

# *Priourella lenticellata* sp. nov. (Sapotaceae), a new species from the Amazon rainforest

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## ABSTRACT

*Priourella lenticellata* sp. nov. is here described and illustrated as a new species endemic to the Amazon rainforest. It is morphologically similar to *P. manaosensis*, but differs by having trunks with relatively larger circumference, coriaceous and smaller leaves, cuneate to truncate leaf bases, and glabrescent fruits with numerous lenticels. The verrucous testa is addressed as an important generic feature of *Priourella*. This new species is only known from northern Brazil and its border with French Guiana. It occurs in terra firme forest, on clayey soil in plain areas. Considering its occurrence in protected areas and its wide distribution, we suggest a preliminary conservation status as Least Concern, according to IUCN criteria. An identification key to all accepted species of *Priourella* is included.

**KEYWORDS:** Brazil, conservation, Ericales, lenticelled fruit, taxonomy, terra firme forest

## *Priourella lenticellata* sp. nov. (Sapotaceae), uma nova espécie para a floresta amazônica

### RESUMO

*Priourella lenticellata* sp. nov. é descrita e ilustrada como uma nova espécie endêmica da floresta amazônica. É morfologicamente semelhante a *P. manaosensis*, mas distingue-se por troncos de circunferência relativamente maior, folhas coriáceas e menores, base foliar cuneada a truncada e frutos glabrescentes com numerosas lenticelas. Esta nova espécie é conhecida apenas do norte do Brasil e de sua fronteira com a Guiana Francesa. Ocorre em floresta de terra firme, em solo argiloso em áreas planas. Considerando a sua ocorrência em áreas protegidas e a sua ampla distribuição, sugerimos um estado de conservação preliminar na categoria de Pouco Preocupante, de acordo com os critérios da UICN. Incluímos uma chave de identificação para todas as espécies aceitas de *Priourella*.

**PALAVRAS-CHAVE:** Brasil, conservação, Ericales, floresta de terra firme, fruto lenticelado, taxonomia

## INTRODUCTION

*Priourella* Pierre was recently re-established with five species for the Neotropical region (Swenson et al. 2023). The genus was originally described by Pierre (1891) who characterized it as being cauliflorous, having imbricate sepals and corolla lobes, dome-shaped flowers and stamens inserted at the base of the corolla lobes. However, subsequent Sapotaceae systematists did not recognize *Priourella* as a genus until Aubréville (1964) re-established the genus and expanded it to seven species (Aubréville 1965, 1967). Pennington (1990) did not accept *Priourella* on generic level, but recognized it as a section of *Chrysophyllum* L. based on common characters such as pentamerous flowers, absence of staminodes, foliaceous

cotyledons, exerted radicle below the cotyledon commissure, and presence of endosperm. However, phylogenetic studies using molecular data have proven that *Priourella* is monophyletic and only distantly related to *Chrysophyllum* (Faria et al. 2017; Swenson et al. 2023).

Faria et al. (2017) found *Priourella* to be monophyletic with strong support and with a morphology corresponding to that described by Aubréville (1964), but hesitated to reinstate the genus since the type species, *Chrysophyllum cuneifolium* (Rudge) A.DC., was not included in their analysis because it had been suggested to have hybrid origin. Nevertheless, Swenson et al. (2023) made a new attempt, including two accessions of *C. cuneifolium*, one from Ecuador and one

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from French Guiana, which formed a sister pair embedded in *Priourella*. The morphology of *Priourella* includes an eucamptodromous leaf venation, tertiary veins that are horizontal at midvein and oblique between the secondaries towards the leaf margin, and a transverse higher-order venation between the tertiaries. Flowers are pentamerous, with quincuncial calyx, dome-shaped corolla, stamens inserted at the base of the corolla lobes, just above the tube orifice, and absent staminodes. Seeds are usually somewhat laterally compressed with rough (Pennington 1990) or verrucose testa. The embryo has foliaceous cotyledons, exerted radicle and is surrounded by an endosperm.

