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Salpingifera (Achariaceae) a new monotypic and endemic genus from Gabon

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Key words

Achariaceae
new genus
taxonomy
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Abstract The aberrant *Oncoba ngounyensis* from Gabon, originally described in *Lindackeria* (then *Flacourtiaceae*, nowadays *Achariaceae*), but excluded from that genus by Sleumer, is closer investigated to see whether it belongs in *Camptostylus* as suggested by that author or in any other genus of the *Lindackerieae*. It is concluded that this species belongs to neither *Lindackeria* nor *Camptostylus*. Within the *Lindackerieae*, *Oncoba ngounyensis* occupies a morphologically isolated position which is taxonomically best expressed by placing it in a new genus of its own, we name *Salpingifera*.

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INTRODUCTION

In 1923 Pellegrin described a new species of *Lindackeria* C.Presl (*Flacourtiaceae*) from Africa and named it *L. ngounyensis* Pellegr. after the Ngounye River basin in Central Gabon. The type material collected by Le Testu is only flowering. When Sleumer (1974a) revised the genus *Camptostylus* Gilg (*Flacourtiaceae*, now *Achariaceae*) he stated that *Lindackeria ngounyensis* probably ('vermutlich') belonged to this genus. The only argument was that the leaves resembled those of *C. ovalis* Chipp, but because only staminate flowers were known he further ignored the species in his revision. Maybe the presence of staminate, so unisexual, flowers was an argument for Sleumer as well, but such is not stated explicitly. In his following revision of the African *Lindackeria* species (Sleumer 1974b) he excluded *L. ngounyensis* from this genus and, although fruits were still unknown, he strengthened his earlier statements now saying that it almost surely ('wohl sicher') belonged to *Camptostylus*. Without any argument Hul (1995) transferred all species of *Camptostylus* and *Lindackeria* occurring in Gabon to *Oncoba* Forssk. and so *L. ngounyensis* became *Oncoba ngounyensis* (Pellegr.) Hul. In a later publication Hul & Breteler (1997) argued that the previous segregation of genera by Gilg (1925), that was followed by Sleumer (1974b), was based on mostly vague delimitations with a major dependency on fruit characters. They more or less reverted back to the classification by Oliver (1868) into a widely circumscribed *Oncoba* and transferred the non-Gabonese species as far as necessary.

Chase et al. (2002) divided the *Flacourtiaceae* genera over *Salicaceae* and *Achariaceae*. *Oncoba* s.str. was placed in *Salicaceae*, but the remaining genera of the *Flacourtiaceae* tribe *Oncobeae*, including those that were included in *Oncoba*

by Hul (1995), went to *Achariaceae* and were placed in a new tribe *Lindackerieae* Zmarzty, under their former pre-Hul (Hul 1995) generic names, although no new specific combinations were made. *Lindackerieae* is predominantly an African tribe, currently including eight wholly African genera: *Buchnerodendron* Gürke, *Caloncoba* Gilg, *Camptostylus*, *Grandidiera* Jaub., *Peterodendron* Sleumer, *Poggea* Gürke, *Prockiopsis* Baill. and *Xylothea* Hochst. *Prockiopsis* occurs only in Madagascar. Three further genera are confined to Central and South America: *Carpotroche* Endl., *Mayna* Aubl. and *Kuhlmanniodendron* Fiaschi & Groppo (Groppo et al. 2016). Finally *Lindackeria* as currently circumscribed occurs in both Africa and the Americas, the only genus of the tribe that does so. This classification is likely wrong and will be the subject of another paper (Breteler & Wieringa in prep.).

MATERIAL AND METHODS

Based on herbarium and alcohol collections at BM, BR, BRLU, K, L, P, U and WAG (acronyms according to Thiers continuously updated), the leaves, flowers, fruits and seeds of all *Lindackerieae* genera have been morphologically studied. Of the African genera all species have been investigated. The American genera have all been investigated, but the different species only as far as material was available in L, U or WAG.

RESULTS

Since *Lindackeria ngounyensis* was included in the *Lindackerieae* when these were described by Chase et al. (2002), the species fits the tribal description. To include this species the description had to be stretched to accommodate for 4 sepals per flower. The tribal character 'inflorescence not racemose-spicate' is only true when the individual flowers are seen as one-flowered cymes (see below). The species does not fit any of the other tribal circumscriptions by Chase et al. (2002) by sev-

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eral characters, except for *Erythrospermeae*. However, it only fits there because the exceptions, invoked by 'often' or 'usually' phrases, have to be chosen several times to fit *L. ngounyensis*. In that tribe 'the sepals and petals often indistinguishable from one another' and 'petals usually with an adnate adaxial basal scale' do not nicely accommodate this species with petals without any scales clearly different from the sepals. We have considered the genera included in *Erythrospermeae* based on generic descriptions and concluded our species does not fit any of them.

