

Novelties in the *Saccoloma inaequale* complex (Saccolomataceae) from the neotropics

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RESUMEN: Estudios recientes en *Saccoloma inaequale* para el neotrópico han resultado en la descripción de las especies nuevas: *S. quadripinnatum* y *S. sunduei*. La primera especie es caracterizada por escamas del rizoma y base del pecíolo redondas a ovadas y muy pequeñas, frondas más de 4-pinnadas con segmentos pequeños y creciendo en pendientes rocosas a lo largo de quebradas. La segunda especie es reconocida por la combinación de pecíolo y raquis escamosos en toda su extensión con dos tipos de escamas, frondas muy grandes superficie adaxial de la lámina verde oscuro (cuando viva) o negruzca (cuando seca). También *Microlepia galeottii* y *Saccoloma inaequale* var. *nigrescens* son combinadas como especies válidas en el género *Saccoloma*. Adicionalmente, se presenta una clave para las especies neotropicales de *Saccoloma*.

PALABRAS CLAVE: helechos, neotrópico, nuevas combinaciones, nuevas especies, *Saccoloma inaequale*, Saccolomataceae.

ABSTRACT: Recent studies on *Saccoloma inaequale* from the neotropics have resulted in the description of the following two new species: *S. quadripinnatum* and *S. sunduei*. The first species is characterized by rhizome and stipe base scales rounded to ovate and very small, fronds more than 4-pinnate with small segments and growing in rock slopes along streams. The second species is recognized by the combination of stipe and rachis scaly throughout with two types of scales, very big fronds and adaxial surface of the blade dark green (when living) or blackish (when dry). Also *Microlepia galeottii* and *Saccoloma inaequale* var. *nigrescens* are combined as valid species under the genus *Saccoloma*. In addition, a key for the neotropical species of *Saccoloma* is given.

KEY WORDS: ferns, neotropics, new combinations, new species, *Saccoloma inaequale*, Saccolomataceae.

INTRODUCTION

Moran (2008), characterized the genus *Saccoloma* Kaulf. by its petioles that have a continuous (undivided) omega-shaped (Ω), vascular bundle in transversal section; rhizomes that are scaly and erect or decumbent; axes that are grooved on the upper surface; and sori that are marginal or submarginal at the apex of a vein.

Moran (1992) mentioned that *Saccoloma inaequale* (Kunze) Mett. probably represents a complex of several species. Moran (2008) mentioned that *Saccoloma* is a genus of shaded wet forest; it is pantropical with about 15

species, six of which occur in the Neotropics; the most common species from Mexico to southern Brazil is *S. inaequale*, which is highly variable and probably consists of several, undescribed taxa.

The classification of extant ferns, established by Smith *et al.* (2006) based in phylogenetic studies, put to *Saccoloma* in a monogeneric family related to Lindsaeaceae. Schuettpelz & Pryer (2008) to be agreement with the classification of Smith *et al.* (2006) respect to Saccolomataceae.

The more recent species described in *Saccoloma* are *S. membranaceum* (Mickel 1984), *S. squamosum* (Moran 1992), *S. laxum* (Moran and Øllgaard, 1995) and *S. moranii* (Rojas 1996). Here two new species are described and two names are combined.

Saccoloma inaequale (Kunze) Mett., Ann. Sci. Nat. Bot. Sér. 4, 15: 80. 1861. (Fig. 1).

Davallia inaequalis Kunze, Linnaea 9: 87. 1834. Type: Peru, Poeppig 2113 (Holotype: ?; Isotypes: B! (photos: F, GH, COL!), GH (not found, Sundue, pers. com.), US (fragm.)).

Saccoloma inaequale var. *caudatum* Hieron., Hedwigia 47: 207. 1908. Type: Peru, Loreto, near Iquitos and Cocha (in the Marañón Valley), *Stubel 1129* (B, not seen).

Saccoloma inaequale var. *costaricense* Rosenst., Repert. Spec. Nov. Regni Veg. 22 (606-608). 1925. Syntype: Costa Rica, Carrillo, *A. Brade & C. Brade 334* (?). Costa Rica, litorale atlanticum, Finca Gebr. Hundriesser, *A. Brade & C. Brade 637* (?). The later specimens have not seen, however apparently they are distributed in the lowlands of Caribbean side of Costa Rica, the typical geographical distribution of *S. inaequale*.

Saccoloma moranii A. Rojas, Brenesia 45-46: 45, f. 8. 1996. Type: Costa Rica, Limón, Pococí, San Juan de Pococí, Cuatro Esquinas, 10°34'N, 83°51'W, 17 May 1991, *A. Rojas et al. 1822* (Holotype: INB!; Isotypes: CR, MO, NY).

Rhizome de 5-15 mm in diameter, compact, erect; *rhizome scales* 4-10 x ca. 1 mm, linear, concolorous, brown, marginally entire; *fronds* 30-80 (-140) cm long, semierect; *stipe* ca. 1/2 of the frond length, 1.5-2.5 mm in diameter, yellowish to brown in the base, grooved; *blade* 15-70 x 20-60 cm, 2-pinnate-pinnatifid to 3-pinnate-pinnatifid, deltate, papiraceous; *axes* yellowish-brown, inermous, glabrous; *segments* 7-20 x 3-10 mm, ovate to oblong, sessil to short

pedicellate, cuneate at base, with acroscopic side obtuse and the basisopic cuneate to decurrent, marginally aserrate to lobate, not incurvate; *blade surface* yellow-green to green adaxially, light green abaxially, glabrous; *aerophores* absent or less than 1 mm tall; *sori* 0.7-1 mm long, submarginal to marginal.

DISTRIBUTION. Known from lowlands in the Neotropics between Honduras to Bolivia at 0-500 (-1000) m alt.

ADDITIONAL SPECIMENS EXAMINED.

NICARAGUA. Atlántico Norte: Cerro Kalansa Asang, 14°18'N, 84°36'W, 200 m, 22 Jan 1996, *Rueda et al. 4006* (MO); Cerro Saslaya, 13°47'N, 84°59'W, 300-400 m, 9 Apr 1999, *Rueda et al. 10531* (MO), *ibid.*, 11 Apr 1999, *Rueda et al. 10612* (MO); Madregara, 100-800 m, 13°47'N, 84°43'W, 6-7 Jan 1970, *Atwood 3211* (F, G, MO). Atlántico Sur: Río Pejibaye, 11°22'N, 84°01'W, 50-200 m, 13 Jan 1999, *Rueda et al. 9996* (MO). Río San Juan: Buena Vista, 1 km W de Delta del Río San Juan, 10°46'15"N, 83°47'30"W, 10 m, 14 Sep 1982, *Martínez & Riviere 2109* (MEXU, MO); Caño Chontaleño, 11°06'N, 84°14'W, 14 Feb 1997, *Rueda et al. 5779* (MO); Caño Chontaleño, 11°08'N, 84°12'W, 17 Feb 1997, *Rueda et al. 5943* (MO); Caño Chontaleño, 11°09'N, 84°10'W, 10 Jun 1997, *Rueda et al. 6214* (MO); Río Caño Negro, 10°58'N, 84°04'W, 60 m, 16 May 2002, *Rueda & Mendoza 16964* (MO); Castillito, 10°44'30"N, 83°52'30"W, 110 m, 5 Sep 1982, *Martínez 2165* (MO); Comunidad Aguas Zarcas, 11°14'22"N, 84°14'16"W, 350 m, 7-10 Apr 2005, *Toval 363* (MO).

COSTA RICA. Heredia: near Tirimbina, E of Río Sarapiquí, 10°24'N, 84°07'W, 150-250 m, 12-15 Aug 1971, *Burger & Burger 8104* (MEXU); Finca La Selva, the OTS Field Station on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, Holdridge Trail in 2200-2400 line, ca. 100 m, 15 Mar 1981, *Folsom 9346* (CR); Sarapiquí, Puerto Viejo, Estación