*Priourella* is endemic to tropical America, present in northern Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Panama, Peru, Venezuela and Suriname, occurring preferentially in the Amazon rainforest. Its species usually have preference for specific habitats, such as non-flooded areas (*P. priouri* (A. DC.) Aubrév. and *P. wurdackii* Aubrév.), moist montane forests (*P. colombiana* Aubrév.), riverbanks (*P. cuneifolia* Pierre), or sandy soils that are regularly flooded (*P. manaosensis* Pierre) (Pennington 1990).

While studying specimens of *Priourella* in the herbarium of the National Institute for Amazonian Research (INPA, Manaus, Brazil), specimens identified as *Priourella manaosensis* were observed to have fruits that were very different from the globose and tomentose form that corresponded to the description of *P. manaosensis* (Pennington 1990), and was suspected to be a new species. Later, specimens of *P. manaosensis* and the *Priourella* trees with different fruits were collected in the same locality during a botanical survey in the central Brazilian Amazon, and were found to differ in other morphological traits and habitat preference.

In comparison with all available type species of the genus, it became clear that these specimens did not correspond to any known *Priourella* species, and are here described as a new species for the Amazon rainforest. We also provide a morphological comparison with other *Priourella* species accommodated in this genus and an updated identification key for *Priourella* species.

## MATERIAL AND METHODS

We collected fertile material of *Priourella* in May 2022 during a botanical survey in Adolpho Ducke Forest Reserve (ADFR), in the phytogeographic domain Amazon Rainforest, in the central Amazon region of Brazil. The reserve is a 10,000-ha area of primary terra firme rain forests (2°57'42.0"S, 59°55'40.0"W) located in the periurban region of Manaus, the capital city of Amazonas state (Ribeiro et al. 1999). The region's climate, according to the Köppen classification, is type Am, characterized by being hot and humid throughout the year. The average annual temperature is 26 °C and the average annual precipitation is 2524 mm (Barroco Neta and

Nishiwaki 2018). The soils are yellow-alic, clayey latosols on higher ground, and sandy podzols on lower ground (Ribeiro et al. 1999; Hopkins 2005).

A comparative analysis of the sampled material was carried out with specimens of *Priourella* deposited in the herbaria INPA, L, NY, PEUFR, RB, SPF, U and US (acronyms according to Thiers 2024, continuously updated). A morphological and taxonomic analysis was carried out using specialized bibliography (Pierre 1891; Pennington 1990; Swenson et al. 2023) and the comparison with the types of all *Priourella* species. The collected material was deposited in the INPA and PEUFR herbaria.

Morphological terms follow Beentje (2016). Habitat, phenology, flower and fruit color, and location data were compiled from specimen labels and field observations. Specimens with absent geographic coordinates, but with information on the collection location, were georeferenced using the geoLoc tool (<http://smlink.cria.org.br/geoloc?criaLANG=pt>). Maps were prepared in Quantum GIS 3.10.2 software (<https://www.qgis.org/>). The extent of occurrence (EOO) and the occupation area (AOO) were estimated using the GeoCat geospatial conservation assessment tool software ([geocat.kew.org](http://geocat.kew.org)). Based on these estimated parameters, the preliminary conservation status of the new species was evaluated according to the IUCN Red List categories and criteria (IUCN 2022).

Images of the *Priourella* material from ADFR were obtained in the field using a digital camera (Canon Eos Rebel T100). Ink drawings of morphological structures were prepared using images obtained using a binocular stereomicroscope Bel SZ Led.

We follow a morphological species concept in which at least two morphological characters have to differ against all other known congeners, as proposed by Queiroz (2007) as sufficient to infer the existence of a different species.

## RESULTS

### *Priourella lenticellata* R. Lima, sp. nov.

(Figures 1, 2, 3)

**Type:** Brazil, Amazonas, Manaus, Reserva Florestal Adolpho Ducke, estrada do Acará, 02°53'S, 59°58'W, fr., 05 May 1988, *D. Coêlho & R. P. Lima 16-D* (holotype, INPA [179243]!; isotypes, K [digital image!]!, MG [digital image!]!, NY [01174721]!).

