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## **Front cover**

*Rhodospatha forgetii* N.E.Br., analytical plate prepared from photos by Oscar Cubero

## **Back cover**

*Anthurium matabanchoyae* A.Hay & M.Llano, in the wild at Vereda Ramos, Laguna de la Cocha, Nariño, Colombia. — Photo A. Hay

# *Rhodospatha forgetii* N.E.Br. (Araceae— Monsteroideae—Anepsiadeae), forgotten for 110 years, and three new *Rhodospatha* species from Costa Rica and Panama

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## ABSTRACT

We provide a detailed description and photographic documentation of *Rhodospatha forgetii*, a species described in 1913 from material cultivated in England by the Sanders' nursery, and until now known only from the type specimen, a slightly later illustration and its corresponding voucher presumably of the same clone. In addition, two terrestrial and one appressed-climbing nomadic vine species new to science are described: *R. osaensis*, endemic to Costa Rica and Panama, *R. antonensis* endemic to Costa Rica and Panama, and *R. ovatifolia*, endemic to Costa Rica and Panama.

**Key Words.** Monsteroideae, Pérez Zeledón, Cloudbridge Reserve, taxonomy, Talamanca, *Rhodospatha*, Araceae, Costa Rica, Panama.

## INTRODUCTION

*Rhodospatha* Poepp. a member of the Araceae subfamily Monsteroideae, is a neotropical genus nested in the *Heteropsis* clade with *Stenospermation* Schott, *Heteropsis* Kunth and *Alloschemone* Schott (Zuluaga et al., 2019), a strongly supported clade now recognized as the neotropical tribe Anepsiadeae Schott (syn. Heteropsidae Engl.), sister to the pantropical Monstereae Engl. (Haigh et al., 2023). It currently comprises 28 accepted species but is anticipated to grow to an estimated 70 species (Boyce & Croat, 2022), found from southern Mexico to much of northern South America and Trinidad and Tobago (Mayo et al., 1997; Grayum, 2003; Alzate-Lozano et al., 2019), with a disjunct occurrence in Atlantic Brazil (Temponi et al., 2012). *Rhodospatha* species are small to massive, usually appressed-climbing nomadic vines, but in some cases, plants can be terrestrial (e.g. *R. moritziana* Schott and *R. arborescens* Temponi & Croat) or rheophytic (the diminutive *R. rupicola* Edwin Trujillo, Zuluaga & Alzate-Lozano, endemic to Caquetá in Amazonian Colombia) (Mayo et al., 1997: 125; Grayum, 2003; Alzate-Lozano et al., 2019). The last full revision of *Rhodospatha* was by Engler & Krause (1908), and the taxonomy of the genus is thus still poorly understood (Alzate-Lozano et al., 2019).

In Central America, *Rhodospatha* is represented by 12 species that range from sea level to 2200 m, with a high species diversity concentrated in Panama and Costa Rica, mostly in the Cordillera de Talamanca (Grayum, 2003). Typically, *Rhodospatha* are sympatric with other members of Monsteroideae, such as *Monstera* Adans. and *Stenospermation*. However, *Rhodospatha* differs in having membranous and narrowly lanceolate to broadly ovate, never divided nor fenestrate leaf blades which are usually red or pinkish when new, with abundant primary lateral veins, striate secondary venation, conspicuous geniculate petioles, and bilocular ovaries generally with numerous ovules per locule (Mayo et al., 1997: 125; Grayum, 2003).

During fieldwork between 1971 and 2023 documenting Araceae along the Cordillera de Talamanca in Costa Rica and Panama, we have between us encountered noteworthy and unknown *Rhodospatha* entities. We found that some of those specimens could not be keyed out to the species known in Central America and Colombia. After an exhaustive analysis of the specimens, we concluded that these populations represent three undescribed species, and the rediscovery of *Rhodospatha forgetii* N.E.Br., a species up till now known only from its type made over a century ago from a plant in English cultivation, for which we provide notes on its botanical history as well as the first known photographs in the wild. We further describe and illustrate two terrestrial species and one appressed-climbing nomadic vine new to science based on morphological evidence.

## Material and Methods

Morphological assessments were based on the comparison of herbarium specimens and living plants in the field. Further, all relevant taxonomic literature from Central and South America, type specimens from JSTOR Global Plants (2022), and protologues were examined. To compare morphological variation and to delimit the new species from closely similar species, the following herbaria were consulted (acronyms follow Thiers continuously updated): AGUAT, B, BM, BIGU, CHIP, COAH, COL, CR, CSAT, CUVC, DUKE, ENCB, F, HEM, HLDG, HNMN, HUAZ, ITIC, JAUM, JBB, JVR, K, LAGU, LSCR, MA, MEXU, MHES, MO, NY, PMA, SEL, SCZ, TEFH, UDBC, UCH, UJUAT, USCG, USJ, XAL, WU, as well as images of specimens accessible on-line at C, COL, EAP, ENCB, MEXU and TEFH.

Photographs of living plant were taken with a Nikon COOLPIX P530 and Canon PowerShot SX540HS digital camera, as well as mobile phones with integrated high-resolution cameras, such as Huawei p20, iPhone 11 Pro, and Samsung Galaxy S22 Ultra. Measurements were made on living plants in the field and herbarium specimens. The plates were made using the Lankester Composite Dissection Plate (LCDP) methodology (Karremans et al., 2020) and the Adobe Photoshop 2021–2023 program.

Stated life zones follow the terminology of Holdridge et al. (1971). We assessed the conservation status based on IUCN Red List Categories and Criteria (IUCN, 2012) and the parameters for applying them (IUCN Standards and Petitions Committee, 2019). The Extension of Occurrence (EOO) was calculated through GeoCAT (Bachman et al., 2011).

Due to the high demand for aroid species as ornamental plants, and a rapidly growing black market that endangers native populations (even in protected areas), coordinates are here omitted from all specimen citations, and no distribution maps are provided.

## ***RHODOSPATA FORGETII* REDISCOVERED**

Historically, the identity and origin of *Rhodospatha forgetii* have been somewhat unclear, mainly because it had not been collected or documented in the field since its original description over a hundred years ago (Brown, loc. cit.). It has been accepted or listed by some authors such as Standley (1937, 1944), Croat (1978), Grayum (2003), and Correa A. et al. (2004), who expressed varying opinions about its identity or acceptability as a species. Standley (1937: 143), in his synopsis of the Araceae from Costa Rica, considered *R. forgetii* as an accepted species. Subsequently, Standley (1944: 448), in his treatment of the Araceae of the Flora of Panama,

recognized the occurrence of *R. forgetii* in Panama, based on a few examined specimens from Barro Colorado Island (Panamá Province) and Cana (Darién Province). However, Croat (1978: 220–221), in the Flora of Barro Colorado (Panama), indicated that the material identified as *R. forgetii* by Standley (1944) actually corresponds to *R. wendlandii*, under which name he synonymized *R. forgetii*. Grayum (2003), in the most recent treatment for the Araceae for Costa Rica, accepted *R. forgetii* and included a synthetic description; nevertheless, he stated that due to the limited information available about its origin and the lack of recent collections, both the identity of *R. forgetii* and its occurrence in Costa Rica were doubtful. Most recently, Correa A. et al. (2004) in the Catalogue of Vascular Plants of Panama, citing D’Arcy (1987: 541), listed *R. forgetii* as a synonym under *R. wendlandii*.