Biológica La Selva, 10°26'N, 84°01'W, 50 m, 2 Jul 2001, *Jones et al.* 16 (CR), *ibid.*, 8 Aug 2001, *Jones & Olivas* 173 (CR), *ibid.*, 10 Aug 2001, *Jones & Olivas* 181 (CR), *ibid.*, 50-150 m, 4 Mar 2002, *Jones & Olivas* 344 (CR); Barva, Barva, Transect Trail between Volcán Barva and Finca La Selva, 10°19'45"N, 84°03'35"W, 400 m, *Kluge* 2691 (CR); La Selva Research Station of OTS, CES Trail at 500, 10°10'N, 84°00'W, 100 m, 15 May 2002, *Landrum et al.* 10,266 (CR); Cantón de Sarapiquí, Zona Protectora La Selva, cuenca del Río Sarapiquí, Puerto Viejo, cercanías de La Arboleda, 2 Dec 1997, 10°26'N, 84°01'W, 50 m, *Rojas et al.* 4157 (CR); finca of Dr. Leslie Holdridge, on the Río Puerto Viejo, near the junction with Río Sarapiquí, ca. 300 ft [90 m], 18-28 Feb 1955, *Scamman* 7444 (CR); La Selva, finca of Dr. Leslie Holdridge, on the Río Puerto Viejo, near the junction with Río Sarapiquí, ca. 300 ft [90 m], 28 Apr 1956, *Scamman & Holdridge* 7918 (CR); Finca La Selva, the OTS Field Station, on the Río Puerto Viejo just E of its junction with the Río Sarapiquí, Southwestern Trail in 1100 line, 100 m, 14 Jul 1996, *Wilbur* 66139 (CR). Limón: Limón, Reserva Biológica Hitoy Cerere, cuenca del Río Estrella, límite E de la reserva, 9°40'30"N, 83°01'36"W, 100 m, 2 Jul 2000, *Acosta* 2059 (CR); hills 2 airline km SSE of Islas Buena Vista, in the Río Colorado, 110-120 m, 13-14 Sep 1986, *Davidse & Herrera* 31043 (CR); airline km SW of Barra del Colorado, 10°40'N, 83°40'W, Cantón de Talamanca, Reserva Indígena Talamanca, Cordillera de Talamanca, Amubri, Soki, 9°30'05"N, 82°58'05"W, 80-150 m, 11 Apr 1996, *Gallardo et al.* 342 (CR); Talamanca, Gandoca, margen izquierda del Río Mile Creek, siguiendo las colinas al NW, 9°37'N, 82°38'W, 10 m, 1 Apr 1995, *Herrera et al.* 7680 (CR); Parque Nacional Barbilla, cuenca del Matina, sector Colonia Puriscaleña, Sendero Cerro Azul, 9°49'45"N, 83°23'08"W, 11 Mar 2000, 400-500 m, *Mora et al.* 943 (CR, INB), *ibid.*, *Mora et al.* 945 (CR, INB); Cantón de Talamanca, La

Bomba, Asunción, Fila Matama, aguas arriba del Río Banano, Fila Asunción, 9°54'N, 83°12'W, 400 m, 20 Feb 1995, *Rodríguez* 558 (CR). Puntarenas: Cantón de Aguirre, cuenca del Naranjo y Parrita, Faldas de Cerro Nara, arriba de Quebrada Salitrillo, 9°28'55"N, 84°02'50"W, 200 m, 1 Apr 1998, *Rodríguez et al.* 3212 (CR); Cantón de Golfito, Parque Nacional Corcovado, Península de Osa, Jiménez, Estación Los Patos, 8°33'59"N, 83°30'59"W, 200 m, 2 Jul 1998, *Rodríguez* 3550 (CR). San José: Pérez Zeledón, Río Nuevo, Savegre Abajo, Cerro El Zoncho, 9°26'20"N, 83°51'20"W, 800-1000 m, 13 May 1999, *Estrada et al.* 2219 (CR); Tarrazú, San Marcos, San Pablo, de el desvío a Quepos, 0.5 km camino a San Carlos, 9°38'10"N, 84°05'25"W, 70 m, 22 Feb 1995, *Herrera* 7733 (CR); Finca Los Cusingos of Dr. Alexander Skutch, Quizarrá de Pérez Zeledón, 8 mi SE from San Isidro del General, 2500 ft [760 m], 5 Apr 1949, *Norby & Norby* 369 (CR).

PANAMA. Darién: Serranía de Pirre, above Cana Gold Mine, between Río Cana and Río Escucha Ruido, 1000-1310 m, 27 Jul 1976, *Croat* 37,784 (MO); Chepimana District, Cana, Cuasi trail (Camp 2), 3000 ft [910 m], 10 Mar 1940, *Terry & Terry* 1468 (MO).

COLOMBIA. Amazonas: Mun. Leticia, Parque Nacional Natural Amacayacu, Centro Administrativo Amacayacu-INDERENA, trocha hacia la cabaña Matamatá, 03°47'S, 70°15'W, 150 m, 8 Apr 1991, *Pipoly et al.* 15062 (MEXU, MO); Mun. Leticia, Parque Nacional Natural Amacayacu, Centro Administrativo Mata-Matá (indígena), al N de la Quebrada Mata-Matá, 03°47'S, 70°15'W, 110 m, 13 mar 1991, *Rudas et al.* 1581 (MEXU, MO); Mun. Leticia, Corregimiento Tarapacá, Parque Nacional Natural Amacayacu, Cabaña Lorena, alrededores y trocha a la cabaña, 3°02'S, 70°00'W, 100 m, 22 Jun 1991, *Rudas et al.* 2342 (MEXU, MO); Mun. Leticia, Corregimiento Tarapacá, Parque Nacional Natural Amacayacu, Cabaña Lorena (Río Cotuhé), trocha que va a la cabaña y a las

cabeceras del Caño Lorena, 3°02'S, 70°00'W, 100 m, 24 Jun 1991, *Rudas et al. 2419* (MEXU, MO). Antioquia: Mun. San Luis, Quebrada "La Cristalina", 6°N, 74°45'W, 550-770 m, 24 Aug 1987, *Ramírez & Cárdenas 1478* (MO). Chocó: Mun. Nóvita, Vereda Curundó, margen izquierda del Río Ingará, 550 m, 12 Jan 1983, *Franco et al. 1097* (MO). Cundinamarca: Cordillera Oriental, Buena Vista, Gazaguan Valley, 6 km W of Medina, 800 m, 6 Oct 1944, *Grant 10418* (CR). Meta: along road to San Luis de Cubarral, 5 km W of N-S hwy, between Villavicencio and Granada, 3°45'N, 73°45'W, 550 m, 24 Mar 1983, *Croat 55536* (MO). Putumayo: Mun. Mocoa, El Churumbelo, Vereda El Zarzal, costado derecho de la Quebrada Dantayaco, 1°06'N, 76°36'W, 840 m, 13 Jun 2002, *Ramírez et al. 15549* (COAH). VENEZUELA. Bolívar: Departamento Sifontes, base de los tepuyes (Peraytepuy y Guytepuy), del sector "La Hoyada" (Parytepuy) 7 km al NW del Caserío El Pílon, 58 km al W de Santa Elena de Uairén, aprox. 4°40'N, 61°33'W, 850-1100 m, 23 Oct 1986, *Aymard 4761* (MO); 17 km E of El Pajui by road and 64 km W of Santa Elena by road, 4 km N of hwy, Río Las Ahallas, ca. 4°30'N, 61°30'W, 850 m, 30 Oct 1985, *Liesner 19197* (MO); Distrito Piar, Amaruay-Tepui, S side about 1 km from SW corner of tepui, 5°54'N, 62°15'W, 550-810 m, 25 Apr 1986, *Liesner & Holst 20314* (MO); 5 km S of El Pajui, "El Abismo", Río Samay, affluent of Icabarw forested valley, 4°23'N, 61°38'W, 520 m, 21 Oct 1985, *Liesner & Holst 18845* (MO). Falcon: Sierra de San Luis, arriba de Santa María, 1080 m, 1 Feb 1979, *without collector 294* (MO). Mérida: Distrito Tovar, Los Giros near El Osa, ca. 5 km from previous location, 8°27'N, 77°44'W, 700 m, 26 Jul 1983, *Werff & Ortíz 5720* (MO). Táchira: Distrito Uribante, along road from La Siberia, to entrance to Represa Las Cuevas, 9 Jul 1983, *Werff & González 5190* (MO). Territorio Federal Amazonas: Departamento Atabapo, slope of Huachamacari, 3°39'N, 65°42'W, 750 m, 6 Mar 1985, *Liesner 18361* (MO).

GUYANA. Upper Potato River Region, ca. 19 mi N of Kopinang Village, 5°5'N, 59°49'W, 720 m, 27 Jun 1989, *Boom & Samuels 8888* (MO).

FRENCH GUIANA. Montagne de l'Inini, extrémité NW, 3°30'40"N, 53°35'40"W, 700 m, 16 Aug 1985, *P. Cayenne et al. 8950* (MO); Mont Atachi Bacca, Région de l'Inini, Pied du Mont Atachi Bacca, PK 7 á 9, entre Camp II et III, 3°33'N, 53°55'W, 500 m, 11 Jan 1989, *Cremers et al. 165* (MO).