**Diagnosis:** *Priourella lenticellata* sp. nov. is morphologically similar to *Priourella manaosensis*, but differs in being ramiflorous (*vs.* ramiflorous and cauliflorous), with a proportionally thicker trunk with 30–65 cm in circumference (*versus* thinner with 16–28 cm in circumference), coriaceous leaves (*vs.* chartaceous), up to 17 cm long leaves (*vs.* up to 33 cm long), cuneate or rounded leaf base (*vs.* acute or



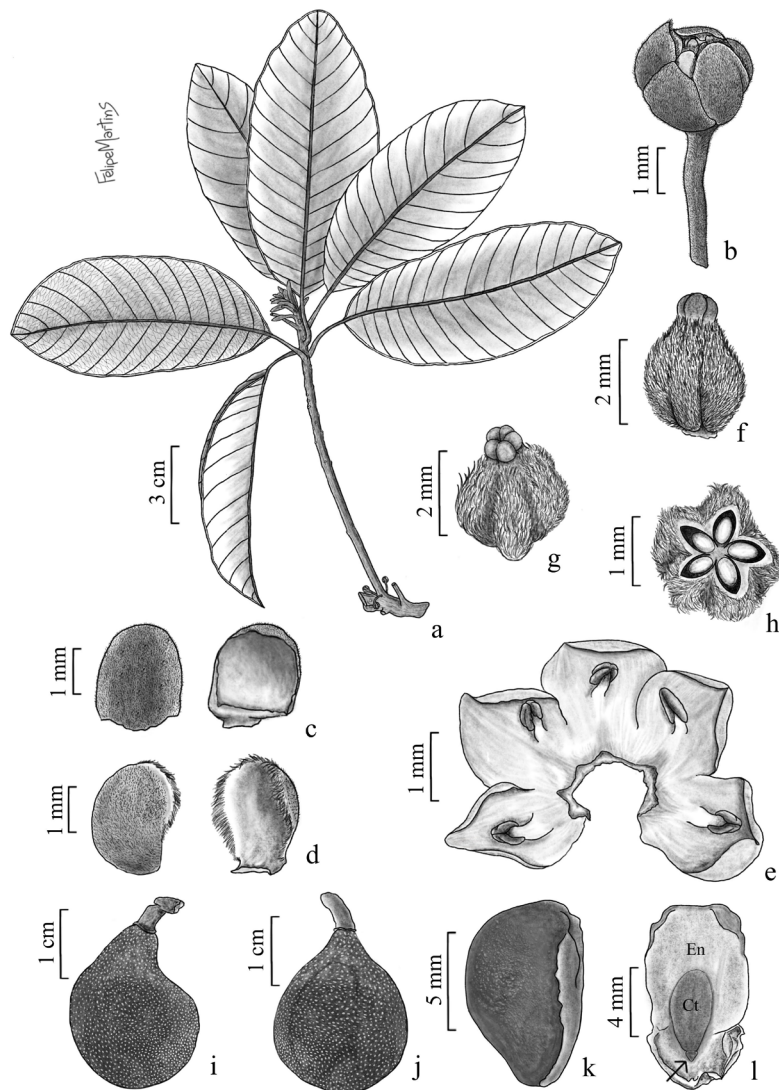
**Figure 1.** *Priourella lenticellata* sp. nov. **A** – Trunk; **B** – Latex; **C** – Leaves; **D** – Flowers and open corolla showing stamens inserted at the base of the corolla lobes; **E** – Beginning of fruiting; **F** – Fruit; **G** – Seed showing a vesicular testa. A–E from *R. Lima* 96; F from *G.T. Prance* 12223; G from *M.C. Lemos* s/n INPA202250. Credits: R. Lima.

cuneate), and glabrescent, lenticellate fruits (*vs.* tomentose, not lenticellate) (Figure 4, Table 1).