According to the protologue of *Rhodospatha forgetii* (Brown, loc. cit.), it was described from living material from the nursery of F. Sander & Sons, St. Albans (England), originally collected by Louis Forget (d. 1915) in Costa Rica at an unknown locality. Forget, a French orchid collector (Ossenbach, 2009: 180), was one of the many ‘orchid hunters’ who worked for Sander & Sons, one of the most important nineteenth century orchid nurseries in England. Sander & Sons operated by contracting many orchid collectors who explored various areas of South and Central America, New Guinea, Myanmar and Malaysia. In the case of Forget, almost nothing is known about his travel itinerary (Grayum 2003). However, the collections deposited at K attributed to Forget indicate that in addition to visiting Costa Rica, he was also in Brazil, Bolivia, Colombia, Mexico, Peru, and Venezuela. He was also honoured in Araceae with the Colombian *Anthurium forgetii* N.E.Br.

According to Grayum (2003), there were only two specimens of *Rhodospatha forgetii*, both prepared from cultivated living material and deposited at K: the holotype (*Hort. Sander & Sons s.n.*; Fig. 1) and a slightly later collection of a plant cultivated in Scotland (*W. W. Smith. s.n.*), which probably corresponds to a propagation carried out later on plants from F. Sander & Sons nursery. The specimen from cultivation in Edinburgh consists of three sheets which bear one leaf and two inflorescences. All the sheets have a label that includes the name of the species and the origin (“cult. hort. Edinb.”), but also note “Bot. Mag. t. 9105” referring to a publication in Curtis’s Botanical Magazine. We traced this work published by Stapf (1926), which in addition to recounting historical notes, detailed descriptions, and comparisons, included an illustration (t. 9105; Fig. 1) that surprisingly details many of the diagnostic characters involved in the original diagnosis by Brown (1913). In this publication, Stapf (1926) reiterated that this plant was originally collected by L. Forget in Costa Rica for F. Sander & Sons. Additionally, Stapf thanked W. W. Smith [Sir William Wright Smith (1875–1956), Regius Keeper of the Royal Botanic Garden Edinburgh] for the specimens sent from Edinburgh, which were used for making the *Bot. Mag.* illustration, tab. 9105, and preserved at K.

The new material collected earlier this year in Costa Rica agrees extremely closely with the morphological features of the holotype of *Rhodospatha forgetii*, as well with the later specimen cultivated in Scotland, and the drawings and description in Stapf (1926).

***Rhodospatha forgetii*** N.E.Br. ('*Forgeti*') in Stapf, Bull. Misc. Inform. Kew 1913(9): 358. 1913. — Type: Cultivated Hort. Sander, St. Albans, Herts., England, ex Costa Rica (orig. coll. L. Forget, precise locality unknown), 2 August 1913, *N.E. Brown, s.n.* (holotype, K!, not yet barcoded).

*Recognition:* *Rhodospatha forgetii* could be confused with *Rhodospatha wendlandii* Schott but differs in having oblong or lanceolate to elliptical blades (vs. oblong-oblancoelate blades), cuneate to attenuate at base (vs. rounded to truncate, or subcordate), withe and pinkish, naviculiform spathes (with broad margins overlapping at the base) (vs. lanceolate, white to creamy spathes). *Rhodospatha forgetii* is the only species of the genus with non-deciduous pinkish spathes at male anthesis. The spathe remains open for two days with overlapping margins at the base, releasing a very candy-like scent, only during the night.

Robust nomadic vine, appressed-climbing. SEEDLINGS: unknown. JUVENILE PLANTS: terrestrial appressed; *stems* green, glossy, smooth, cylindrical; *internodes* 3–5 cm long, 3.0–6.0 mm diam.; *petiole* dark green, smooth, 7–30 cm long; *blades* lanceolate to elliptic, bilaterally asymmetrical, acute to narrowly rounded at the base, acuminate at apex, 12–25 × 4.5–8.0 cm. ADULT PLANTS: root climbers; *stems* dark-green, glossy, cylindrical or slightly flattened, smooth; *internodes* 6–8 cm long, 1.9–2.7 cm diam.; *anchor roots* light brown; *feeder roots* dark brown; *petiole* light green, smooth, 24–71 cm long, sheathed to base of geniculum; *petiole sheath* deciduous and with fibrous remnants; *geniculum* smooth, sunken adaxially, convex abaxially, 2–6 cm long; *blade* oblong lanceolate, bilaterally asymmetrical, 33–82 × 11.9–29.9 cm, subcoriaceous, with the new leaves reddish, cuneate to attenuate at base, acuminate at apex, decurrent on geniculum; *midrib* sunken adaxially, convex abaxially; *primary lateral veins* 23–32 per side, sunken adaxially, prominent abaxially; *collective veins* not visible; *secondary veins* prominent and parallel towards the margin; *margin* undulate. INFLORESCENCES on ascending stems, 1 or 2 simultaneously at flowering time, arranged in leaf axils or within a green cataphyll; *peduncle* smooth, 13.5–26 cm long; *spathe* acuminate to long-acuminate, membranous, completely open, with margins overlapping at base, brownish-orange externally during development, pale pink externally and internally at anthesis, 15.0–36 × 6.5–10 cm, up to 6 cm longer than the spadix, with longitudinal pinkish veins internally at anthesis, not

deciduous; *spadix* cylindric and weakly tapered to the blunt apex, 11.2–22 cm long, 1.1–1.6 cm diam., with 9–11 flowers in principal spiral and 17–19 in the alternate spiral, lilac during development and pinkish at anthesis, sessile or stipitate up to 6 mm; *flowers* 5–6 mm long; stamens 1.5–5.0 mm long; anthers 0.5–1.0 mm long; ovary quadrangular in longitudinal section, 2–3 × 1.3–2.0 mm; style quadrangular or hexagonal, 1.3–2.0 × 1.8–2.7 mm; stigma linear with a transparent stigmatic secretion; *berries* unknown; *seeds* unknown. **Figures 1–7.**

**Distribution and ecology** — This species is endemic to Costa Rica, where it occurs in the region of Pérez Zeledón in the Cordillera de Talamanca. The species was recorded from the Pacific slope in cloud forests and Premontane Rain Forest life zones, in a mature secondary forest, with an approximate age of 50 years, at 1800 m elevation. The populations are located on the edge of a primary forest that connects with the Chirripó National Park, where species such as *Citharexylum* spp., *Zanthoxylum* spp., and *Guatteria* spp. are common. The individuals occur sympatrically with *Monstera* and *Anthurium* Schott species on trees between 3 and 5 m high. The forest has a low canopy approximately 15 m high and areas with steep slopes, allowing the species to grow with good availability of light. Flowering has been recorded in April.

