes also on the lamina, initially spathulate but soon becoming crenulate to branched with short to elongate-linear sections of thallus color but tips conspicuously darkened, up to 2 mm long and 1 mm broad, branches up to 0.3 mm broad. The medulla is compact, cream-colored to whitish, K+ yellowish, C+ pink-red. The lower surface is somewhat undulated, cream-colored. The primary lower tomentum is brown to dark brown, composed of dense but rather short hyphae, absent along a narrow, bare margin. The secondary lower tomentum is hard to discern from the primary tomentum. Rhizines are up to 1 mm long, unbranched, whitish to centrally dark brown to blackish brown, a few loosely scattered and growing isolated from one another but more frequently bundled into clusters of rhizines, especially towards the thallus center. Cyphellae and pseudocyphellae are absent. Cephalodia were not observed.

The upper cortex appears paraplectenchymatous, 40–60 µm thick, composed of 5–7 cell layers; the uppermost 1–2 layers with small, thick-walled cells in thick sections appearing orange-brown; cells 4–5 µm diam., with cell walls around 2 µm thick and the lumina 2–3 mm in diam., gradually transitioning into lower layers composed of 3–5 layers of larger, thin-walled cells; cells 4–6 µm diam., with cell walls around 1 µm thick and the lumina 3–5 mm in diam. Algal layer 30–40 µm thick, with the cells 3–5 µm in diam. Medulla 150–200 µm thick, composed of 2–3 µm thick hyphae encrusted with small crystals. The lower cortex is paraplectenchymatous, 20–40 µm thick, composed of 3–4 cell layers; cells 4–8 µm in diam., with cell walls about 1.5 mm thick. Internal cephalodia were not observed. The lower primary tomentum 200–300 µm long, formed by single hyphae or loose fascicles of 10–20 hyphae, hyphae unbranched or apically branched, septate and more or less constricted at the septa, with individual cells often subglobose, brown; the secondary tomentum 20–50 µm long, formed by single hyphae, hyphae unbranched rarely branched, septate and constricted at the septa with individual cells subglobose to globose and hyphae appearing moniliform, colorless to pale brown. Rhizines composed of agglutinated, brownish hyphae.

Apothecia were not observed.

Pycnidia were not observed.

Secondary chemistry: Gyrophoric acid; medulla K+ yellowish, C+ pink-red.

Etymology: The epithet is an acronym of the full name of Prof. Dr. Enrique Forero, **En**rique **Fo**rero **Go**nzáles. It is to be considered an arbitrarily constructed epithet according to ICNafp Art. 23.2. and it is to be treated as adjective.

Ecology and distribution: *Yoshimuriella enfogoa* is known so far from two localities in montane rain forests in the Colombian Andes (Cundinamarca), growing on tree bark. One paratype (Silano JS18-060) was collected as part of an environmental impact assessment (Corporación Autónoma Regional de Cundinamarca – CAR, *Proyecto "Diseño del embalse Calandaima – Contrato CAR No 1186 de 2014*", EPAM S.A.).

Remarks: The material studied here was first wrongly identified as *Ricasolia tenuis* (Vain.) Stizenb., a distantly related species recently reclassified in the genus *Emmanuelia*, as *E. tenuis* (Vain.) Lücking, B. Moncada & Gumboski (**Simon *et al.***, 2020). Both taxa exhibit heavily phyllidiate lobe margins and a uniform lower tomentum not forming a vein-like pattern (**Figures 9, 10**). To our surprise, the molecular data revealed that the examined specimens do not belong in *Emmanuelia* and are not related to *E. tenuis* but form a clade deeply nested within *Yoshimuriella* (**Figure 11**), which is a remarkable example of morphological homoplasy between these two genera. The phyllidia of *E. tenuis* are overall more delicate and more coralloid than those of *Y. enfogoa*, and the lower tomentum is comparatively thin.

Figure 9. *Yoshimuriella enfogoa* B. Moncada & Lücking (paratype; R. Lücking 35354 & B. Moncada). **A.** Thallus in situ. **B.** Thallus lobes enlarged in situ. **C.** Thallus surface enlarged in situ showing phyllidia. Scale in A–B = 20 mm, in C = 10 mm