An important new character to separate groups within *Lindackerieae* is the presence of a resinous layer on young shoots, which usually is present in inflorescences as well. The presence of such a resinous layer might hamper the development of stipules, bracts and bracteoles, so the linkage of the resinous layer with poorly or not developed stipules might rather be a functional correlation than a clear phylogenetic signal. This resinous layer is present in the genera *Caloncoba*, *Camptostylus*, *Xylothea* and in the American species of *Lindackeria*. Other important characters are the number of sepals, the dehiscence of fruits, the presence of a sarcotesta and the flower arrangement within the inflorescence.

The inflorescence of *Lindackeria/Oncoba ngounyensis* is different from that of the other genera of the *Lindackerieae*. The flowers seem to be arranged in a raceme. Each flower is at base, on both sides of its pedicel, accompanied by a small, variable number of trumpet-shaped organs (Fig. 3a, b). Pellegrin (1923) observed that these trumpet-shaped organs look like pedicels of which the flowers are aborted or have not developed at all. However, as is evident on photos taken in the field (Fig. 3b), these organs are terminated by a gland producing a liquid that is searched after by ants. So, either it are pedicels of which each flower is extremely reduced to a gland, or it is a completely unique organ bearing glands. Interestingly, *Lindackerieae* are supposed to have no disk glands, so it is peculiar that the only remain of the flower would be a gland. Maybe some *Lindackerieae* do have some nectar production, which has never been observed, just like the glandular nature of these trumpet-shaped organs was never recorded. We considered these trumpet-shaped structures as pedicels with reduced flowers, which together with the single developed flower, are part of a dichasium of which only the top flower of the primary axis has fully been developed. That these trumpet-shaped organs are in fact reduced flowers in a dichasium is corroborated by the fact that they develop after the development of the floral bud and they bear their own bracts and bracteoles. The whole inflorescence should be considered as a thyse.

Sleumer (1974a) considered *Camptostylus* to have indehiscent fruits. However, as is evident in some herbarium specimens these fruits are tardily dehiscent. Since *Camptostylus* has seeds with a fleshy seed coat this would be logical to expose these

seeds. *Lindackeria ngounyensis* possesses the same fleshy seeds, but the fruits seem to be indehiscent, which is quite extraordinary for *Lindackerieae*. Indehiscent fruits within this tribe have been described for *Mayna* and *Carpotroche* by Gilg (1925), but as is evident from some carpological collections in U of *Carpotroche brasiliensis* (Raddi) A.Gray (*Ducke 3891*), *C. platyptera* Pittier (*Chatrou 86*) and *C. surinamensis* Uittien (*Ek 796*), at least the fruits of these species of *Carpotroche* are dehiscent, or maybe tardily so. Possibly some other species of *Carpotroche* are indeed indehiscent. Groppo et al. (2013) states for *Carpotroche* 'maybe tardily dehiscent', which is confirmed by our observations. As far as we can assess from herbarium collections *Mayna* fruits are indeed indehiscent. *Kulmanniodendron* fruits are also described as indehiscent, but we have too poor material to assess this is indeed the case. So, next to in *L. ngounyensis*, indehiscent fruits only occur in *Mayna*, likely *Kulmanniodendron* and maybe *Carpotroche*.

Fleshy seed coats are present in *Caloncoba*, *Camptostylus* and likely in *Carpotroche* where herbarium labels mention 'arils' and Endlicher (1839: 918) describes it as "Semina ... epidermide carnosâ". These genera have dehiscent fruits, except that we cannot rule out that of some *Carpotroche* species the fruits may be indehiscent. This renders the combination of indehiscent fruits with fleshy seed coats unique, only possibly matched in *Carpotroche*. Fruits of the South American *Carpotroche* can be easily distinguished from *L. ngounyensis* by the free 4–8 styles where this African species only has a single style. Following the classification of fruit types by Spjut (1994) *L. ngounyensis* fruits should possibly be classified as a carcerulus, although this fruit type does not specify whether the seeds should have a sarcotesta or not. These fruits seem similar to the indehiscent fruits of *Punica L.*, which also do have a sarcotesta and are classified as a balausta, but a balausta includes other flower tissues like a hypanthium, which is not the case here. A specific name for an indehiscent solely carpel-based fruit with seeds including a sarcotesta does not seem to exist.