**Conservation status** — The recent collections of *Rhodospatha forgetii* reported here come from a single locality within a protected area (Cloudbridge Nature Reserve, Costa Rica). Further information on the distribution and population status is needed in order to achieve a more precise conservation assessment of this species. *Rhodospatha forgetii* is therefore considered as Data Deficient [DD] at present.

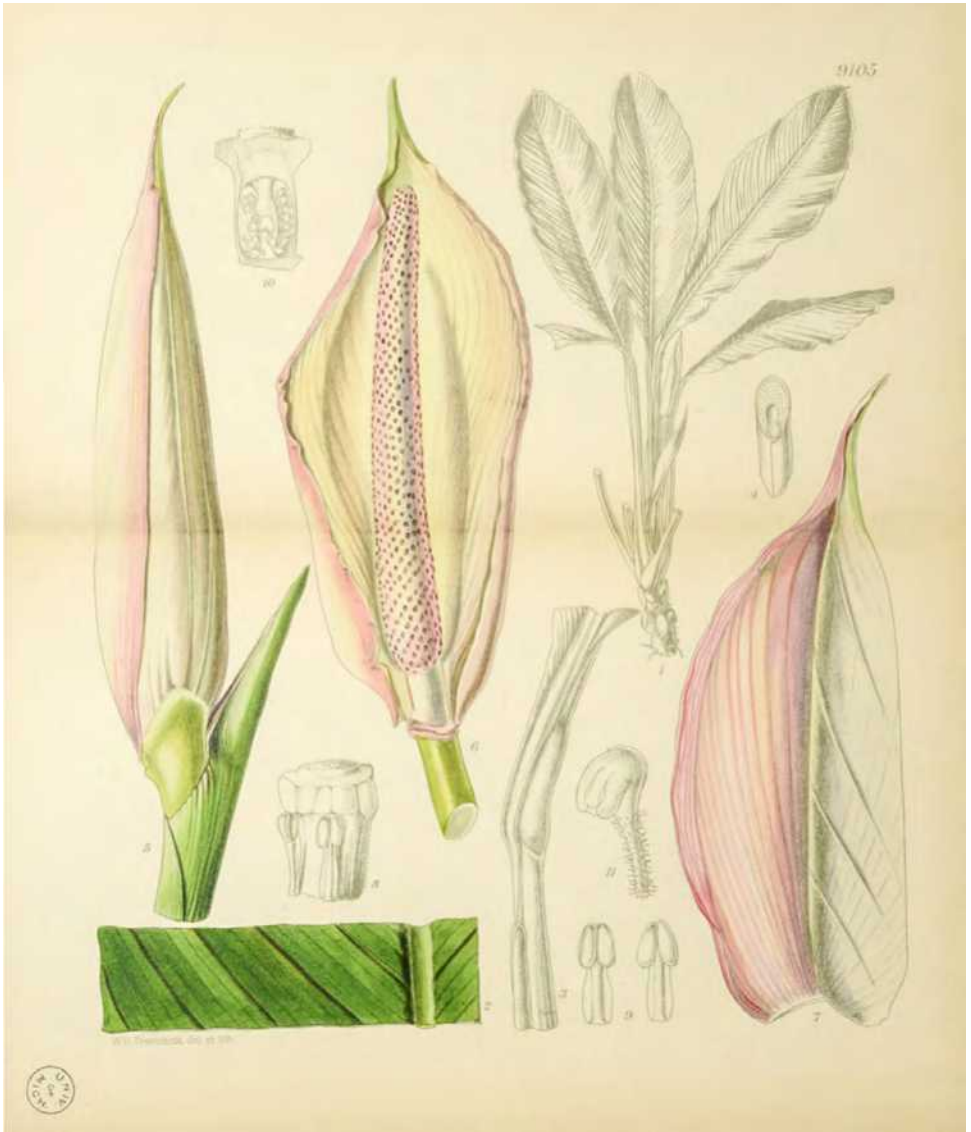
**Comments** — *Rhodospatha forgetii* is characterized by having an appressed-climbing growth form, long stems, elongate internodes, long petioles, oblong or lanceolate to elliptical leaf blades with numerous, well-separated primary lateral veins, pinkish spadices at anthesis, and acuminate, broadly opened (naviculiform) pinkish spathes.

**ADDITIONAL SPECIMENS EXAMINED. Costa Rica.** San José: Pérez Zeledón, Reserva Cloudbridge, 1800 m, 25 April 2023, *O. Cubero 01* (USJ); Pérez Zeledón, Reserva Cloudbridge, 1800 m, 25 April 2023, *O. Cubero 02* (USJ); Pérez Zeledón, Reserva Cloudbridge, 1800 m, 25 April 2023, *O. Cubero 03* (USJ). **Cultivated.** ‘Cult. Hort. Edinb.’ [R.B.G. Edinburgh, Scotland], no date [1925?], *W.W. Smith s.n.*, *fide* Stapf, 1926 (K, 3 sheets).





Figure 1. Holotype of *Rhodospatha forgetii*.



**Figure 2.** Illustration of *Rhodspatha forgetii* from Stapf (1926).



**Figure 3.** *Rhodospatha forgetii* — *O. Cubero* 001 (USJ). **A.** Developing inflorescence; **B.** Inflorescence with pink spathe, in female anthesis; **C.** Spadix in female anthesis; **D.** Stylar plate top view; **E.** Spadix with stipe and flowers in female anthesis; **F.** Spadix with lilac color during development; **G.** Fertile flower, in lateral view; **H.** Inflorescence with open spathe front view; **I.** Juvenile plant; **J.** Adult plant; **K.** Inflorescence with open spathe, back view. — Photos O. Cubero





**Figure 4.** *Rhodospatha forgetii* — O. Cubero 001 (USJ). Habit, adult plant growing in the nature in the Reserva Cloudbridge. — Photo O. Cubero

## THE NEW SPECIES

*Rhodospatha osaensis* Croat, Grayum & M.Cedeño, **sp. nov.** — Type: COSTA RICA. Puntarenas: disturbed area between Las Cruces Botanical Garden and Río Jaba, ca 4 km S.E. of San Vito de Coto Brus, 1150 m, 27 May 1986, *M.H. Grayum, B. Hammel & G. de Nevers 7574* (holotype, MO-3486444!; isotypes CR!, K!, US!).

*Diagnosis:* This species differs from the other species of the genus by its climbing habit with internodes up to 4 cm long, leaves persisting along the stem, leaf blades narrow, measuring 19–41 × 4.0–9.4 cm, with few (7–22) primary lateral veins per side.