**Description:** Tree 20–40 m high, trunk 30–65 cm in circumference, white latex; trunk cylindrical and slightly buttressed at base in old trees; bark reticulately fissured, scaly, reddish–maroon outside, cream inside. Twigs slightly striated, beige, cylindrical, many leaf scars. **Leaves** alternate, spirally arranged, clustered at the end of branches; petiole 1.1–2.7 cm long, canaliculate, puberulous; blade (5–)6–17 x 2–7 cm, obovate or elliptic, coriaceous; base cuneate or rounded; apex obtuse, rounded or mucronate to apiculate; puberulous on lower leaf surface, indumentum reddish–brown; young leaves concentrated at the end of the branch; margin slightly revolute; leaf venation eucamptodromous, secondary veins 12–18, tertiaries oblique, higher-order venation transvers,

**Table 1.** Morphological characters to distinguish *Priourella lenticellata* sp. nov. from *P. manaosensis*. CBH = circumference at breast height.

Characters	<i>Priourella lenticellata</i> sp.nov.	<i>Priourella manaosensis</i>
Trunk circumference	Up to 65 cm CBH	Up to 35 cm CBH
Leaf texture	Coriaceous	Chartaceous
Leaf size	Up to 17 cm	Up to 33 cm
Leaf apex	Obtuse, rounded, mucronate, or apiculate	Attenuate or acuminate
Leaf base	Cuneate or truncate	Acute or cuneate
Secondary veins	12–18 pairs	16–32 pairs
Inflorescence	Ramiflorous	Ramiflorous and cauliflorous
Fruit shape	Pyriform or rarely obovoid	Globose
Fruit surface	Lenticellate	Not lenticellate
Fruit indumentum	Glabrescent	Tomentose