ECUADOR. Esmeraldas: Eloy Alfaro, Parroquia Teleuvi, Cristóbal Colón, Cooperativa Tesoro Escondido, zona del Río Gualpi, 0°31'N, 79°08'W, 520 m, 8 Mar 2004, *Narvaéz et al. 992* (MO). Morona-Santiago: La Misión Salesiano, 5 km al S del Río Bomboiza, cerca de la carretera Zamora-Gualaquiza, 800 m, 13 May 1985, *Baker 6169* (MO); Gualaquiza Cantón, 3 km of town of Gualaquiza, 3°24'S, 78°34'W, 1000 m, 27 Jul 1993, *Fay & Fay 4159* (MEXU, MO); Gualaquiza, off main road S of Gualaquiza, at tourn-off to Bomboiza, 3°27'S, 78°33'W, 800 m, 8 Feb 1993, *Fay & Fay 4224* (MO); Misión Bomboiza, 3°29'S, 78°34'W, ca. 800 m, 23 Apr 1973, *Holm-Nielsen et al. 4263* (MO); Bomboiza, 17 km SE of Gualaquiza, 3°27'S, 78°34'W, 750 m, 23 Jul 1985, *Palacios 548* (MEXU, MO). Pastaza: vicinity Shell, ca. 1 km N of town, along Río Claro, 0°29'39"S, 78°03'52"W, 1085 m, 29 Aug 2002, *Croat & Hannon 87093* (MO); Pastaza Cantón, ca. 1 km SE of Puyo, toward Indian village, then SW, Los Ángeles area, 1°30.5'S, 77°58'W, 950 m, 19 Jul 2008, *Fay & Fay 3698* (MO); Pastaza Cantón, pozo petrolero "Moretecocha de Arco", 1°30'S, 78°30'W, 500 m, 20-27 Feb 1991, *Gudiño 1322* (MO); Población de Moretecocha, 1°30'S, 78°30'W, 500 m, 19-21 Mar 1991, *Gudiño 1376* (MO); Pastaza Cantón, pozo petrolero "Ramírez" 20 km S de la población de Curaray, 01°32'S, 76°51'W, 300 m, 21-28 Feb 1990, *Zak & Espinosa 4976* (MEXU, MO). Zamora-Chinchipec: along road between el Pangui and Zamora, vicinity of San Roque, 2 km S of San Roque, 10 km S of El Pangui,

3°42'11"S, 78°35'59"W, 78°35'59"W, 900 m, 7 Sep 2002, *Croat 87205* (MO); along road out of the town of Chuchumbleza, parallel to Zamora River, going S, 3°31'S, 78°31'W, 800 m, 8 Feb 1993, *Fay & Fay 4229* (MO).

PERU. Cusco: Panantombo, Atalaya-Carzón, 700 m, *Vargas 13,398* (CR). Loreto: Maynas Prov., Indiana, Reserva Explorama (Yanamono), 25 km al NE de Iquitos, a lo largo del Río Amazonas, 03°30'S, 72°50'W, 110 m, 27 Sep 1990, *Pipoly et al. 12486* (MEXU, MO). Maynas Prov., Región de Amazonas, Las Amazonas, Explornapo Camp, cerca de Sucusari, a lo largo del Río Napo, 3°20'S, 72°55'W, 100-140 m, 6 Mar 1991, *Pipoly et al. 14668* (MO); Maynas, Iquitos, Nina Rumi, Río Nanay, 03°50'S, 73°25'W, 122 m, 14 Jun 1988, *Vázquez & Jaramillo 10,787* (MEXU, MO). Pasco: Oxapampa, Palcazu Valley, Iscozacín, trail to Villa America, 4 km from airstrip, 10°12'S, 75°15'W, 400 m, 12 Jan 1984, *Foster et al. 7914* (MO). San Martín: km 72 of Tarapoto-Yurimaguas road, Lamas, Santa Risa de Davidcillo, 06°15'S, 76°17'W, 200-250 m, 2 Sep 1986, *Knapp 8238* (MEXU, MO).

NEW COMBINATION AND NEW STATUS

Saccoloma galeottii (Fée) A. Rojas, comb. nov. (Fig.1)

Microlepidia galeottii Fée, Mem. Foug. 5: 327. 1852. Type: México, Teotalengo, *Galeottii 6526* (P, n.v.).

Microlepidia caudata Fée, Mem. Foug. 5: 327. 1852. Type: México, *Galeottii 6527* (P, photo MEXU!).

Rhizome (7-) 10-20 mm in diameter, compact-ascending; *rhizome scales* 3-7 x 1-2 mm, lanceolate to linear-lanceolate, patent, central portion dark brown to blackish, margin brown and erose; *fronds* 70-120 (-200) cm long; *stipe* 40-70 cm long, yellowish-brown to pale brown, blackish at the base along 10-40 cm (ca. 1/4-1/2 of the stipe length), inermous or muricate at the

base, scaly only in the base, the scales 2-6 x 1-2 mm, linear-lanceolate, dark brown to blackish, patent; *blade* 50-100 x 40-90 cm, deltate, 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, charthaceous; *axes* grayish-brown to brown, inermous, glabrous; *aerophores* absent or less than 1 mm tall; *blade surface* glossy dark green adaxially and green abaxially, glabrous in both surfaces; *sori* conical, submarginal.

This species can be recognized by the combination of linear-lanceolate, bicolorous and erose to denticulate rhizome scales, partially bicolored blade (adaxial surface green and abaxial surface pale green), and distributed between Mexico and Nicaragua at 1000-2500 m (except for a form with sori principally in the axil of segments, that grow in Oaxaca, Santa María Chimalapa at 150-500 m alt).

Microlepidia caudata cannot be combined under *Saccoloma* because this name is occupied by *Saccoloma caudatum* Copel., Philipp. J. Sci. 30: 327. 1926.

DISTRIBUTION. Known from Mexico to Nicaragua at 1000-2500 m alt. (few specimens in Oaxaca at 150-500 m).

ADDITIONAL SPECIMENS EXAMINED. MEXICO. Chiapas: Mun. Jitotol, about 12 km N of Jitotol, 2000 m, 28 Oct 1971, *Breedlove & Thorne 21519* (MEXU); SE side of Cerro Tres Picos and the ridges near summit, 2100-2500 m, 28 May 1972, *Breedlove 25374* (MEXU), *ibid.*, [16°30'N, 92°30'W], 28 Mar 1973, *Breedlove 34369* (MEXU, MO); Mun. Siltepec, ridge above Siltepec on the road to Huixtla, 2000-2400 m, 18 Jan 1973, *Breedlove & Smith 31996* (MEXU); Mun. La Trinitaria, Montebello National Park, E of Laguna Tzikaw, 1300 m, 23 Jan 1973, *Breedlove & Smith 32208* (MEXU); E of Lagos de Montebello, along road to Dos Lagunas and Ojo de Agua, 1.6 km beyond Ojo de Agua at ca. km 16, 1330 m, [16°30'N, 92°30'W], 28 Jan 1979, *Croat 46706* (MEXU,

MO). Oaxaca: Santa María Chimalapa, Río Verde, 7 km en línea recta al NNE de Santa María Chimalapa, 16°58'17"N, 94°39'45"W, 360-430 m, 4 Aug 1985, *Calettiet al.* 100 (MEXU, MO); District Villa Alta, along trail from Yetzelalag toward Lovani, 3500 ft [1065 m], 2 Dec 1971, *Hallberg 1510* (MEXU); Mun. Santa María Chimalapa, cresta del cerro al N del Río Del Corte, ca. 8 km al NE de Santa María, 16°57'30"N, 94°40'00"W, 450 m, 4 Mar 1985, *Hernández 961* (MEXU, MO); Mun. Santa María Chimalapa, Arroyo Morga, 3-4 km arriba de la desembocadura al Río Del Corte, ca. 6-7 km el línea recta al NE de Santa María, 16°58'N, 94°37'30"W, 220 m, 17 May 1985, *Hernández 1197* (MEXU, MO); Mun. Santa María Chimalapa, arroyo Sardina, parte superior, 7-7.5 km S de Santa María, 16°52'N, 94°41'W, 350 m, 9 Dec 1985, *Hernández 1902* (MEXU, MO); Mun. Santa María Chimalapa, 16°51'30"N, 94°43'00"W, 400 m, 19 Oct 1985, *Hernández & González 1684* (MEXU, MO); Mun. Santa María Chimalapa, ca. 8 km N de Santa María, por la vereda a Río Verde, subida de Matzpac (Sacatal), 16°57'N, 94°41'W, 350 m, 28 Oct 1985, *Hernández & González 1760* (MEXU, MO); Distrito Ixtlán, 31 km S de Valle Nacional, camino a Oaxaca, [17°00'N, 96°30'W], 22 Nov 1984, *Martínez et al.* 8771 (MEXU, MO); Mun. San Felipe Usila, 8 km en línea recta al S de Santa Cruz Tepetotutla, 17°39'56"N, 96°33'36"W, 2500 m, 19 May 1994, *Meave et al.* 1614 (MEXU); District Villa Alta, valley of the Yelagago River, ca. 20 mi NE of Villa Alta, 17°25'N, 96°05'W, 3800-4300 ft [1155-1305 m], 25 Jul 1972, *Mickel 974* (MEXU, MO); Distrito Tuxtepec, 24 km S of Valle Nacional, 5 km N of Campamento Vista Hermosa, 4100 ft [1245 m], [17°00'N 96°30'W], 31 Jul 1971, *Mickel 5928* (MEXU, MO); Distrito Ixtlán, 58 km N de Ixtlán, 11 km N of high point at Cerro Pelón, 6600 ft [2005 m], [17°00'N 96°30'W], 27 Oct 1969, *Mickel & Hellwig 4248* (MEXU, MO); Mun. Santa María Chimalapa, Distrito Juchitlán, Los Ángeles antes de Arroyo Seco, 23.3 km E de Lázaro