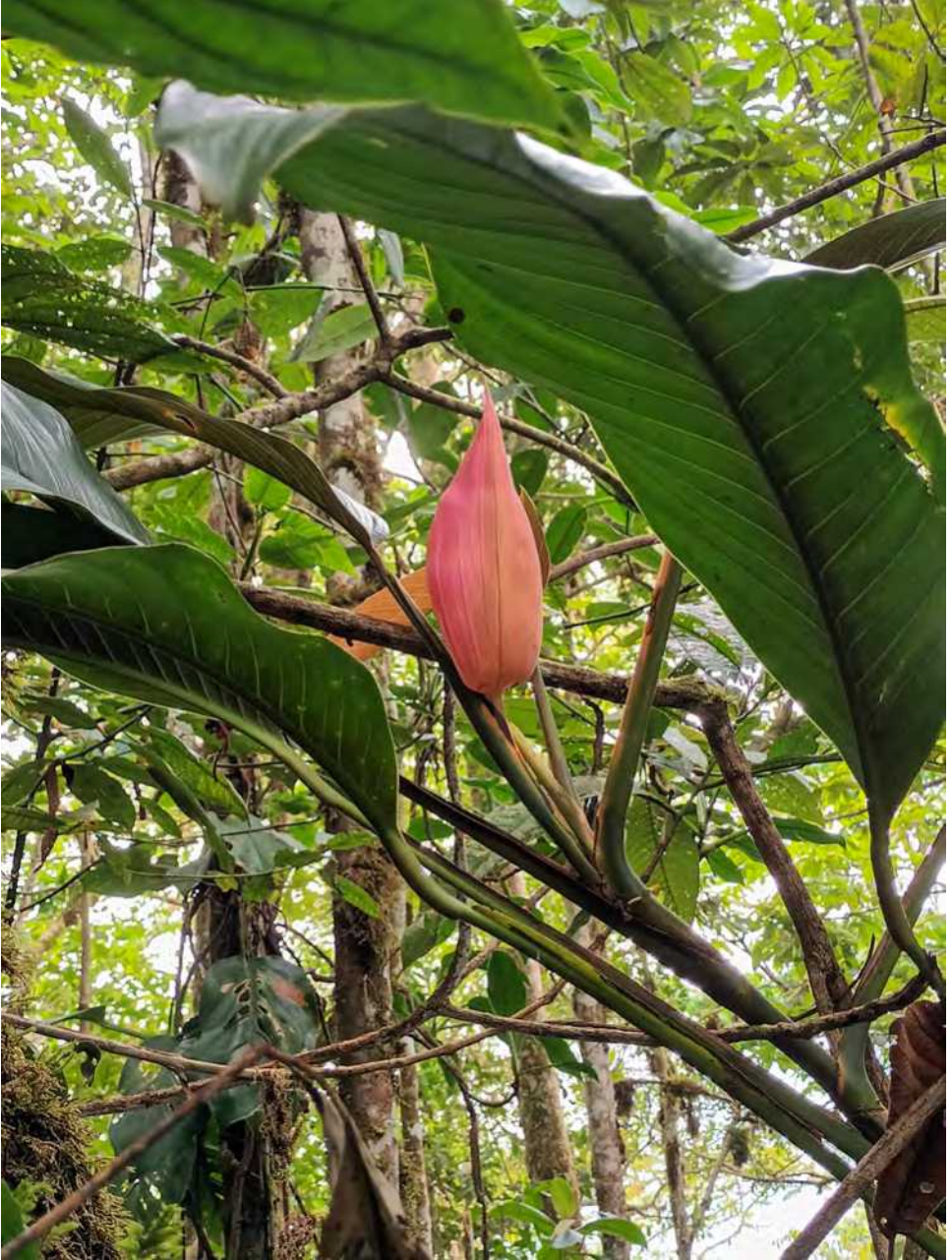
**Figure 5.** *Rhodospatha forgetii* — O. Cubero 001 (USJ). Oscar Cubero collecting an adult plant to make an herbarium specimen. — Photo Greilin Fallas Rodríguez

Robust nomadic vine, appressed-climbing. SEEDLINGS: unknown. JUVENILE PLANTS: terrestrial appressed to the substrate; *stems* green, smooth, cylindrical; *internodes* 3–6 cm long, 3.0–5.0 mm diam.; *petiole* dark green, smooth, 4–7 cm long; *blade* oblong, bilaterally asymmetrical, acute to narrowly rounded at the base, acuminate at apex, 5.0–10 × 2.5–4.0 cm. ADULT PLANTS: root climbers; *stems* dark-green or light brown, semi-glossy, cylindrical, smooth; *internodes* 0.5–4 cm long, 0.7–1.5 cm diam.; *anchor roots* dark; *feeder roots* dark; *petiole* light green, smooth, 8–19.5 cm long, sheathed nearly to the base of the blade; *petiole sheath* persistent, partly involute, the free apex often prolonged beyond the





**Figure 6.** *Rhodospatha forgetii* — O. Cubero 001 (USJ). Spathe pale pink externally and with longitudinal pinkish veins internally in male anthesis, not deciduous. — Photo O. Cubero



**Figure 7.** *Rhodospatha forgetii* — O. Cubero 001 (US). Adult plant with long internodes (up to 8 cm long) and spathe pale pink externally. — Photo O. Cubero

base of the blade; *geniculum* smooth, obscure; *blade* narrowly elliptic or oblong-lanceolate to oblanceolate, markedly bilaterally asymmetrical, 19–41 × 4.0–9.4 cm, subcoriaceous, glossy, acute to narrowly rounded at base, acuminate at apex; *midrib* sunken adaxially, convex abaxially; *primary lateral veins* 7–22 per side, sunken adaxially, prominent abaxially, arising at a 45–65° angle; *collective veins* not visible; *secondary veins* prominent and parallel towards the margin. INFLORESCENCES on ascending stems, 1 or 2 simultaneously at flowering time, surrounded by a green cataphyll; *peduncle* smooth, 8–19 cm long; *spathe* acuminate, cucullate, coriaceous, greenish externally during development, cream externally and internally at anthesis, 8–12 × 3.5–6.0 cm, up to 3 cm longer than the spadix, deciduous; *spadix* cylindrical, 4.3–12 cm long, 0.6–1.5 cm diam., with 8–9 flowers in principal spiral and 11–12 in the alternate spiral, white during development and cream at anthesis, stipitate up to 1.3 cm; *flowers* 4–5 mm long; stamens 1.5–5.0 mm long; ovary quadrangular in longitudinal section; style quadrangular, 1.5–2.0 × 1.0–1.5 mm; stigma circular; *berries* with a light green styler cap during development, mature styler cap unknown; *seeds* unknown. **Figures 8–11.**

**Distribution and ecology** — This species is endemic to southwestern Costa Rica and westernmost Panama on the Pacific slope. This species generally grows in a Tropical Wet Forest life zone, at 0–1200 m elevation. The species was recorded along rivers, in primary and secondary forest and in open areas, as nomadic vines which climb the host tree and then develop hanging flowering branches. Flowering and fruit have been recorded in January, April through September, and December.