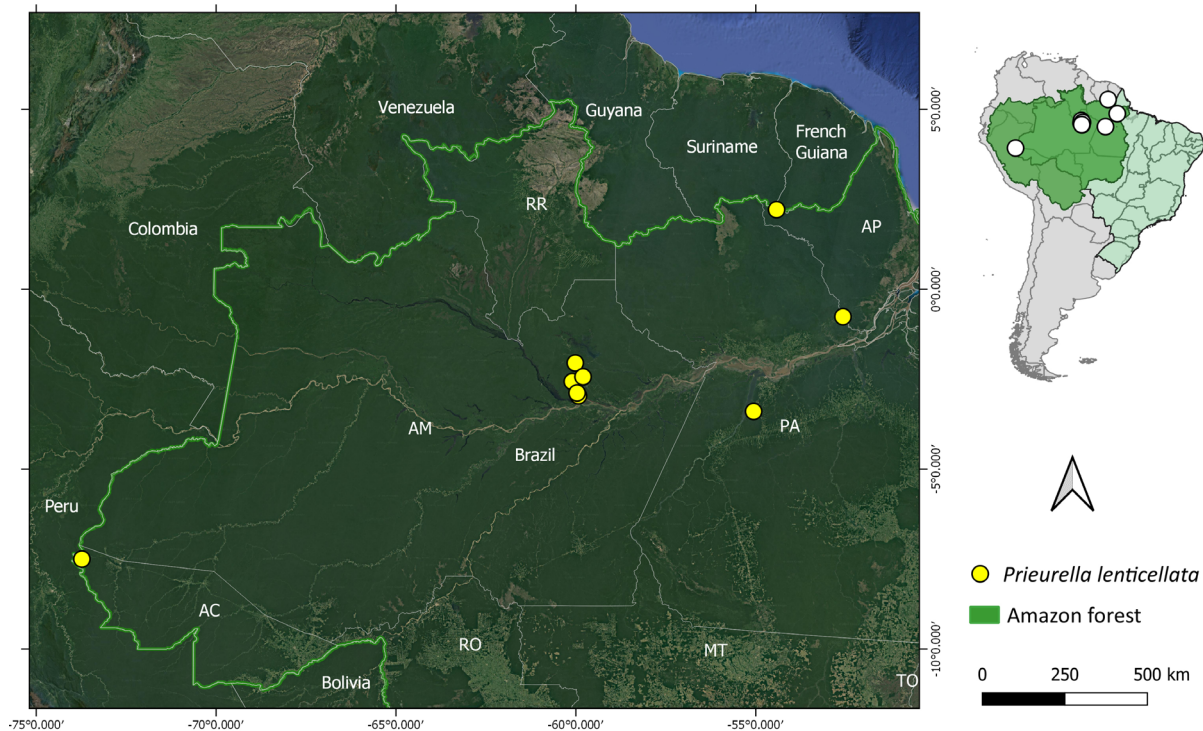


**Figure 2.** *Priurella lenticellata* sp. nov. **A** – Twig; **B** – Early flower; **C** – Outer sepal from outside (left) and inside (right); **D** – Inner sepal from outside (left) and inside (right) with ciliate margin; **E** – Open corolla showing stamen insertion; **F-G** – Gynoecium; **H** – Ovary in cross section with five locules and five ovules; **I** – Fruit with two seeds; **J** – Fruit with four seeds; **K** – Seed, side view; **L** – Folioleous cotyledons (Ct), radicle (arrow) and endosperm (En). A–H from *R. Lima* 96; I–J from *D. Coelho & R. P. Lima* 16-D; I. M.C. Lemos s/n INPA202250. Credits: Felipe Martins.

somewhat branching. **Flowers** pentamerous, greenish, bisexual, axillary, 1–3 in each fascicle, 5–7 mm long; pedicel 2.5–3.5 mm long; calyx quincuncial; sepals tomentulose on both sides, 1.5–2.5 mm long, broadly elliptic; margin of innermost sepals ciliate; corolla 1.8–2.0 mm long, dome-shape, glabrous, tube slightly shorter than the corolla lobes; lobes 1.0–1.2 mm long, ovate; stamens inserted at the base of the corolla lobe; filament 0.5–0.7 mm long, glabrous; anther 0.3–0.4 mm long, dehiscence longitudinal, glabrous; gynoecium 1.7–2.0 mm long, ovate, pubescent; style 0.2–0.3 mm, apex with small, round, glabrous stigmatic areas. **Fruit** 1.7–3.7 × 1.2–2.5 cm, pyriform or rarely obovoid, yellow to orange when ripe, glabrescent, conspicuous lenticels; pedicel continues to grow up to 10 mm in fruit; sepals persistent in

the fruit. Seeds up to 5 per fruit, ca. 11 × 7 mm, obovoid to elliptic, laterally compressed; testa verrucose; seed scar ca. 10 × 2 mm, linear, basi-ventral; embryo with foliaceous cotyledons, exserted radicle, and endosperm.

**Paratypes:** BRAZIL, Acre, Mâncio Lima, Vicinity of Serra do Moa, 22 April 1971, *G.T. Prance* 12223 (NY 01251795!). Amazonas, Manaus, Distrito Agropecuário, ZF3., Distrito agropecuário da SUFRAMA, Rodovia BR 174, Km 64, depois de 34 Km leste na ZF 3, Fazenda Esteio, 02°26'S, 59°48'W, 50–125m, 23 June 1992, *M. Nee* 42831 (INPA!, L [digital image!], NY 1184104!, NY 1184105!, NY 1551012!, NY 1551013!, US [digital image!]). Amazonas, Manaus, Estação Experimental de Silvicultura Tropical – ZP2, *M.C. Lemos* s.n. (INPA202250!). Amazonas, Manaus, Floresta densa de terra-



**Figure 3.** Distribution of *Priurella lenticellata* sp. nov. in the Brazilian Amazon (dark green in the small map). Yellow dots indicate the known localities of occurrence. Acronyms of Brazilian states: AC = Acre; AP = Amapá; AM = Amazonas; MT = Mato Grosso; PA = Pará; RO = Rondônia; RR = Roraima; TO = Tocantins.