Cárdenas hacia San María Chimalapa, entrando por El Mezquite, 16°50'N, 94°45'W, 400 m, 21 Jan 1988, *Torres & Martínez 11159* (MEXU); 39 km al S de Valle Nacional, sobre carretera a Oaxaca, 1800 m, 10 Apr 1976, *Rzedowski 34,038* (MEXU); Mun. Santa María Chimalapa, Congregación Nicolás Bravo, 3-5 km S de la población de Río Alegre, Arroyo Chocolin cerca del Rancho Ruth, 17°10'N, 94°42'W, 150 m, 29 Dec 1984, *Wendt et al.* 4740 (MEXU, MO). Veracruz: 12 km S of Misantla, 1350 m, 21 Dec 1971, *Barrington 711* (MEXU); 12 km S of Misantla, 1350 m, 1 Jan 1982, *Bohs et al.* 1721 (MEXU); Sierra de Chiconquiaco, Cañada del Huerfano, 1300 m, 26 May 1967, *Gómez & Riba 428* (MEXU); about 12 km S of Misantla, ca. 1350 m, 3 Jan 1973, *Kress et al.* 791 (MEXU); Mun. Catemaco, 4-5 km S de Bastonal, vertiente N de la Sierra Santa Marta, 900 m, 12 May 1981, *Lira 198* (MEXU); San Pedro Soteapan, arroyo 4 km N de San Fernando rumbo a Santa Marta, 960 m, 14 Aug 1980, *Riba et al.* 1188 (MEXU); Mun. Yecuatla, Lomas de Santa Rita, 1400 m, 13 Mar 1971, *Ventura 3272* (MEXU); Mun. Banderilla, Banderilla, 1450 m, 3 Jan 1975, *Ventura 10732* (MEXU); Mun. San Andrés Tlalnehuayocan, 1500 m, 26 Jan 1976, *Ventura 12348* (MEXU); Mun. Atzalan, La Calavera, 1000 m, 30 May 1980, *Ventura 17222* (MEXU); Mun. Atzalan, La Calavera, [19°20'N 96°40'W], 1000 m, 27 Apr 1978, *Ventura 15227* (MEXU, MO).

GUATEMALA. Baja Verapaz: Purulha, 15°12'52"N, 90°12'28"W, 1500 m, 16 Jul 1977, *Croat 4117* (MO).

HONDURAS. Atlántida: La Manga, 15°46'57"N, 86°42'24"W, 1150 m, 13-18 Apr 1976, *Nelson et al.* 3273 (MO). Comayagua: 14°30'N, 87°53'W, 2020 m, 2 Mar, 1991, *House 870* (MO). Francisco Morazán: Parque Nacional La Tigra, 14°12'N, 87°06'W, 1800-2050 m, 7 May 1991, *Davidse & House 34219* (MO); El Rosario, 14°13'03"N, 87°05'25"W, 1800 m, 24 Mar 1951, *Morton 7394* (MO); Montaña de Uyuca, 16 km E de Tegucigalpa, 1800 m, 9 Oct 1983, *Rivas 79* (MEXU).

Ocotepeque: 35 km al NE de Nueva Ocotepeque, camino a San Pedro Sula, [14°28'N, 89°04'W], 1870 m, 12 Jun 1985, *Martínez & Téllez 12947* (MEXU, MO).

NICARAGUA. Jinotega: Jinotega, 13°03'N 85°58'W, 1500 m, 7 Aug 1977, *Croat 43,056* (MO).

This species differs from *S. inaequale* by the characters mentioned in the key and table 1.

Saccoloma nigrescens (Mett.) A. Rojas, stat. nov. (Fig. 2).

Saccoloma inaequale (Kunze) Mett. var. *nigrescens* Mett., Fil. Lechl. 1: 22. 1856. Type: Peru, St. Gavan (Río San Gaban), *Lechler 2293* (Holotype LZ, destroyed; Isotype: B, photos GH, US!).

Saccoloma inaequale (Kunze) Mett. var. *dimorphum* H. Christ, Bull. Herb. Boissier, ser 2,5 (3): 252. 1905. Type: Costa Rica, *C. Werkle 252* (US!).

Terrestrial; *Rhizome* (7-) 10-20 mm in diameter, compact-ascending; *rhizome scales* 3-6 x 1-2 mm, ovate to lanceolate, dark brown to blackish, appressed; *fronds* 105-200 (-250) cm long; *stipe* 46-77 cm long, greyish-brown to pale brown, atropurpureous at the base along 10-40 cm (ca. 1/4-1/2 of the stipe length), inermous or muricate at the base, scaly only in the base, the scales 2-6 x 1-2 mm, ovate to lanceolate, dark brown to blackish, appressed; *blade* 60-90 x 70-100 cm, deltate, 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, chartaceous to subcoriaceous; *axes* grayish-brown to brown, inermous, glabrous; *aerophores* 1-2 mm tall and 2-4 mm long, present in the axils of basal pinnae pairs; *blade surface* dark green to blackish when dry adaxially, gray-green abaxially, glabrous in both surfaces; *sori* conical, submarginal.

DISTRIBUTION. Known from Costa Rica, Panama and Colombia at (400-) 700-2200 m alt.

ADDITIONAL SPECIMENS EXAMINED. COSTA RICA. Alajuela: Reserva Forestal San Ramón, N of the station ca. 1 km, 10°12'40"N, 84°36'20"W, 1000-1200 m, 16 Apr 1991, *Bittner 961* (CR); La Palma de San Ramón, 10 Oct 1932, *Brenes 15282* (CR); San Ramón, N slope of Cerros Pata de Gallo, near summit, Montes del Aguacate, 10°02'N, 84°28'W, 1480-1520 m, 18 Nov 1988, *Grayum et al. 9101* (CR, MO); Monteverde Forest Reserve, La Ventana, 10°15'N, 84°50'W, 1600 m, 1 Nov 1986, *Hennipman et al. 6627* (CR); Upala, Bijagua, El Pilón, ladera Caribe del Volcán Tenorio, cuenca alta del Río Celeste, 10°43'30"N, 85°00'25"W, 1500-1800 m, 23 Jul 1988, *Herrera 2153* (CR, MO); Upala, Dos Ríos, 5 km al S de Brasilia, margen derecha del Río Pizote, 10°55'N, 85°20'W, 500 m, 29 Oct 1987, *Herrera 997* (CR, MO); Poás, 1700 m, 30 March 1932, *Kupper 803* (CR); San Ramón Reserva Biológica Monteverde, Cordillera de Tilarán, Estación La Casona, Sendero Orquídeas, 10°20'N, 84°44'N, 1000 m, 3 May 1995, *Martínez 461* (CR, INB); Cantón de San Ramón, Reserva Forestal San Ramón, Cordillera de Tilarán, Distrito Los Ángeles Norte, 10°13'00"N, 84°35'20"W, 800-1000 m, 7 May 1996, *Quesada et al. 1527* (CR, INB); Cantón de San Ramón, Reserva Biológica Monteverde, Cordillera de Tilarán, Estación Aleman's, 10°22'N, 84°48'W, 1200-1500 m, 20 May 1995, *Rojas 1847* (CR, INB); Cantón de San Ramón, Reserva Biológica Alberto Manuel Brenes, entre Volcán Muerto y Cerro Jabonal, 10°11'05"N, 84°37'40"W, 1300-1500 m, 9 Feb 2007, *Rojas & Cervantes 7530* (CR, USJ); N slope of ridge along quebrada draining pastward to Río Cataratitas, ca. 20 km NW of San Ramón, 10°13'N, 84°32'W, ca. 850 m, 3 Feb 1986, *Smith et al. 2257* (CR, UC). Alajuela-Puntarenas: Monteverde Natural Reserve, Pacific watershed, 10°18'N, 84°47'W, 31 Oct-2 Nov 1975, *Burger & Baker 9779* (CR, F).