**Etymology** — The epithet refers to the Osa Peninsula where the type locality is situated.

**Conservation status** — *Rhodospatha osaensis* is known from 64 specimen collections. For this species, an Extent of Occurrence of 13,715 km<sup>2</sup> has been calculated, along at least four locations: Osa Peninsula-Punta Burica (Costa Rica-Panama Border), Pittier (Costa Rica), Dominical (Costa Rica), and Turrubares (Costa Rica). About half of the records of this species were made within or on the borders of 10 protected areas: Las Tablas Protection Zone, Wilson Botanical Garden, Golfito Wildlife Refuge, Piedras Blancas National Park, Corcovado National Park, Golfo Dulce Forest Reserve, Finca Barú del Pacífico Wildlife Refuge, La Cangreja National Park, Fernando Castro Cervantes Wildlife Refuge, and Audubon Reserve. In the absence of data on population size, and contingent upon active protection of the protected areas, *R. osaensis* could be provisionally assessed as Least Concern [LC].

**Comments** — This species is characterized by its climbing habit, with internodes up to 4 cm long, relatively short, fully sheathed petioles with the sheath persistent, sometimes slightly





**Figure 8.** *Rhodospatha osaensis* — M. Cedeño 791 (USJ). Adult plant with one inflorescence in female anthesis and one infructescence in development. — Photo M. Cedeño

involute or completely open, and narrow leaf-blades glossy on the upper surface. *Rhodospatha osaensis* is not confused with any other species of the genus in Costa Rica or Panama. It is the only species that has such narrow leaf blades (4.0–9.4 cm wide).

*Rhodospatha osaensis* was treated as “*Rhodospatha* sp. D” in the Manual de Plantas de Costa Rica (Grayum, 2003).

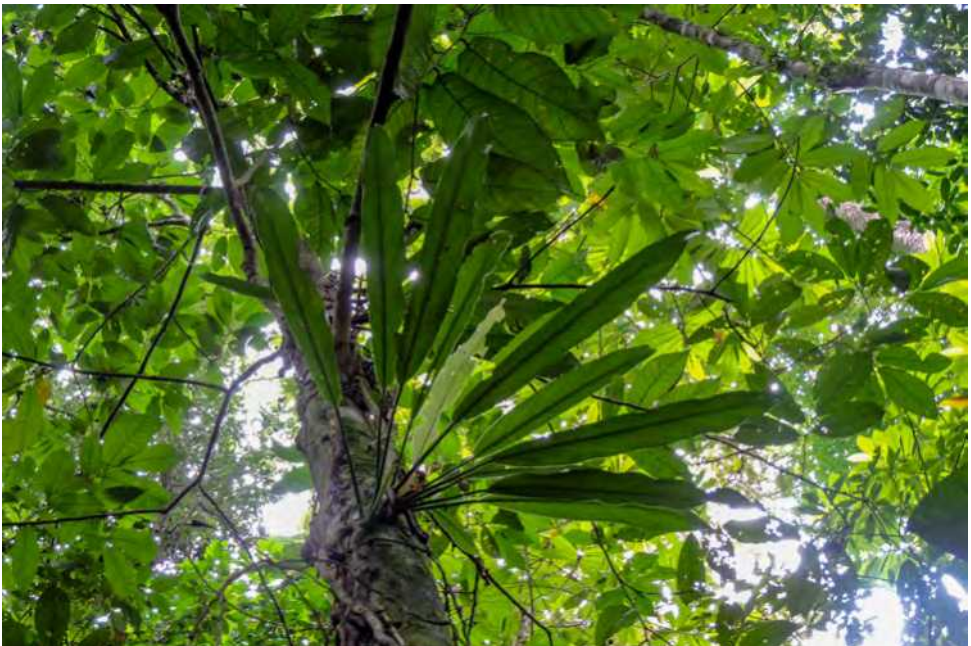
**ADDITIONAL SPECIMENS EXAMINED. Costa Rica.** Puntarenas: Coto Brus, Biological Station Las Cruces, 1230 m, 28 Agust. 2008, *F. Oviedo-Brenes* 217 (HLDG); Coto Brus, Aguas Caliente de Pittier, 1063 m, 22 Aug. 2008, *F. Oviedo-Brenes* & *J.M. Chavez* 2689 (HLDG); Coto Brus, Gamboa de San Vito, 1031 m, 17 May 2008, *F. Oviedo-Brenes* & *R. Quirós* 1836 (HLDG); Coto Brus, Estación Biológica Las Cruces, 1200 m, 1 May 2015, *M. Cedeño* 791 (USJ); Coto Brus, near San Vito and the Las Cruces Forest San Vito, Costa Rica, 30 Jan. 2003, *M.M. Mayfield* 143-240-3199 (MO); Near San Vito and the Las Cruces Forest, 31 July 2001, *M.M. Mayfield* 143-1930-2112 (MO); Osa Peninsula, Fila Esquinas, Mogos, 20 April 1993, *R. Soto* 24 (CR); Reserva Forestal Golfo Dulce, Rancho Quemado, Río Riyito, 200 m,



**Figure 9.** *Rhodspatha osaensis* — M. Cedeño 791 (USJ). Spathe cucullate and cream externally in female anthesis (left), and infructescence with a light green stylar cap during development (right). — Photo M. Cedeño