firme da Amazônia Central, norte de Manaus, 2°57'42"S, 59°55'40"W, 18 October 2017, *I.D.K. Ferraz & J.E. da C. Souza 1291* (INPA!). Amazonas, Manaus, Reserva Florestal Adolfo Ducke, Floresta de vertente, indivíduo 641-05, km 26, 02°53'S, 59°58'W, 27 May 1997, *P.A.C.L. Assunção et al. 505* (INPA!, NY01174719!). Amazonas, Manaus, Reserva Florestal Adolfo Ducke, Barra branco, indivíduo 641-05, 02°56'00.0"S, 59°58'31.1"W, 85m, 18 May 2022, *R.G.V.N. Lima et al. 96* (PEUFR!). Amazonas, Manaus, Reserva Florestal Adolfo Ducke, Área do Palhal – Marco M512, indivíduo 725, 2°55'48"S, 59°58'19"W, 83m, 19 May 2022, *R.G.V.N. Lima et al. 100* (INPA!, PEUFR!). Amazonas, Manaus, Reserva Florestal Adolfo Ducke, Área do Projeto TEAM. Parcela da Ducke-Sede, sub parcela 08, indivíduo n° 187, 18 February 2005, *A.B. de Azevedo 4* (INPA!). Amazonas, Manaus, Reserva Florestal Adolfo Ducke, Próximo ao alojamento, planta fichada 922-05, 24 March 1994, *J.E.L.S. Ribeiro et al. 1246* (INPA!, RB00372103 [digital image!], RB00768243 [digital image!], U0060939 [digital image!]). Amazonas, Presidente Figueiredo, Rebio Uatumá, grande do PPBio, 1°00'S, 59°00'W, 15 March 2007, *J.G. Carvalho-Sobrinho et al. 1358* (INPA!). Pará, Almeirim, Monte Dourado, Estrada Sul Pacamari, 11 December 1978, *M.R. Santos 512* (INPA!, NY 01174713!). Pará, Parque Nacional do Tapajós, km 60 da estrada Itaituba-Jacarecanga, 21 November 1978, *M.G. da Silva & C. Rosário 3872* (NY 01251804!, SPF 68397 [digital image!]). FRENCH GUIANA, Borne Frontiere N°1, Parcelle BOU2, N° inv:

BOU2-357, 2°12'43"N, 54°25'28"W, 300m, *D. Sabatier & J.F. Molino 5134* (US 01122530 [digital image!]).

**Distribution and habitat:** *Priurella lenticellata* is known from the Amazon rainforest of northern Brazil, specifically in the states of Acre, Amazonas and Pará, as well as from French Guiana. The point of occurrence in French Guiana is close to the border with the state of Amapá in Brazil, making the presence of this species in Amapá likely. Similarly, the occurrence of the species in Acre near the border with Peru suggests the possibility of its presence in Peruvian territory as well.