Cartago: just W of Quebrada Casa Blanca, Tapantí, 9°47'N, 83°48'W, 1350 m, 26 Dec 1984, *Grayum et al.* 4657 (CR, MO); Cantón de Turrialba, Reserva Biológica Barbilla, cuenca del Matina, sendero principal al Río Barbilla, 9°58'24"N, 83°27'02"W, 500 m, 18 Sep 1999, *Mora & Rojas* 480 (CR, INB, MO); Cantón de Paraíso, Valle del Reventazón, Mirador Ecológico Monte Sky, 9°44'40"N, 83°50'00"W, 1700-2000 m, 23 Sep 1995, *Rojas et al.* 2506 (CR, INB). Guanacaste: Parque Nacional Rincón de La Vieja, Liberia, cabeceras de Quebrada Rancho Grande, alrededores de Meseta Aguacatales, 10°46'N, 85°49'W, 1350-1400 m, 2 Dec 1987, *Herrera* 1482 (CR, MO). Heredia: between Quebrada Tigre and E fork of Río Sardinal, ca. 9 km SW of Las Horquetas, 17°N, 84°02'W, ca. 800 m, 2 Feb 1985, *Grayum et al.* 5048 (CR, MO); between Río Peje and Río Sardinalito, caribbean slope of Volcán Barva, 10°17.5'N, 84°04.5'W, 700-750 m, 2 Apr 1986, *Grayum* 6696 (CR, MO); Parque Nacional Braulio Carrillo, 10°15'N, 84°10'W, 1830 m, 8 Nov 1986, *Hennipman et al.* 6777 (CR, MO); Braulio Carrillo National Park, 10°20'N, 84°10'W, 1215 m, 13 Nov 1986, *Hennipman et al.* 6895 (CR); Barva, transect trail between Volcán Barva and Finca La Selva, 10°14'09"N, 84°05'05"W, 1400 m, 2003, *Kluge* 4239 (CR); along Río Vueltas, (upper Río Patria) at end of Rte 113, 9 km N of Ángeles, 10°06'N, 84°04'W, 1900 m, 1 Apr 1973, *Stolze* 1618 (CR, F). Limón: Cantón de Limón, Cordillera de Talamanca, along divide between Río Xichiari and Río Boyei, above Cabécar Village of Almirante, 9°46'30"N, 83°20'00"W, 1100-1150 m, 13 Aug 1995, *Grayum* 10913 (CR, MO); Siquirres, Las Brisas de Pacuarito, subiendo por las estribaciones al en de Cerro Tigre, 9°56'10"N, 83°25'20"W, 900 m, 1 Nov 1995, *Herrera et al.* 8652 (CR, MO); Cantón de limón, Cerro Muchilla, Fila Matama, entrando por El Progreso, Cordillera de Talamanca, 9°47'40"N, 83°06'30"W, 850 m, 11 Apr 1989, *Robles & Chacón* 2746 (CR, MO); Pococí, Parque Nacional Braulio Carrillo,

cuenca del Sarapiquí, Estación Quebrada González, Sendero las Palmas, 10°09'48"N, 83°56'20"W, 500 m, 11 Sep 1996, *Rodríguez et al.* 1522 (CR, INB); Pococí, cuenca del Sarapiquí, Finca Bosque Lluvioso, propiedad del INBio, alrededores de la Estación, 10°11'24"N, 83°51'25"W, 400 m, 11 Nov 1999, *Rodríguez et al.* 5402 (CR, INB, MO); Limón, Reserva Indígena Chirripó, Fila Matama, Almirante, 9°46'15"N, 83°20'15"W, 1060-1330 m, 10 Aug 1995, *Rojas et al.* 2276 (CR, INB, MO); Cerro Coronel, E of Río Zapote, E of new road, higher parts of hill ca. 1.5 from Río Colorado, 10°40'N, 83°40'W, 40-100 m, 13 Mar 1987, *Stevens et al.* 24790 (CR, MO). Puntarenas: Golfito, Parque Nacional Corcovado, Península de Osa, Cerro Rincón, 8°31'N, 83°28'W, 700-745 m, 27 Jan 1998, *Rojas et al.* 4216 (CR, INB, MO). San José: Dota, Zona Protectora Cerro Nara, Fila, 9°27'40"N, 84°00'50"W, 900-1000 m, 3 Dec 1997, *Estrada et al.* 1347 (CR); Pérez Zeledón, Savegre, Peor es Nada, margen izquierda de Quebrada Misteriosa, 9°31'10"N, 83°51'30"W, 1700 m, 3 Aug 1994, *Herrera et al.* 7242 (CR); Cantón de Vázquez de Coronado, Parque Nacional Braulio Carrillo, cuenca del Sarapiquí, Estación Carrillo, Quebrada Sanguijuela, 10°09'38"N, 83°57'23"W, 700 m, 23 Mar 1999, *Rojas & Jenkins* 5003 (CR, INB, MO); Tarrazú, San Carlos, cruce de la calle a San Carlos y Ríos Paraíso, orilla de la laguna, 9°36'29"N, 84°07'04"W, 1650 m, 21 Sep 2004, *Rojas & Lobo* 6136 (CR, MO); Tarrazú, San Carlos, Reserva Biológica Ríos Paraíso, sendero a las aguas termales, 9°33'50"N, 84°07'25"W, 400 m, 17 May 2004, *Rojas & Ruiz* 5613 (CR, MO); Cantón de Tarrazú, Valle Central, Cerro Pito, 2.5 km SE del Basurero, 9°34'30"N, 84°04'30"W, 1500 m, 18 Apr 1995, *Rojas et al.* 1770 (CR, INB); along unnamed N fork of Río Zurquí (upstream from hwy N of tunnel), Cordillera Central, 10°04'N, 84°01'W, ca. 1500-1600 m, 18 Jan 1986, *Smith et al.* 1680 (CR, UC).

PANAMA. Bocas del Toro: Cerro Colorado 9.2 mi W of Chamé, along trail E of road which leads down to stream, 8°35'N, 81°50'W, 1450-1480 m, 6 Jul 1988, *Croat 69049* (MO). Chiriquí: above San Félix along mining road 18-27 mi off of Pan-Am Hwy (above Chame or turnoff to Escopeta), 1200-1500 m, 12 Mar 1976, *Croat 33069* (MO); along road in vicinity of branch in road to Cerro Colorado and Escopeta, above Río San Félix near town of San Félix (ca. 13 mi N of Río San Félix bridge), 800-1200 m, 15 Mar 1976, *Croat 33427* (MO); Cerro Colorado, along road above San Felix, 29 km above bridge over Río San Félix (7.9 km above turnoff to Escopeta), 1500 m, 14 Jul 1976, *Croat 37082* (MO); along Río Caldera (Boquete region) and on slope to the E, ca. 3.5 km NW of Bajo Mono, 8°50'N, 82°28'W, ca. 1600 m, 8 Feb 1986, *Smith et al. 2499* (MO). Coclé: area of El Valle, 2 km E of La Mesa, N slope of Cerro Gaital, 8°38'N, 80°07'W, 800 m, 24 Nov 1983, *Churchill 3906* (MO); summit of Cerro Pilón, above El Valle de Antón, ca. 2700 ft [820 m], 28 Mar 1969, *Dwyer et al. 4486* (MO); N slope and summit of Cerro Pilón, 900-1173 m, 16 Mar 1972, *Croat 22941* (MO). Darién: summit of Cerro Pirre, 1000-1400 m, 29 Dec 1972, *Gentry & Clewell 7146a* (MO), *ibid.*, *Gentry & Clewell 7076* (MO); Pirre Masiff, Alturas de Nique, above Cana Mine, 7°45'N, 77°40'W, 1250-1500 m, 3 Mar 1988, *McPherson 12204* (MO). Panamá: Campo Tres, 3 mi en of Altos de Pacora, 500-800 m, 10 Mar 1973, *Croat 22731* (MO). Veraguas: along road between Santa Fé and Río Calovebora, 1.8 mi beyond Escuela Agrícola Alto Piedra, 735 m, 5 Apr 1976, *Croat & Folsom 34,256* (MO).

COLOMBIA. Antioquia: Urao Mun., Vereda Calles, Parque nacional Natural "Las Orquídeas", margen derecha del Río Calles, en el filo NW de la Cabaña Calles, 6°32'N, 76°19'W, 1450 m, 2 Dec 1993, *Cogollo et al. 7724* (MO); Mun. Anorí, Vereda Santa Gertrudis, finca La Estrella, quebrada que surte de agua la casa, 7°07'58.8"N, 75°09'34.9"W, 1420 m, 3 Oct 2003, *Rodríguez et al. 4120*

(COL); Mun. Anorí, Vereda San Antonio, finca "El Cielo", 7°16'0.5"N, 75°03'51.9"W, 725 m, 9 Nov 2003, *Rodríguez 4229* (COL). Antioquia-Chocó: both sides of the principal ridge W of La Mansa, at ca. Km 105.5 of the Ciudad Bolívar-Quibdo Road, 2100-2200 m, 4 Apr. 1971, *Lellinger & de la Sota 925* (CR, US). Boyacá: carretera Chiquinquirá a Pauna, Puente de Piedra, 2050 m, 13 Oct 1967, *Jaramillo et al. 3514* (COL). Cauca: Mun. Santa Rosa, 1 km arriba de la desembocadura del Indiyaco en el Caquetá, 600 m, 15 Oct 1996, *Sánchez et al. 3048* (COAH), 16 Oct 1996, *R. Sánchez et al. 3081* (COAH). Cundinamarca: Yacopí, Inspección de Policía de Guadalito, Vereda La Laguna, 1465 m, 27 Oct 1995, *Morales et al. 467* (COL).

VENEZUELA. Portuguesa: Departamento Sucre, localidad conocida como La Divisoria de La Concepción, 9°18'N, 70°06'W, 1500-1800 m, 23-26 Oct 1985, *Ortega et al. 2741* (MO), *Ortega et al. 2760* (MO).