**Figure 10.** *Rhodospatha osaensis*. Adult plant growing with pendulous stem. — Photo M. Cedeño



**Figure 11.** *Rhodospatha osaensis*. Adult plant growing about 4 m from the ground with narrow leaf. — Photo M. Cedeño



31 Mar. 1991, *B.E. Hammel 18184* (CR, MO); Parque Nacional Corcovado Los Patos Forest, 500 m, 2 July 1988, *C. Kernan & P. Phillips 649* (CR, MO); Along Río Jaba S of San Vito de Coto Brus, collected with Brian Jacobs, George Schatz and John Kress, 1150 m, 01 July 1984, *M.H. Grayum 3389* (MO); Mostly secondary forest between Las Cruces Botanical Garden and Río Jaba, ca. 3 km SE of San Vito de Coto Brus, 1050–1200 m, 11 July 1985, *M.H. Grayum 5601* (MO); Along trail between Las Cruces Botanical Garden and Río Jaba, ca. 3.5 km SE of San Vito de Coto Brus, 1160–1200 m, 12 September 1985, *M.H. Grayum, G. Herrera Ch. & J. Berrocal 5984* (MO); Esquinas Forest, 60 m, 27 Mar. 1951, *P.H. Allen 6034A* (EAP); Reserva Forestal Golfo Dulce Aguabuena, Sector oeste, 50–150 m, 20 Nov. 1991, *R. Aguilar 663* (MO); Hills above Palmar Norte, 100–200 m, 20 May 1976, *T.B. Croat 35116* (MO); Along highway from Río Claro (on Panamerican Highway) to Golfito, 2.5 m SE of Golfito, 27.5 mi S of Río Claro, 60 m, 15 Sept. 1987, *T.B. Croat 67623* (MO); Along road from Pan-American Hwy., at Piedras Blancas to Rincón (on Osa Peninsula), 3.7 mi W of Panamerican Hwy., 90–105 m, 16 Sept. 1987, *T.B. Croat 67653* (MO); Along road between Palmar Norte and Panamerican Border, 3 km N of turn-off to Rincón, 110 m, 10 Sept. 1996, *T.B. Croat & D.P. Hannon 79194* (CR, MO, WU); Along abandoned “high road” W of Rincón de Osa, 250–540 m, 4 Mar. 1985, *T.B. Croat & M.H. Grayum 59876* (CR, MO); Along short cut-road to Golfito from Villa Briceño on Interamerican Hwy., W side of Fila Gamba, ca. 6 km from Golfito airport, 100 m, 06 Mar. 1985, *T.B. Croat & M.H. Grayum 59907* (MO); San Vito de Java, Las Cruces Tropical Botanical Garden. In forest below gardens, scandent in tree, 4000 ft, 28 May 1978, *W.J. Kress 78-968* (DUKE, F); Coto Brus. Along road to stream through forest on grounds of Finca Las Cruces, 4500 ft, 29 May 1973, *J.L. Luteyn 3862* (DUKE, MO); Cordillera de Talamanca, Aguas Termales, 3 km antes de Agua Caliente, 1000 m, 15 Jun. 1995, *M.M. Chavarria 879* (CR, MO); Golfito. Golfo Dulce, 0 m, 17 Feb. 1933, *A.M. Brenes 552* (F); Playa Blanca, Golfo Dulce, Coto, 0 m, 17 Feb. 1933, *M. Valerio 552* (CR); 200–300 m, 18 Feb. 1998, *M. Lobo 205* (MO); R. N. Fauna Silv. Golfito along crest of Fila Gamba, to ca. 0.7 km N of Golfito/Villa Briceño road, 160–260 m, 26 Jan. 1992, *M.H. Grayum 10060* (CR, MO); Conte, Burica, 2 July 1980, *R.Á. Ocampo 2682* (CR); R. N. V. S. Cópano. Península de Osa, Puerto Jiménez, Miramar, 100 m, 6 May 1995, *R. Aguilar 4114* (CR, K, MO); Osa, Between Golfo Dulce and Río Térraba, 30 m, Dec. 1947, *A.F. Skutch 5327* (US); Between Golfo Dulce and Río Térraba, 30 m, Dec. 1947, *A.F. Skutch 5380* (US); Rincón de Osa, road between Rincón and Playa Blanca, 0–10 m, 25 July 1974, *J.F. Utley & K. Burt-Utley 1244* (F); Corcovado National Park, Primary forest and edge of forest near new airfield under construction at Pavo, 5 m, 7 July 1977, *R.L. Liesner 3025* (MO). San José prov.: Refugio de Vida Silvestre Boracayán, Fila Costeña, San José-Puntarenas Province border, ca. 10 km E of Dominical, Just N of Fila Alivio in upper Río Barucito basin, a southern tributary of Río Barú, 29 May 2003, *B.K. Holst 8729* (MO); Pérez Zeledón. Along road between San

Isidro del General and Dominical, 9 miles southwest of Río Pacuare, disturbed remnants of primary forest, 680 m, 23 May 1976, *T.B. Croat 35350* (MO); Along road between San Isidro del General and coastal town of Dominical, southwest of San Isidro, 4.8 miles from the Río Pacuare, remnants of virgin forest along road, 1000 m, 22 May 1976, *T.B. Croat 35257* (MO); About 1 mile beyond divide between San Isidro del General and coastal town of Dominical, 900 m, 22 May 1976, *T.B. Croat 35317* (CR, MO); Puriscal. Zona Protectora La Cangreja, along Quebrada Grande and on adjacent ridges, ca. 2 km north of Mastatal de Puriscal, 340 m, 22 July 1988, *M.H. Grayum, B.E. Hammel, N. Zamora & M. Marta Chavarria 8617* (MO); Turrubares, Z. P. Cerro de Turrubares, Cuenca del Tárcoles, San Pablo de Turrubares, 100–200 m, 08 Dec. 2004, *D. Santamaría 302* (CR, MO); Reserva Biológica Carara, Valle del Tárcoles, Cuenca del Río Grande de Tárcoles, Puesto Carara, along Río Carara, between guardpost and Río del Sur, 130–170 m, 2 April 1993, *M.H. Grayum 10431* (CR, MO); Z. P. Turrubares; Cuenca del Río Grande de Tárcoles; SW spur of Cerro Turrubares, ridge bet. N and S forks of Río Carara, 850–1100 m, 06 April 1993, *M.H. Grayum, B.E. Hammel & R. Zúñiga 10556* (CR, MO). **Panamá.** Chiriquí: Punta Burica, El Chorogo, 16 May 2007, *J.E Aranda 3928* (PMA).

***Rhodospatha antonensis*** Croat & O.Ortiz, **sp. nov.** — Type: PANAMA. Coclé: La Mesa, above El Valle de Antón, 900–1173 m, 13 Apr. 1971, *T.B. Croat 14382* (holotype, MO-2057839!; isotype, NY!).

*Diagnosis:* This species is related to *Rhodospatha wendlandii* but it is distinguished by growing in colonies with a (usually) terrestrial habit with fully erect stems or decumbent with semi-horizontal stems which are erect when flowering (vs. nomadic vines with inflorescences on ascending appressed shoots).

Terrestrial, erect or decumbent, sometimes nomadic vines with hanging flowering branches. SEEDLINGS: unknown. JUVENILE PLANTS: unknown. ADULT PLANTS: *stems* up to 3 m long, *internodes* short at apex (usually less than 0.5 cm long, to 2 cm diam.), longer when older (1.5–2 cm long, to 2.2 cm diam.), with protuberant horizontal fissures, drying yellow-brown; *petioles* 20–41 cm long, fully sheathed or 2–5 cm before the base of the leaf blade, drying dark brown, free portion terete, minutely white-dotted; *geniculum* terete, 1.5–2 cm long; *petiole sheath* marcescent, semi-persistent (with irregular pieces of tissues or fibers) and later fully deciduous, margins drying brown; *blade* subcoriaceous, oblong-elliptic, 26–60 × 12–24 cm, 2–2.5 times longer than wide, 1.3–1.5 times longer than the petiole, apiculate or mucronate at apex, usually bilaterally asymmetrical and obtuse to rounded at the base, green and matte on

the upper surfaces, pale green, semiglossy and reddish dotted (when dry) on the lower surfaces; drying grayish brown or brown above, brown or yellow-brown below; *midrib* sunken above, drying minutely granular; *primary lateral veins* 38–54 pairs, arising at a 70–80° angle, sunken above, convex below; cross-veins present when fresh. INFLORESCENCE on ascending stems, 1 simultaneously at flowering time, surrounded by a green cataphyll a green cataphyll; *peduncle* 10–20 cm long, terete, drying 7–10 mm diam., green; *spathe* greenish-white, broadly ovate, 13–16 cm long, 10–12 cm wide, 1.3 times longer than wide, acuminate at apex, deciduous; *spadix* creamy-white at female anthesis, dark creamy yellowish to light brown at male anthesis, 12–13 cm long, 1–1.5 cm diam., stipitate, stipe green, up to 1 cm long; *flowers* 11–12 visible in the principal spiral, 17–19 visible in the alternate spiral, ca. 1.8 mm long; pistils 1.2–1.9 mm diam., stigmas circular at female anthesis, oblong at post anthesis, 0.8–1.0 mm long, 0.3 mm wide; *stamens* 0.8–1.0 mm long, 0.3–0.4 mm wide, anthers creamy-white; *berries* unknown; *seeds* unknown. **Figures 12–15.**