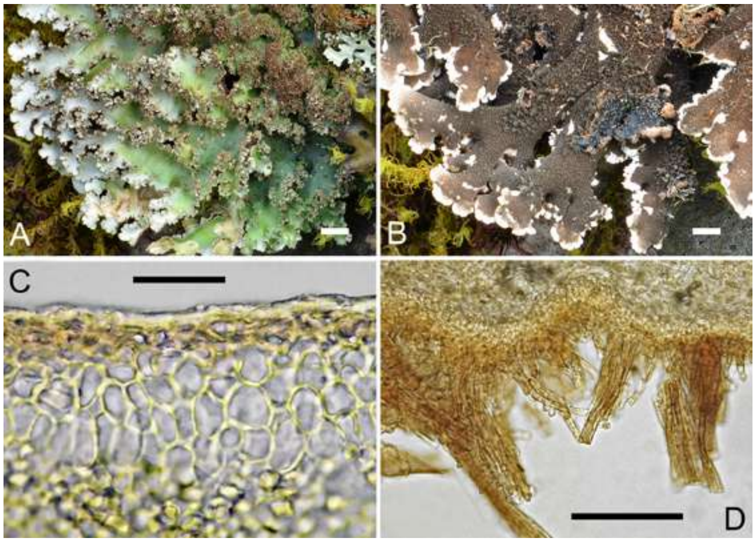

Figure 10. *Yoshimuriella enfogoa* B. Moncada & Lücking (holotype above; isotype below). **A.** Thallus in situ. **B.** Thallus underside in situ showing tomentum and scattered to clustered rhizines. **C.** Upper cortex. **D.** Lower tomentum with rhizines. Scale in A–B = 10 mm, in C = 10 µm, in D = 100 µm

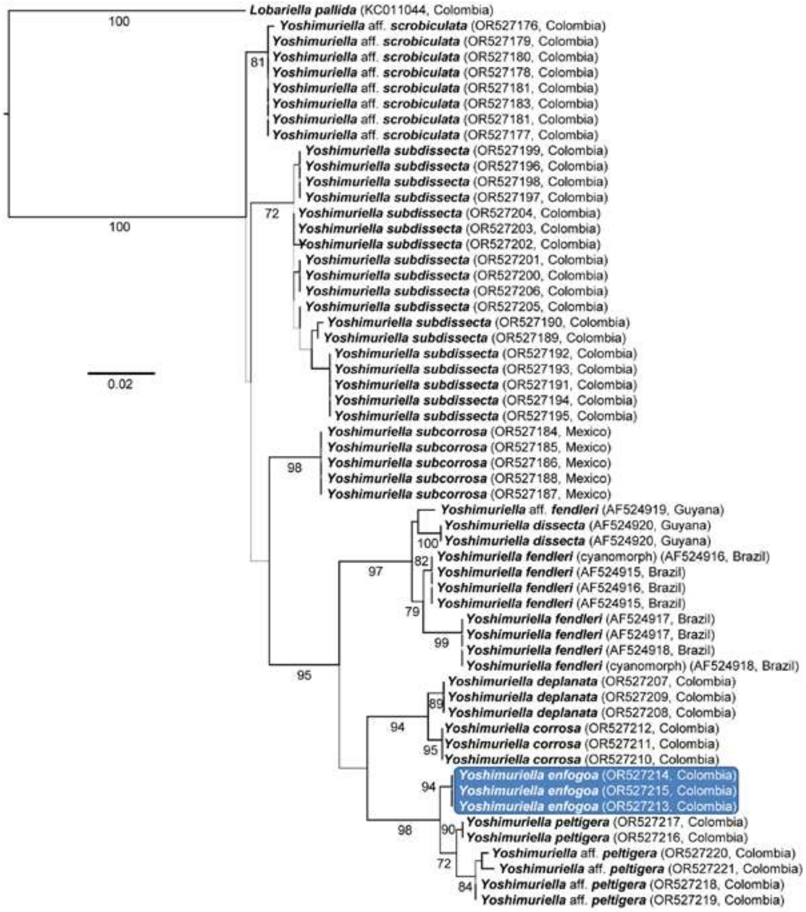

Figure 11. Phylogenetic position of *Yoshimuriella enfogoa* based on maximum likelihood analysis of the fungal ITS barcoding marker. Values below branches indicate bootstrap support equal to or greater than 70%.