Sleumer's (1974a) statement that *Lindackeria ngounyensis* has to be excluded from (African) *Lindackeria* is approved. His suggestion, however, that it should be placed in *Camptostylus* does not find any support in the morphological characters presented in Table 1. The only actual match is the fleshy seed coat, a character that was not known to Sleumer.

Lindackeria/Oncoba ngounyensis shows a unique combination of characters and cannot be placed in any of the existing genera of the *Lindackerieae* without distorting the current morphological generic circumscriptions. It is the only *Lindackerieae* with four sepals. Moreover, the unique trumpet-shaped gland-like structures on the axis of the inflorescence stand out as extraordinary. Also the inflorescence type – a reduced thyse – is unique within the tribe. The indehiscent fruit including seeds with fleshy seed coats is probably a unique character for the tribe. The best

Table 1 Morphological comparison between *Camptostylus*, *Lindackeria ngounyensis*, and the remaining African *Lindackeria* species.

	<i>Camptostylus</i>	<i>Lindackeria ngounyensis</i>	remaining African <i>Lindackeria</i> species
Branchlets	resinous	not resinous	not resinous
Stipules	small, resinous, obsolete or absent	well-developed	well-developed
Leaf blades	entire	dentate	dentate
Inflorescence	an elongate axillary axis with scattered, short, compact, resinous, few-flowered lateral racemes	axillary, not resinous, with flowers in much reduced thyrses	axillary, paniculate, racemose, sometimes umbellate or subumbellate; not resinous
Sepals	three	four	three
Fruit	tardily dehiscent, ± smooth or ribbed, many-seeded	indehiscent, smooth, many-seeded	dehiscent, sometimes tardily so, spiny or bristly or with short emergencies, few-to many-seeded
Seed	seed coat completely fleshy	seed coat completely fleshy	seed with thickened raphe, sometimes as large as the seed, developed into a basal aril or not

solution for this species is to place it in its own genus. This segregation is supported by unpublished molecular analyses (Zmarzty et al. pers. comm.). We propose to classify it in the new monotypic genus *Salpingifera*: *Salpingifera ngounyensis*.

CONCLUSION

Lindackeria ngounyensis has to be excluded from African *Lindackeria* and cannot be placed in any other current genus of

the *Lindackeriae*. This species is best classified in a separate, new genus named *Salpingifera*. At present it is best placed in *Lindackerieae*, where the characters of this species have already been included in the description and delimitation. Still, its morphological description more or less fits that of *Erythrospermeae* as well. A classification in *Erythrospermeae* or even in a separate tribe could be considered when molecular data for more genera becomes available and tribal classification of some other genera may have to be reconsidered.