**Distribution and ecology** — Endemic to Costa Rica and Panama on the Pacific and Caribbean slopes. This species generally grows in cloud forests in a Tropical Wet Forest life zone, at 700–1200 m elevation. It has been documented from steep areas such as ravines, river and stream banks, on slightly rocky soils. Flowering has been recorded in February to April, and September.

**Etymology** — The name refers to the type locality where the plant was first collected.

**Conservation status** — *Rhodospatha antonensis* is known from seven locations of which six are either within protected areas or very close to their outer limits. Considering the value calculated in the Extent of Occurrence (EOO = 37,659 km<sup>2</sup>), as well as the fact that most of its occurrences are in protected areas, we provisionally assessed *R. antonensis* as Least Concern [LC].

**Comments** — This species can be confused morphologically with *Rhodospatha wendlandii*, due to the oblong multi-nerved leaf blades, as well as by the nomadic vine habit that *R. antonensis* can sometimes develop. *Rhodospatha wendlandii* differs from *R. antonensis* in having a uniformly appressed-climber habit, generally smaller leaves, longer lanceolate spathes (2.2–2.4 times longer than wide), and somewhat smaller spadices that are usually pinkish or lilac at anthesis. Due to its typically terrestrial habit, *R. antonensis* could be confused with *R. ovatifolia* but the latter differs in having smooth stems and the pinkish orange spadices in female anthesis.



**Figure 12.** *Rhodospatha antonensis* — O.O. Ortiz *et al.* 4205 (PMA). Habit, adult plant growing terrestrially with creeping stem. — Photo O.O. Ortiz





**Figure 13.** *Rhodospatha antonensis* — O.O. Ortiz et al. 4205 (PMA). Adult shoot with horizontal striations completely encircling the stem. — Photo O.O. Ortiz





**Figure 14.** *Rhodospatha antonensis* — O.O. Ortiz et al. 4319 (PMA). Adult plant growing as a nomadic vine with decumbent hanging flowering branches. — Photo O.O. Ortiz

**ADDITIONAL SPECIMENS EXAMINED.** **Costa Rica.** Alajuela prov.: 840–950 m, 22 Jan 1986, M.H. Grayum, P.J. Sleeper, T. Ray, C. Alvarado, A.R. Smith & T. Béliz 6182 (MO); 800–1000 m, 10 Mar 1985, C.M. Taylor & C. Skotak 4804 (DUKE); Cartago prov.: Turrialba, 1200–1300 m, 30 Jun 1976, T.B. Croat 36643 (MO); Heredia prov.: 500–600 m, 18 Feb 1984, T.D. Pennington, P.E. Sánchez & N. Zamora 11536 (K); 450–550 m, 14 Feb 1986, M.H. Grayum & P.J. Sleeper 6530 (MO); 700–800 m, 03 April 1986, M.H. Grayum 6707 (CR); 760 m, 28 May 1976, T.B. Croat 35789 (MO); 500–600 m, 18 Feb 1984, T.D. Pennington, P.E. Sánchez & N. Zamora 11526 (K); 500–600 m, 18 Feb 1984, T.D. Pennington, P.E. Sánchez & N. Zamora 11528 (K); 500–600 m, 18 Feb 1984, T.D. Pennington, P.E. Sánchez & N. Zamora 11534 (K); 750 m, 22 Jan 1983, G.E. Schatz 693 (DUKE); Limón prov.: 850 m, 11 April 1989, R. Robles & A. Chacón 2753 (CR, MO); San José prov.: Vazquez de Coronado, 400–1500 m, 28 Jul 1985, B.E. Hammel & J. Trainer 14252 (MO). **Panama.** Coclé prov.: El Valle de Antón, carretera que va desde Mata Ahogado hacia Altos del María, 1024 m, 22 Feb 2021, O.O. Ortiz et al. 4205 (PMA); N slope and summit of Cerro Pílon, 900–1173 m, 900–1173 m, 16 Mar 1973, T. B. Croat 22931 (MO); El Valle de Antón. Camino hacia Cerro Llorón,



**Figure 15.** *Rhodospatha antonensis* — O.O. Ortiz et al. 4319 (PMA). Inflorescence in female anthesis with greenish-white spathe and creamy-white spadix. — Photo O.O. Ortiz

W Alt: 731 m, 13 Jun 2021, *O.O. Ortiz et al. 4319* (MO, PMA); Panamá Oeste prov.: Cerro Campana, 30 Sep 1967, *R. Dressler 3046* (MO); Panamá prov.: 850 m, 26 Mar 1988, *S.A. Thompson 4596* (CM); Capira, 3000 ft, 22 Jun 1980, *T. M. Antonio 4924* (MO); 600–800 m, 15 Jun 1976, *T. B. Croat 35965* (MO).

***Rhodospatha ovatifolia*** Croat, Grayum & M.Cedeño, **sp. nov.** — Type: COSTA RICA. Cartago: along Camino de Hule, SE of Platanillo (Tsipiri), 1200–1400 m, 1 July 1976, *T.B. Croat 36755* (holotype, MO-2390113!; isotype CR!).

*Diagnosis:* Related to *Rhodospatha wendlandii* from which it differs by its terrestrial or rupicolous habit; internodes up to 6 cm long (vs. 1–2 cm long); proportionately broader leaf-blades, with 48–62 primary lateral veins (vs. 28–52 primary lateral veins); and the pinkish orange spadices in female anthesis (vs. white to pink at anthesis, sometimes light red in female anthesis).