ECUADOR. Carchi: above San Marcos de Los Coaiqueres, on trail towards Gaulpí Bajo, 1°06'N, 78°17'W, 1000 m, 7 Feb 1985, *Øllgaard et al. 57521* (MO). Morona-Santiago: Morona, Cordillera de Cutucu, Centro Shuar Uunsuants/TransKutucu, 2°32'S, 77°56'W, 1100 m, 19 Jan 2002, *Toasa & Tirado 8628* (MO). Napo: Cantón El Chaco, Río Granadillo, campamento de INECEL, "Codo Alto", 0°08'S, 77°28'W, 1300 m, 13-15 Sep 1990, *Palacios 5625* (MO). Pastaza: Pastaza Cantón, ca. 1 km SE of Puyo, toward Indian village, then SW, Los Ángeles area, 1°30.5'S, 77°58'W, 950 m, 19 Jul 1992, *Fay & Fay 3669* (MO), *ibid.*, *Fay & Fay 3674* (MO); Pastaza Cantón, N of city of Puyo, in city park by the river, 01°29'S, 77°59.5'W, 950 m, 14 Jul 1992, *Fay & Fay 3740* (MEXU, MO), *ibid.*, *Fay & Fay 3741* (MEXU, MO). Zamora-Chinchipec: Nangaritza, Parroquia Guayzimi, campamento militar, 4°21'S, 78°40'W, 1050-1150 m, 24 Oct 1991, *Cerón et al. 17179* (MO); Nangaritza Canton, Mizai, in Río Nangaritza valley, 4°18'S, 78°40'W, 850-900 m, 31 Jul 1993, *Gentry*

80970 (MO); Nangaritza Canton, Río Nangaritza, Pachicutza, camino al hito de Pachicutza, 4°07'S, 78°37'W, 900-1000 m, *Palacios et al.* 8222 (MO); región de la Cordillera del Condor, Parroquia Surmi, Comunidad Yawi, 4°28'19"S, 78°38'20"W, 970 m, 11 Jun 2005, *Quizhpe et al.* 1344 (MO); around mining camp of the Río Tundaime, 3°31'41"S, 78°25'33"W, 800 m, 31 Oct 2004, *Werff et al.* 19,081 (MO); in the vicinity of the mining camp at the Río Tundaime, along road to military base El Condor, 3°38'02"S, 78°25'32"W, 1500 m, 6 Nov 2004, *Werff et al.* 19381 (MO); Cordillera del Condor region, upper Río Nangaritza valley, S of Guayzimi, 4°08'27"S, 78°38'25"W, 900 m, 6 Nov 2006, *Werff et al.* 21974 (MO).

PERU. Junín: Schunke Hacienda, above San Ramón, 1300-1700 m, Aug-Oct 1923, *Schunke* A232 (COL).

This species differs from *S. inaequale* by the characters mentioned in the key and table 1.

The specimens of Costa Rica and Panama have longer (2-6 mm vs. 1-2) and ovate (vs. rounded) rhizome scales, in other characters are similar, however, few specimens have been revised from Panama and probably this character change continuously along the geographical distribution, if it presumption is false, the variety *dimorphum* could be need to combined in species status or accepted as variety.

NEW SPECIES

Saccoloma quadripinnatum A. Rojas, sp. nov. (Fig. 2).

TYPE. COSTA RICA. San José: Cantón de Vázquez de Coronado, Parque Nacional Braulio Carillo, cuenca del Sarapiquí, Sendero Sanguijuela, orilla de la cascada, 10°09'38"N, 83°57'23"W, 700 m, 14 May 2008, *Rojas* 8657 (Holotype: CR; Isotypes: K, MO, USJ).

A. S. inaequale (Kunze) Mett. *squamis rhizomatis minoribus, rotundis, nigrescentibus et adpressis; lamina magis divisa superficie laminae adaxiali viridi et in habito distincto crescens differt.*

Epilithic; rhizome 7-12 mm in diameter, short-creeping; rhizome scales 0.5-1 x 0.5-0.7 mm, deltate to ovate, blackish, sparse, appressed; fronds 95-120 cm long; stipe 33-54 cm long, brown throughout, inermous, glabrous; blade 60-70 x 40-75 cm, deltate, 4-pinnate-pinnatifid to 5-pinnate, chartaceous; axes grayish-brown, inermous, glabrous; aerophores absent; blade surface dark green adaxially, green abaxially and glabrous in both surfaces; sori conical, submarginal.

DISTRIBUTION. Known from Costa Rica, Panama and Colombia at 400-800 (-1200) m alt.

PARATYPES. COSTA RICA. San José: Cantón de Vázquez de Coronado, Parque Nacional Braulio Carillo, cuenca del Sarapiquí, Sendero Sanguijuela, orilla de la cascada, 10°09'38"N, 83°57'23"W, 700 m, 14 Jul 1999, *Rojas & Soto* 5161 (CR, INB, MO).

PANAMA. Veraguas: on caribbean slope above Río Primer Brazo, 5 mi NW of Santa Fé, 700-1200 m, 18-19 March 1973, *Liesner* 992 (CR, MEXU, MO); 7 km W of Santa Fé, on new road past agricultural school, ca. 2900 ft [880 m], 12 Apr 1974, *Nee* 11265 (MO).

COLOMBIA. Antioquia: in valley of Río Anorí, between Dos Bocas and Anorí, vicinity Planta Providencia, 26 km S y 23 km W (by air) of Zaragoza, 7°13'N, 75°03'W, 400-700 m, 14 Jul 1976, *Shepherd* 498 (COL); Mun. Anorí, Vereda Madre Seca, Quebrada Pilonas, sector Juanico, 7°17'00.2"W, 75°03'00.0"W, 610 m, 22 Jan 2004, *Rodríguez et al.* 4546 (COL). Chocó: Nóvita, Vereda Curundó, margen izquierda del Río Ingará, 550 m, 12 Jan 1983, *Franco et al.* 1097 (MO).

The new species differs from *Saccoloma inaequale* (Kunze) Mett. by smaller (0.5-1 mm

in diameter vs. 4-10 mm long), rounded (vs. linear), blackish (vs. light to dark brown) and appressed (vs. patent) rhizome scales; more divided (4-pinnate-pinnatifid to 5-pinnate vs. 2-pinnate-pinnatifid to 3-pinnate-pinnatifid) blade; darker (dark green vs. green) adaxial blade color and, growing in different habitat (in leaning rocks at streams margins vs. understory) (Fig. 1-2, table 1).

ETYMOLOGY. The name of the new species refers to its blade dissection.

Saccoloma sunduei A. Rojas, sp. nov. (Fig. 2).

TYPE. COSTA RICA. San José: Tarrazú, San Carlos, Cerro Cura, orillas de carretera, 9°36'25"N, 84°07'05"W, 1750-1850 m, 2 Feb 2007, A. Rojas & J. Cervantes 7462 (Holotype: CR; Isotypes: MO, USJ).

A. S. inaequale (Kunze) Mett. *quia duos typos squamarum rhizomatis habet, unas 3-6 mm et ovatas ad lanceolatas, altras ca. 1 mm diámetro, rotundas et adpressas; frondibus longioribus; superficie laminae adaxiali fuscatores; axibus squamosis et dissimili distributione altitudinalis differt.*

Terrestrial; Rhizome 20-35 mm in diameter, compact-ascending; rhizome scales 3-6 x 0.5-1 mm, linear-lanceolate, brown, patent, marginally entire to erose; fronds 150-240 (-360) cm long; stipe 90-132 cm long, atropurpleous throughout or at less 3/4 of the length), muricate to spiny throughout, scaly, the scales of two types, the first 3-8 x 0.5-1 (-1.5) mm, ovate to lanceolate, brown, patent, the base hastate and dentate to ciliate, the central and apical portion entire to sparse denticulate, present only in the base, second type 0.5-1.5 x 0.5-1 mm, deltate to ovate, brown, appressed, the margin dentate to ciliate, present throughout the stipe; blade 100-140 x 80-110 cm, deltate, 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, chartaceous to subcoriaceous; axes grayish-

brown to brown, sometimes muricate, sparsely to medium densely scaly, the scales similar to small type at the stipe; *aerophores* 3 mm tall and 5 mm long, present in the axils of basal pinnae pairs; *blade surface* dark green adaxially and grayish-green abaxially, glabrous in both surfaces; *sori* conical, submarginal.

DISTRIBUTION. Known from Costa Rica, Panama, Colombia and Ecuador at (1300-) 1500-2400 (-3200) m alt.

PARATYPES. COSTA RICA. Alajuela: Grecia, Cariblanco, Faldas del Cerro Congo, orillas del camino, 10°16'00"N, 84° 13'00"W, 1300-1500 m, 10 May 2008, *Rojas et al.* 8622 (CR, MO, USJ). Cartago: Paraíso, Orosí, Parque Nacional Tapantí, estribaciones S, Alto Perla, 1400 m, 21 Dec 1992, *Herrera* 5798 (CR, MO); between headwaters of Río San Fernando and Río Sardinal, Caribbean side of Volcán Barva, 10°12'N, 84°06.5'W, 1850-1880 m, 22 Apr 1986, *Grayum* 7352 (CR, MO); Paraíso, Orosí, Parque Nacional Tapantí, Sendero Árboles Caídos, 10°46'00" N, 83° 47'20" W, 1220-1430 m, 28 Jan 2008, *Rojas et al.* 8223 (CR, MO, USJ). Limón: Cordillera de Talamanca, Bratsi, Amubri, Alto Lari, Kivut, fila divisoria entre ríos Lari y Dapari, cabeceras de ambos, 9°22'45"N, 83°06'15"W, 1900 m, 25 Mar 1992, *Herrera* 5511 (CR, MO); Limón, Almirante, Cerro Chiqui, subiendo desde la base por el flanco N, 9°43'40"N, 83°18'30"W, 1700 m, 18 Aug 1995, *Herrera & Gamboa* 8609 (CR). Puntarenas: Las Cruces ridge, 6 km S of San Vito de Java, 4500 ft [1370 m], Feb 1974, *McAlpin* 2420 (CR). San José: Pérez Zeledón, Savegre, Peor es Nada, Margen Izquierda de Quebrada Misteriosa, 9°31'10"N, 83°51'30"W, 1700 m, 2 Aug 1994, *Herrera et al.* 7242 (CR, MO).