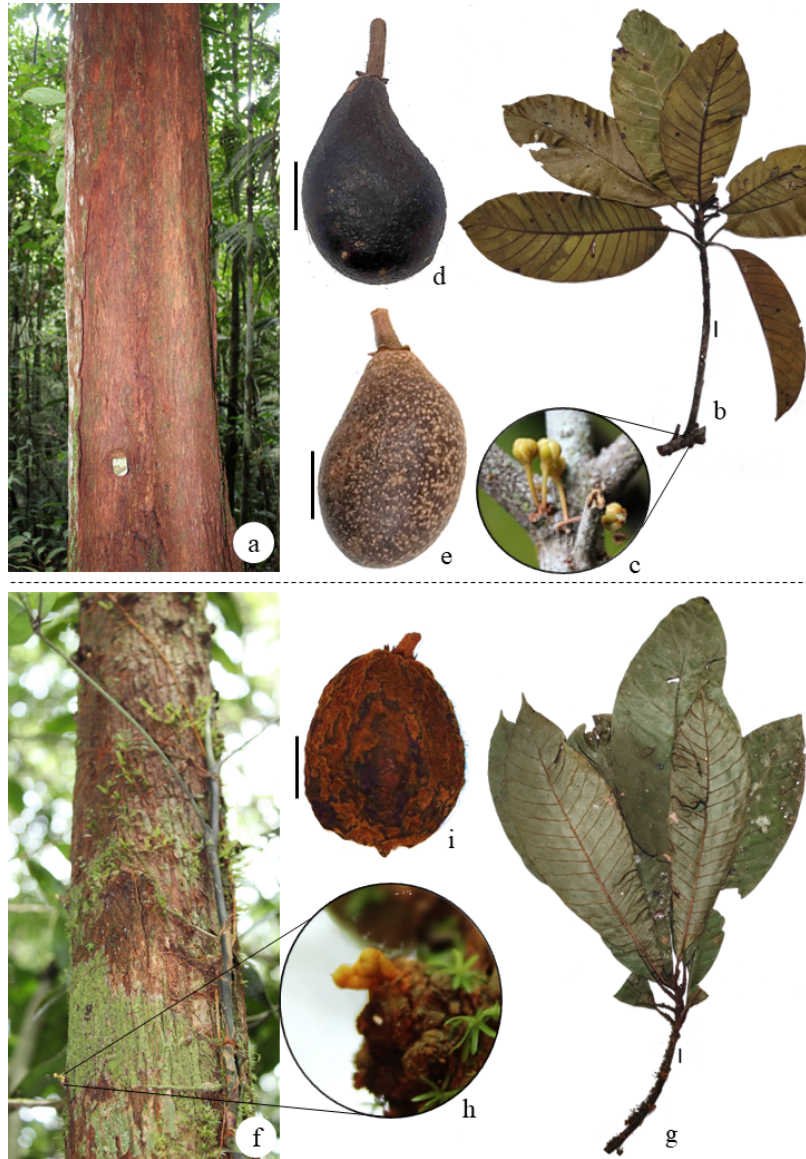
It occurs in terra firme forest, i.e., in non-flooding areas on clayey soil, between 50 and 300 m a.s.l. Within this habitat, the species was found on plateau and slope areas with forest canopy ranging from 30 to 40 m in height.

**Etymology:** The epithet *lenticellata* refers to the conspicuous lenticels on the fruit, a diagnostic character of this species.

**Common name:** It is known as *abiurana de massa* in the region of Manaus, Amazonas, Brazil.

**Phenology:** In Amazonas state, in the central Brazilian Amazon, flowers of *Priurella lenticellata* were observed in May, and fruits were collected from February to October. In Acre, in the southwestern Amazon, fruits were collected in May, and in Pará, in the eastern Amazon, in November and December. In French Guiana, fruits were observed in October.

**Conservation status:** *Priurella lenticellata* is known from 10 localities across the lowland Amazon (Figure 3). Three of



**Figure 4.** Comparison of some morphological features of *Priurella lenticellata* sp. nov. (A–E) and *P. manaosensis* (F–J). **A** – trunk; **B** – twig; **C** – flower position (ramiflorous); **D–E** – fruits with lenticels; **F** – trunk; **G** – twig; **H** – flower position (cauliflorous); **I–J** – fruit pubescent. A–C from *R. Lima* 96; D from *M.R. Santos* 512; E from *G.T. Prance* 12223; F–H from *R. Lima* 97; I from *C.P.F. Pessoa* INPA6124. Credits: R. Lima. Scale bars = 1 cm

them are inside protected areas in Brazil (Adolfo Ducke Forest Reserve and Uatumã Biological Reserve in Amazonas state, and Tapajós National Park in Pará state) and it is frequently observed along trails within these conservation units. The largest number of individuals (five) is known from Adolfo Ducke Forest Reserve. Considering its wide distribution, we believe the species is very likely to occur in between the known localities. The preliminary estimation of extent of occurrence (EOO) is 793,458.414 km<sup>2</sup>, while the area of occupancy (AOO) is only 48 km<sup>2</sup>. Considering that part of the known occurrence localities is within preserved areas, in accordance with the IUCN Red List Criteria (2022), we

propose a preliminary Red List status for *P. lenticellata* sp. nov. as Least Concern (LC).