Terrestrial or rupicolous with appressed habit. SEEDLINGS: unknown. JUVENILE PLANTS: terrestrial appressed; *stems* dark green, smooth, cylindrical; *internodes* 1–2 cm long, 3.0–7.0 mm diam.; *petiole* dark green, smooth, 7–15 cm long; *blade* obovate, acute at the base, acuminate at apex, 10–20 × 10–15 cm. ADULT PLANTS: *stems* green, cylindrical, smooth; *internodes* 3–6 cm long, 1.5–2 cm diam.; *anchor roots* light brown; *feeder roots* dark; *petiole* light-green, smooth, 32–73 cm long, sheathed to base of the geniculum; *petiole sheath* deciduous; *geniculum* smooth, sunken adaxially, convex abaxially, 4–5 cm long; *blade* ovate or broadly elliptic or suborbicular, slightly bilaterally asymmetrical, 30–50 × 16–31.5 cm, cordate or subcordate to truncate at base, acuminate at apex, decurrent on the geniculum; *midrib* thin and slender, sunken adaxially, convex abaxially; *primary lateral veins* 48–62 per side, somewhat to deeply impressed above, convex below, 4.0–7.0 mm apart; *collective veins* not visible; *secondary veins* parallel towards the margin; *margin* undulate. INFLORESCENCES on ascending shoots, 1 simultaneously at flowering time, arranged in leaf axils; *peduncle* smooth, 9.5–41 cm long; *spathe* acuminate, coriaceous, light green externally during development, light green and cream externally and cream internally at anthesis, 17–21 cm long, up to 4 cm longer than the spadix, with longitudinal veins externally at anthesis; *spadix* cylindroid, 6.7–20 cm long, 0.9–2.5 cm diam., with 8–9 flowers in principal spiral and 12–15 in the alternate spiral, pink orange during female anthesis and cream in male anthesis, stipitate up to 3.0 cm; *flowers* 5–6 mm long; *stamens* 1.5–6.0 mm long; *anthers* 0.5–1.0 mm long; *ovary* quadrangular in longitudinal section, 2.0–2.5 × 2.0–2.0 mm; *style* quadrangular, 1.5–2.0 × 1.5–2.0 mm; *stigmatophore* cupuliform; *stigma* circular with a transparent stigmatic secretion; **berries** unknown; *seeds* unknown. **Figures 16–19.**



**Figure 16.** *Rhodospatha ovatifolia* — M. Cedeño & J. Hughes 2395 (USJ). Habit, adult plant growing on rocks. — Photo M. Cedeño

**Distribution and ecology** — Endemic to Costa Rica and western Panama on the Caribbean slope. This species grows in a Tropical Wet Forest and Premontane Rain Forest life zones, at 100–1200+ m elevation in primary forest on rocks along rivers. Flowering has been recorded from April to July.

**Etymology** — The name refers to the species' ovate leaf shape.

**Conservation status** — *Rhodospatha ovatifolia* is known from 27 collections representing at least six locations, of which 10 are in protected areas, such as Fortuna Forest Reserve (Panama), La Amistad International Park (Costa Rica-Panama border), and Braulio Carrillo National Park (Costa Rica). We have recently observed that certain habitats in which this species occurs, specifically in two locations from Turrialba (Costa Rica), have been intensely disturbed by human activity. Considering the Extent of Occurrence calculated (EOO = 10,380 km<sup>2</sup>), as well, the major threats (logging and deforestation) of natural areas, *R. ovatifolia* qualifies as Vulnerable [VU B1ab(iii)].





**Figure 17.** *Rhodospatha ovatifolia* — M. Cedeño & J. Hughes 2395 (USJ). Juvenile plant growing on rocks. — Photo M. Cedeño





**Figure 18.** *Rhodospatha ovatifolia* — M. Cedeño & J. Hughes 2395 (USJ). Inflorescence in female anthesis with the spathe light green externally and cream internally, and the spadix pink-orange. — Photo M. Cedeño



**Figure 19.** *Rhodospatha ovatifolia* — M. Cedeño & J. Hughes 2395 (USJ). Inflorescence in male anthesis with the spathe cream externally and internally and the spadix cream, with a lot of damage by beetles. — Photo M. Cedeño



**Comments** — *Rhodospatha ovatifolia* is most easily confused with *R. wendlandii*, but differs by having a terrestrial or rupicolous habit (vs. robust nomadic vine, appressed-climbing), proportionately broader leaves with 48–62 primary lateral veins (vs. 28–52 primary lateral veins), and the peduncle 34–41 cm long (vs. peduncle 15–23 cm long). *Rhodospatha ovatifolia* is the second terrestrial species in Costa Rica after *Rhodospatha moritziana*, from which it differs in having leaf-blades 30–50 × 16–31.5 cm, with 48–62 primary lateral veins (vs. 45–91 × 20–49 cm with 24–38 primary lateral veins) and the midrib thin and slender (vs. thicker than wide below), and spadices in male anthesis cream (vs. pinkish purple during male anthesis).

*Rhodospatha ovatifolia* was treated as “*Rhodospatha* sp. A” in the Manual de Plantas de Costa Rica (Grayum, 2003).

**ADDITIONAL SPECIMENS EXAMINED.** **Costa Rica.** Cartago prov.: Turrialba, Tres Equis, Bosque sobre carretera a Siquirres, 800 m, 13 May 2021, *M. Cedeño & J. Hughes 2395* (USJ); Turrialba, 500–600 m, 1 May 1985, *M. H. Grayum & G. E. Schatz 5240* (CR, MO); Turrialba, 800 m, 13 Aug 1977, *T. B. Croat 43371* (MO); Turrialba, 1135 m, 2 March 1990, *M. H. Grayum & D. R. Hodel 9725* (MO); Jiménez, 700 m, 16–17 April 1983, *R. L. Liesner 14420* (CR, MO); Turrialba, 1200 m, 6 Jun 1995, *G. Herrera Ch. & A. Cedeño 7942* (MO); Turrialba, 1091 m, 17 May 2006, *L. D. Vargas 1317* (CR); Limón prov.: Limón, 100 m, 27 Jun 2000, *L. Acosta 1890* (MO); Limón, 140 m, 2 August 1985, *B. E. Hammel & M. H. Grayum 14348* (MO); Limón, 650 m, 7 July 1989, *B. E. Hammel, A. Chacón & G. Herrera 17584* (MO); San José prov.: Vázquez de Coronado, 1180 m, 1 September 1996, *T. B. Croat 78815* (CR); Vázquez de Coronado, 400–1500 m, 28 Jul 1985, *B. E. Hammel & J. Trainer 14271* (MO); San José, 1100–1400, 14 Jan 1978, *T. B. Croat 44517* (MO). **Panama.** Chiriquí prov.: 850 m, 29 March 1993, *T.B. Croat 74926* (K, MO); Chiriquí, 1080 m, 18 Feb 1986, *W.S. Hoover 1335* (MO); Bocas del Toro prov.: 780 m, 24 June 1987, *T.B. Croat 66729* (MO); Bocas del Toro, 980 m, 19 March 2005, *A.K. Monro & S. Cafferty 4749* (BM); Bocas del Toro, 850–950 m, 08 March 1986, *B.E. Hammel, G. McPherson & L. Sanders 14701* (MO); Bocas del Toro, 820 m, 12 March 1985, *T.B. Croat & M.H. Grayum 60396* (MO).

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**Declarations** — The authors declare that they have no conflict of interest.

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