COLOMBIA. Cesar: Mun. La Jagua de Ibirico, La Victoria de San Isidro, Vereda El Zumbador, Escuela Nueva El Zumbador, Cerro Cantarranas, 14 Mar 1996, 1820 m, *Fernández et al.* 13,613 (COL). Meta: Cordillera Oriental,

Quebrada Playón, upper Río Manzanares Valley, 20 km SE of Gutiérrez, 65 km S of Bogotá, 2125 m, 6 Aug 1944, *Grant 9863* (CR, COL).

ECUADOR. Carchi: Espejo, Faldas del Cerro Golondrinas Hembra, 0°51'N, 78°07'W, 2300-2400 m, 20 Aug 1994, *Palacios 12755* (MO); Tulcan Canton, Parroquia Chical, Sector Gualpi Medio, Reserva Indígena Awá, Sendero San Marcos al N de la casa comunal, 1°02'N, 78°16'W, 3200 m, 22-27 May 1992, *Tipaz et al. 1111* (MO).

The new species differs from *Saccoloma inaequale* (Kunze) Mett. because it has two types (vs. one type) of rhizome scales, the first are 3-6 mm long (vs. 4-10 mm) and ovate to lanceolate (vs. linear-lanceolate to linear), the second type are ca. 1 mm in diameter, rounded and appressed (vs. this type absent), longer fronds [150-240 (-360) cm vs. 30-80 (-140) cm]; darker adaxial blade color (dark green when living to blackish when dry vs. green); scaly (vs. glabrous) axes and different altitudinal distribution [(1300-) 1500-2400 (-3200) vs. 0-500 (-1100)] (Fig. 1-2, table 2).

ETYMOLOGY. This species is dedicated to Michael Sundue, who made important recommendations at this work.

KEY FOR NEOTROPICAL SPECIES OF *Saccoloma*.

- 1. Fronds pinnate.....*S. elegans*
1'. Fronds 2-4-pinnate.....2
- 2. Fronds 10-20 cm long; stipe ca. 1/4-1/5 of the frond length.....*S. membranaceum*
2'. Fronds 30-240 (-360) cm long; stipe ca. 2/5-1/2 of the frond length.....3
- 3. Fronds 2-pinnate, sori several per segment or pinnule.....*S. dominguense*
3'. Fronds 2-pinnate-pinnatifid to 5-pinnate; sori one (rarely 2 or 3) per segment or lobe.....4
- 4. Stipe and rachis scaly throughout.....5
- 5. Rhizome scales 0.5-1 x 0.3-0.6 mm, linear; fronds 30-90 cm long; rachis scales 0.5-2 mm

- long, linear, brownish to reddish, twister, patent.....*S. squamosum*
5'. Rhizome scales 3-6 x 0.5-1 mm, ovate to lanceolate; fronds 150-240 (-360) cm long; rachis scales in two types, ones 3-8 x 0.5-1 (-1.5) mm, lanceolate, flat, the other ones, 0.5-1.5 x 0.5-1 mm, deltate to ovate, brown, appressed.....*S. sunduei*
4'. Stipe and rachis glabrous, sometimes the stipe scaly at the base.....6
- 6. Rhizome scales linear-lanceolate to linear, brown to blackish, patent.....7
- 7. Pinnule base equilateral or nearly so, with the acroscopic and basispic tertiary segment conspicuously longer than the suprabasal segments and usually overlaps the rachis.....*S. laxa*
7'. Pinnule base inequilateral, with the basal acroscopic tertiary segment or lobe slightly elongated and the basal basispic segment or lobe shortened and ascending, also the basal basispic segment never overlap the rachis.....8
- 8. Rhizome scales bicolorous, central portion dark brown, margin light brown and erose; blade glossy dark green adaxially.....*S. galeottii*
8'. Rhizome scales concolorous, light to dark brown, margin entire; blade opaque green adaxially.....*S. inaequale*
6'. Rhizome scales rounded to lanceolate, blackish, appressed.....9
- 9. Rhizome sparsely scaly; sterile fronds 95-120 cm long; blade 4-pinnate-pinnatifid to 5-pinnate, ending segment ca. 2-3 mm broad; plants growing in leaning rocks at streams margins.....*S. quadripinnatum*
9'. Rhizome medium to densely scaly; sterile fronds 105-200 (-250) cm long; blade 3-pinnate-pinnatifid to 4-pinnate-pinnatifid, terminal segment 3-6 mm broad; plants growing understory.....*S. nigrescens*

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REFERENCES

- Mickel JT. 1984.** New Tropical American Ferns. *American Fern Journal* 74 (4): 111-119.
- Moran RC. 1992.** Five new species of ferns from the American Tropics. *Novon* 2: 132-138.
- Moran RC. 2008.** Neotropical Genera of Ferns and Lycophytes. A guide for students. Organization for Tropical Studies. San José. Printed by the author.
- Moran RC, Øllgaard B. 1995.** Six new species of ferns (Polypodiopsida) from Ecuador. *Nordic Journal of Botany* 15 (2): 177-185.
- Rojas AF. 1996.** Aportes a la Flora Pteridophyta Costarricense. II. Taxones nuevos. *Brenesia* 45-46: 33-50.
- Schuettpelez E, Pryer KM. 2008.** Fern Phylogeny, 397-418. *In*: Ranker TA, Haufler CH (eds.). *The Biology and Evolution of Ferns and Lycophytes*. Cambridge University Press.
- Smith AR, Pryer KM, Schuettpelez E, Korall P, Schneider H, Wolf P. 2006.** A classification for extant ferns. *Taxon* 55 (3): 705-731.

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Table 1. Comparative morphological characters between *Saccoloma galeottii*, *S. inaequale*, *S. nigrescens*, *S. quadripinnatum* and *S. sunduei*.

Character	<i>S. galeottii</i>	<i>S. inaequale</i>	<i>S. nigrescens</i>	<i>S. quadripinnatum</i>	<i>S. sunduei</i>
Habit	terrestrial	terrestrial	terrestrial	epipetric	terrestrial
Rhizome scales length (mm)	3-7	4-10	1-6	0.5-1	ones ca. 1 in diameter, the others 3-6 long
Rhizome scales form	linear-lanceolate	linear-lanceolate to linear	rounded (in South American specimens) and ovate (in Central American specimens)	rounded	ones rounded, the others ovate to lanceolate
Rhizome scales color	bicolorous, central portion dark brown, margin light brown	concolorous, light brown to dark brown	concolorous or scarcely bicolorous, dark brown to blackish with lighter margin	concolorous, blackish	brown
Rhizome scales margin	erose	entire	entire	entire	entire to erose
Sterile fronds length (cm)	70-120 (-200)	30-80 (-140)	105-200 (-250)	95-120	150-240 (-360)
Stipe color	green-yellow to black at the base	green-yellow to brown at the base	greyish-brown to pale brown, atropurpureous at the base	green-yellow to brown throughout	atropurpureous throughout or at less 3/4 of the length
Stipe scales types	one	one	one	one	two
Stipe scales length (mm)	2-6	3-7	1-4 (-6)	0.5-1	ones 3-8, the others 0.5-1.5
Stipe scales form	linear-lanceolate	linear-lanceolate	rounded to ovate	rounded	the first rounded, the second ovate to lanceolate
Stipe scales position	patent	patent	appressed	appressed	The long scales patent, the smaller appressed
Stipe scales distribution	Restricted to the base	Restricted to the base	Restricted to the base	Restricted to the base	Throughout
Blade dissection	3-pinnate-pinnatifid to 4-pinnate-pinnatifid	2-pinnate-pinnatifid to 3-pinnate-pinnatifid	3-pinnate-pinnatifid to 4-pinnate-pinnatifid	4-pinnate-pinnatifid to 5-pinnate	3-pinnate-pinnatifid to 4-pinnate-pinnatifid
Blade texture	chartaceous	papyraceous to chartaceous	chartaceous to subcoriaceous	chartaceous	chartaceous to subcoriaceous
Blade color adaxialy	glossy dark green	yellow-green to green	dark green to blackish when dry	dark green	dark green to blackish when dry
Blade color abaxialy	green	light green	gray-green	green	gray-green
Axes indument	absent	absent	absent	absent	scaly
Blade broad (cm)	40-90	20-60	70-100	40-75	80-110
Altitudinal distribution (meters over sea level)	1000-2500 (few specimens in Oaxaca at 150-500)	0-500 (-1100)	(400-) 700-2200	400-800 (-1200)	(1300-) 1500-2400 (-3200)
Geographic distribution	Mex, Guat, Hond, Nic	Hond, Nic, CR, Pan, Col, Ec, Per, Bol, Ven, Guy, Bra, Ant	CR, Pan, Col, Ec, Per, Bol?, Ven	CR, Pan, Col	CR, Col, Ec

*Countries abbreviations: Mex = Mexico; Guat = Guatemala; Bel = Belize; Hond = Honduras; Nic = Nicaragua; Costa Rica = CR; Panama = Pan; Col = Colombia; Ec = Ecuador; Per = Perú; Bol = Bolivia; Ven = Venezuela; Guy = Guyana, Bra = Brazil and Ant = Greater Antilles.