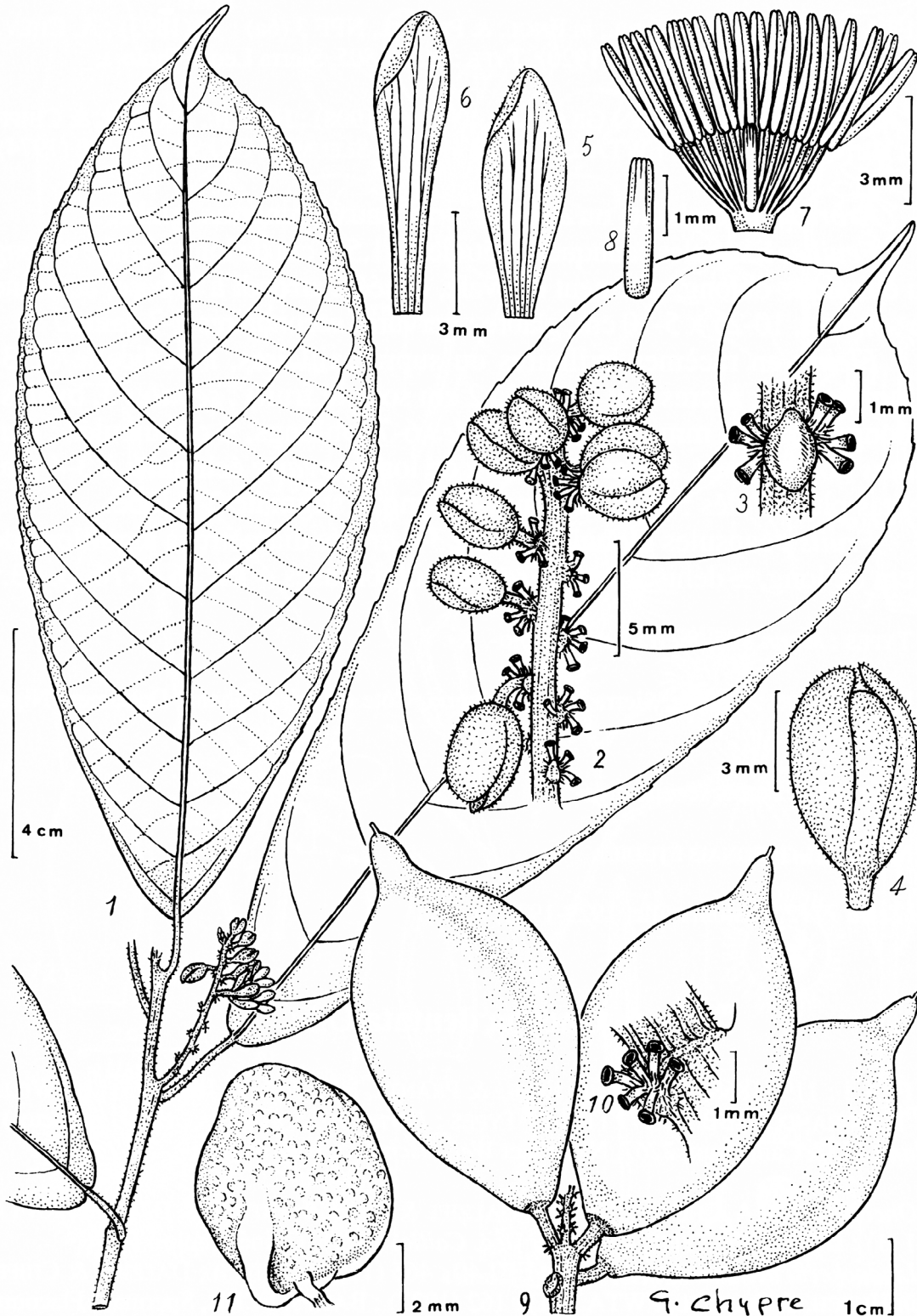


Fig. 1 *Salpingifera ngounyensis* (Pellegr.) Breteler & Wieringa. 1. Flowering branch; 2. inflorescence; 3. details of the trumpet-shaped organs on the rachis; 4. flower bud; 5. sepal; 6. petal; 7. stamens and pistilode; 8. pistilode; 9. fruits; 10. trumpet-shaped organs at base of fruiting pedicel; 11. seed (1–8: *Le Testu* 2235; 9–11: *Breteler* 10874). — Drawn by G. Chypre, reproduced from Hul (1995).

TAXONOMY

Salpingifera Breteler & Wieringa, *gen. nov.*

Etymology. This new, monotypic genus is named after the unique trumpet-shaped organs in the inflorescence. It is derived from the Greek word σαλπινγίς (*salpinx*) having salping- as genitive stem. So *Salpingifera* means trumpet-bearing. *Salpingifera* has the female gender.

Type: *Lindackeria ngounyensis* Pellegr.

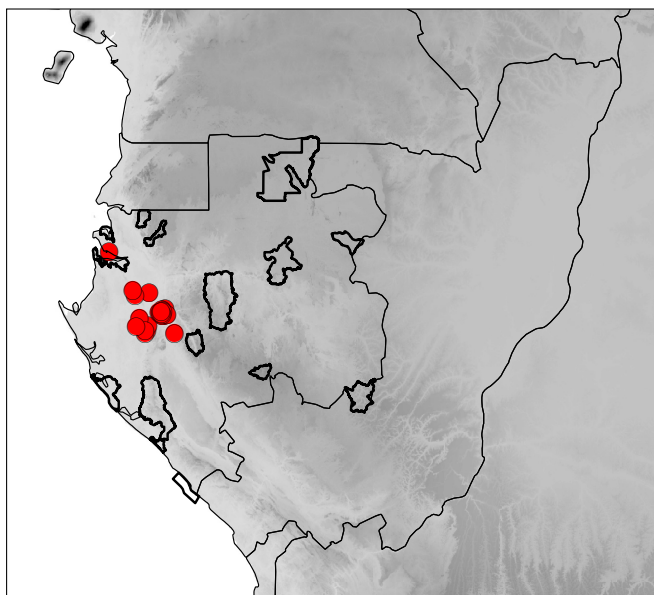
Shrub. *Leaves* alternate, stipulate, penninerved, margin dentate. *Inflorescence* axillary, racemose compound of dichasia (thyse) reduced to a single flower flanked by pedicels bearing trumpet-shaped glands. *Flowers* actinomorphic, staminate or bisexual/pistillate? *Sepals* 4, free, imbricate. *Petals* 8–10, free, imbricate. *Stamens* free, many, with long anthers opening by 2 lengthwise slits. *Ovary* superior, unilocular, with 5 parietal, multiovulate placentas. *Fruit* smooth, leathery, indehiscent, a carcerulus. *Seeds* many, with complete fleshy seed coat. *Embryo* small, embedded in copious endosperm.