#### Identification key to species of *Priurella*

1. Lower leaf surface glabrous or with scattered trichomes ... 2
- 1'. Lower leaf surface with dense and persistent trichomes . 5
2. Petiole 0.3–0.5 cm; leaf base cuneate or truncate ..... *P. cuneifolia*
- 2'. Petiole > 1 cm; leaf base attenuate ..... 3
3. Leaves 9–16 cm long, secondary veins 10–12 pairs ..... *P. wurdackii*
- 3'. Leaves 17–33 cm long, secondary veins 13–21 pairs ... 4

4. Ramiflorous; corolla pubescent inside ..... *P. colombiana*  
 4'. Ramiflorous and cauliflorous; corolla glabrous .....  
 ..... *P. manaosensis*  
 5. Leaf base narrowly attenuate; fruit puberulous without  
 lenticels ..... *P. priurii*  
 5'. Leaf base cuneate or rounded; fruit glabrescent with  
 conspicuous lenticels ..... *P. lenticellata*

## DISCUSSION

*Priourella lenticellata* is most appropriately classified within *Priourella* as described by Swenson et al. (2023), due to the presence of morphological characteristics such as oblique tertiary veins with transvers, slightly branched higher-order venation, valvate-quincuncial calyx, and stamens inserted at the base of the corolla lobes. This classification is further supported by preliminary molecular analyses that confirm the correct inclusion of this species within *Priourella* (unpubl. data, R. Lima).

Morphologically, *Priourella lenticellata* shows a close relationship with *P. manaosensis*, sharing characteristics such as leaves with long petioles, spiral leaf arrangement, brownish leaf color when dehydrated, pentamerous flowers, and glabrous corolla. These similarities likely contributed to taxonomic confusion, leading to the identification of the two species as a single taxon over the years. An example of this is the review by Pennington (1990), which transferred *Priourella manaosensis* to the genus *Chrysophyllum*, renaming it as *C. manaosense* (Aubrév.) T.D. Penn., treating the morphological differences as variations within the same species. However, even though Pennington did not recognize the species described here, the illustrations in his review of Sapotaceae in South America (Pennington 1990, Figs 140: F–K and L–O) clearly show the morphological differences between the two.

Ecologically, *Priourella lenticellata* and *P. manaosensis* occupy distinct niches in the terra firme forest of the Amazon biome, an ecosystem unaffected by the seasonal flooding of rivers. *Priourella lenticellata*, which can reach up to 40 m in height and 65 centimeters in circumference, is typically found in areas of higher ground on plateaus and slopes, while *P. manaosensis* prefers lower, more humid grounds on sandy soils.

Another morphologically close species to *Priourella lenticellata* is *P. priurii*, as both have the lower surface of the leaves covered by dense and persistent trichomes. However, *P. priurii* differs in that it has broadly oblanceolate leaves, with a reddish-brown sericeous indumentum, usually persistent on the lower surface, corolla with trichomes near the base of the lobes, in addition to somewhat unusual fruits, with a warty or muricate surface (Pennington 1990).

The discovery of *Priourella lenticellata* began with the analysis of herbarium material, followed by its collection in the field. Bebbler et al. (2010) demonstrated that 84% of

recently described species were identified from herbarium specimens, often after a long interval of time. According to these authors, the combination of more recent collections with older ones is essential to provide the geographical and morphological evidence necessary for the description of new species. In this context, the digitization of collections has proven to be a crucial tool for the retrieval and identification of species (Rocchetti et al. 2021). Therefore, the study of herbarium material, combined with the collection of material in the field, is fundamental to the discovery of new species.

## CONCLUSIONS

We describe a new species of *Priourella* (Sapotaceae), *Priourella lenticellata* sp. nov., found in the Amazon region. A distinct diagnostic feature of this species is the conspicuous lenticels present on the fruit. *Priourella lenticellata* sp. nov. has a wide distribution in the northern region of Brazil, with a recorded occurrence in French Guiana, near the border with Brazil. The species has a preliminary conservation status classified as “Least Concern” and is found in three protected areas in Brazil. The discovery of *Priourella lenticellata* enriches the known diversity of the genus *Priourella* but also reinforces the importance of revising herbarium material, as this species remained undetected for a long time despite being widely distributed in the Brazilian Amazon.

## ACKNOWLEDGMENTS

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