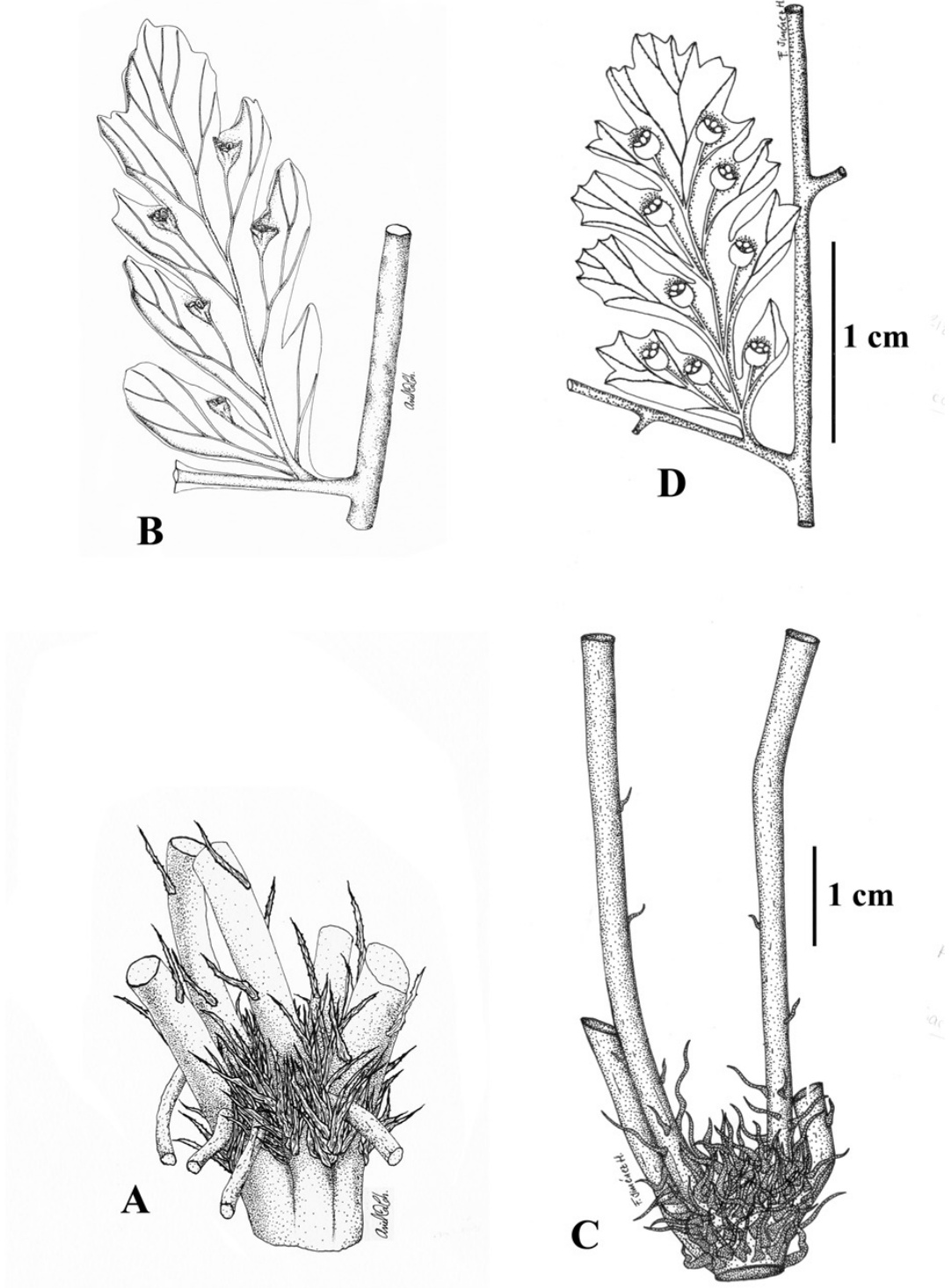


Figure 1. A-B. *Saccoloma galeottii* (Hernández 1760, MEXU). A. Rhizome detail. B. Blade detail. C-D. *S. inaequale* (Rojas 4788, CR). C. Rhizome detail. D. Blade detail.

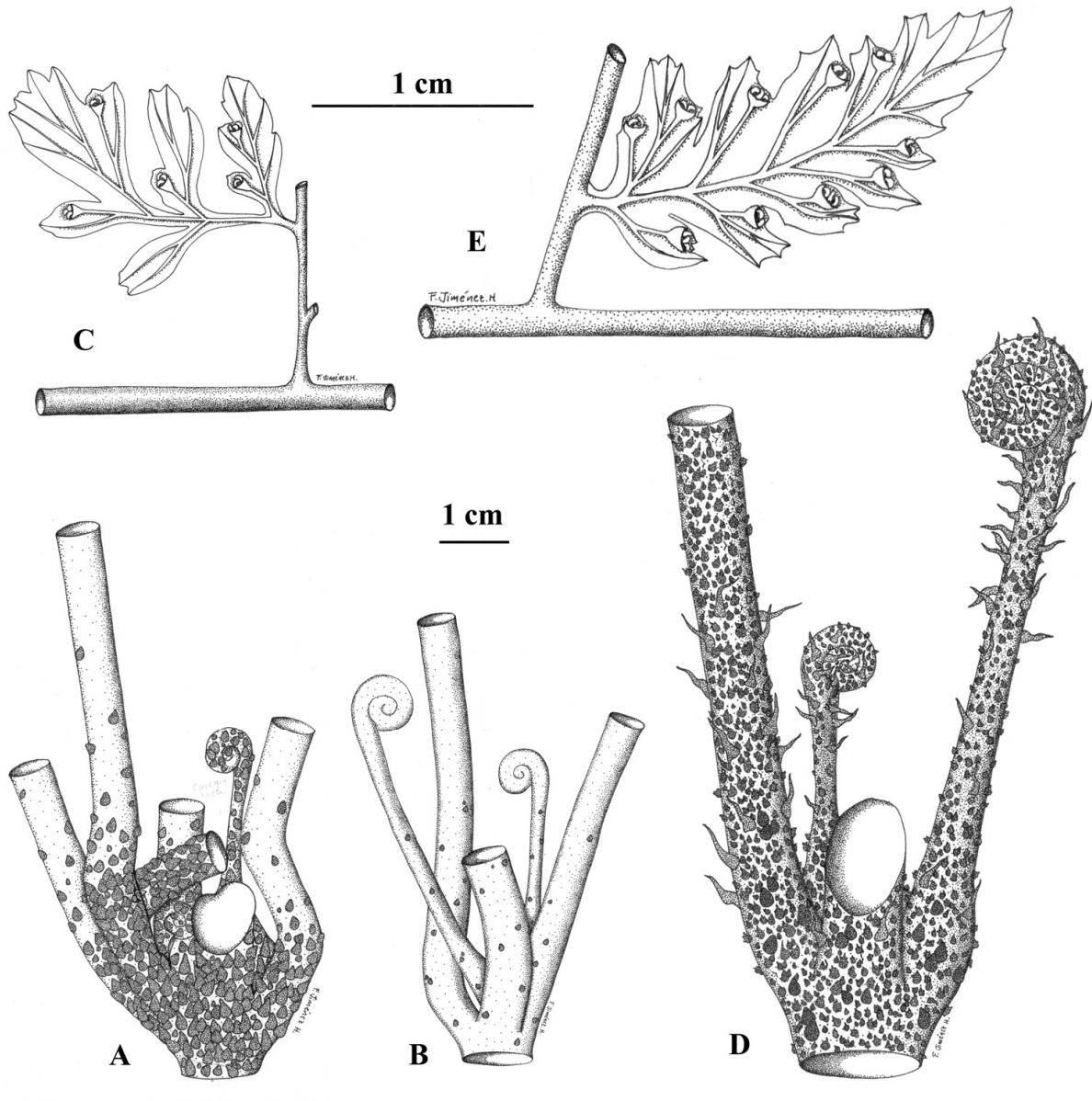


Figure 2. A. *Saccoloma nigrescens* (Rojas et al. 1770, MEXU). A. Rhizome detail. B-C. *S. quadripinnatum* (Rojas & Soto 5161, CR). B. Rhizome detail. C. Blade detail. D-E. *S. sunduei*.