Within *Yoshimuriella*, *Y. enfogoa* is characterized by the rather uniform lower tomentum combined with heavily phyllidiate lobe margins and the adnate, regularly rosette-forming thallus with contiguous lobes. Most other species of *Yoshimuriella* known and sequenced so far feature a tomentum forming a vein-like pattern (**Yoshimura**, 1969, 1998; **Moncada *et al.***, 2013a). Also, their thallus is more loosely attached to the substrate, with their lobes usually more widely spaced. The only exception is *Y. subcorrosa* (Nyl.) B. Moncada & Lücking, originally described from Mexico and considered a putative Mexican endemic species by **Yoshimura** (1998). Indeed, this taxon is overall very similiar to *Y. enfogoa*, including the abundant marginal phyllidia. The main difference is the continuous lower tomentum in *Y. enfogoa* vs. the typically lacunose lower tomentum in *Y. subcorrosa*, leaving numerous small, whitish interspaces that give the impression of a bad shave. Also, the two species are phylogenetically quite distinct, with *Y. enfogoa* closely related to the morphologically deviating *Y. peltigera* (Vain.) Lücking & B. Moncada (**Figure 11**), which supports the notion of *Y. subcorrosa* as a Mexican endemic and demonstrates the morphological convergence even within the genus *Yoshimuriella*.

Dedication

It is with great sadness that we dedicate these three new species (**Figure S1**) to our esteemed mentor, colleague, and friend, Prof. Dr. Enrique Forero González, who passed away recently. Enrique was one of the most outstanding Colombian botanists and specialists in plant families such as Connaraceae and Fabaceae. This past year, in 2022, Dr. Enrique Forero celebrated not only his 80th birthday but also the 50th anniversary of receiving his PhD degree in 1972 and the 25th anniversary of being introduced into the Academia Colombiana de Ciencias Exactas, Físicas y Naturales (ACCEFYN) as full member in 1997.

Enrique Forero started his career as head of the Botany Section at Universidad Nacional de Colombia (1972–1977), head Curator of the National Herbarium of Colombia (1972), and first director of the graduate program in systematics (1981–1984). Afterwards, he increased his experience abroad and became Director of Research at the Missouri Botanical Garden (1986–1991) and Director of the Institute of Systematic Botany of the New York Botanical Garden (1992–1995). Upon his return to Colombia, he was Director of the Institute of Natural Sciences (1996) and Dean of the Faculty of Sciences at Universidad Nacional de Colombia (1996–2000), and from 2013 to 2022, he was President of the Academia Colombiana de Ciencias Exactas, Físicas y Naturales (ACCEFYN).

Besides these achievements and appointments, Enrique Forero was also very active in networking: he participated in the creation of the Asociación Colombiana de Herbarios, the Asociación Latinoamericana de Botánica, and the Scientific Committee at the Red Latinoamericana de Botánica, acting two times as the President of the Asociación Latinoamericana de Botánica (1986–1990, 1998–2002). He was active in the IUCN, the IUCN-WWF Plants Advisory Group, and the Convention on International Traffic of Endangered Species of Flora and Fauna (CITES). While serving as President of the Academia Colombiana de Ciencias Exactas, Físicas y Naturales, he presided over the Colegio Máximo de las Academias de Colombia (2015–2017). Since May 2022, he was a member of the Council of the United Nations University, Chair of the Regional Focal Point for the Latin American and Caribbean Region, and Member of the ISC Committee for Freedom and Responsibility in Science.

Enrique Forero played a fundamental role in encouraging young researchers with advice and corrections. As supervisor of the Master's thesis of the first author of the present contribution, Enrique participated in the first monographic approach to lobarioid Peltigeraceae, genus *Pseudocyphellaria* s.lat., registered for Colombia (**Moncada & Forero**, 2006), and more recently, he contributed directly to the thesis of the second author focused on the taxonomy and ecology of the lichens on the Cerro Machín volcano (Rincón-Murillo *et al*., in preparation). He also encouraged the dissemination of scientific knowledge through lectures and conferences.

Enrique Forero's passing is a deeply felt loss for the scientific community in Colombia and the world and to his students, colleagues, friends, and family. His work, achievements, and example will have a lasting impact on the standing of science in Colombia, influencing researchers at all career levels. His legacy will continue long into the future. Naming these three new lichen species after him is only a small token of appreciation.

Supplementary information

View the figure S1 and annexes S1, S2, and S3 in https://www.raccefyn.co/index.php/raccefyn/article/view/1978/3430

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Author contributions

BM designed the study, collected the studied material, analyzed the specimens, performed the molecular laboratory work and the phylogenetic analyses, wrote the first manuscript draft, including descriptions, edited the draft, and approved the final version.

DRM collected the studied material, analyzed the specimens of *Sticta henrici,* revised and edited the draft, and approved the final version.

RL collected the studied material, analyzed the specimens, performed the phylogenetic analyses, wrote the first manuscript draft, including descriptions, revised and edited it, and approved the final version.

Conflicts of interest

The authors declare no conflict of interest.

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