Distribution — Monotypic, endemic to Gabon.

Salpingifera ngounyensis (Pellegr.) Breteler & Wieringa, *comb. nov.* — Fig. 1–4; Map 1

Lindackeria ngounyensis Pellegr., Bulletin du Muséum National d'Histoire Naturelle de Paris 29 (1923) 591. — *Oncoba ngounyensis* (Pellegr.) Hul (1995) 150. — Type: *Le Testu* 2235 (holo P; iso BR, WAG), Gabon, Ngounié, 16 Oct. 1917.

Shrubs, 2–3(–5) m tall. *Indumentum*: branchlets, stipules, petioles and inflorescences puberulous to shortly velutinous, densely so or not. *Stipules* subulate, 1.5–4(–5) mm long, caducous. *Leaves*: petiole (sub)terete, swollen and usually curved at apex, 0.5–5(–8.5) cm long; lamina obovate, rarely elliptic, (11–)15–25(–33) by (4.5–)6–12(–15) cm, 2–3 times as long as wide, papery to coriaceous, margin dentate mainly in upper half and often obscurely so, base cuneate to narrowly rounded to narrowly subcordate, apex (0.5–)1–2.5 cm long acuminate; glabrous above, glabrous to sparsely puberulous beneath; midrib and the 9–12(–13) pairs of main lateral nerves slightly prominent above, distinctly so beneath. *Inflorescence* erect, up to 8 cm long, few to many flowered; peduncle very short or absent; each dichasium with a single flower and laterally c. 3 mm long glands on pedicels. *Bracts* triangular, 0.5–1 mm long, hairy; bracteoles narrowly triangular, c. 0.4 mm long, hairy.



Map. 1 Distribution of *Salpingifera ngounyensis* (Pellegr.) Breteler & Wieringa.

Flowers staminate or bisexual/pistillate? (see notes). *Staminate flowers*: pedicel firm, articulated at the base, 3–5 mm long, puberulous; sepals 4, free, oblong-elliptic, 7–8 by 3–3.5 mm, decussate, imbricate, puberulous outside, glabrous inside; petals 6–8, narrowly elliptic to oblong, 8–10 by 2–3 mm, imbricate, free, glabrous, white; stamens 25–30, free, anthers yellow, c. 3 mm long, filaments white, 2–2.5 mm long; pistillode absent or minute, c. 2 mm long, glabrous. *Pistillate or bisexual flowers* unknown. *Young fruit* with a style of at least 4 mm. *Fruit* ellipsoid, beaked, 3–5 by 1.5–4 cm, glabrous, sometimes very slightly angled lengthwise, yellow to orange at maturity; style base persistent, developed into a mucron.

Distribution — Only known from Gabon.

Habitat & Ecology — Primary or secondary evergreen forest, in dry land forest as well as in periodically inundated forest, at sea-level to c. 100 m altitude.

Other specimens examined. GABON, Moyen-Ogooué, Bidault *et al.* 941 (WAG), Mabounié, 45 km SE of Lambaréné, near Ngounié R., 18 Oct. 2012; Bidault *et al.* 986 (WAG), *ibid.*, 25 Oct. 2012; Bidault *et al.* 1020 (WAG), *ibid.*, 1 Feb. 2013; Bidault *et al.* 1057 (WAG), *ibid.*, 5 Feb. 2013; Bidault *et al.* 1290 (BR, WAG), *ibid.*, 14 Nov. 2013; Breteler 10874 (P, WAG), Mbéné, c. 30 km on Bifoun – Lambaréné Rd., 3 Mar. 1992; Lachenaud *et al.* 1598 (BR, WAG), near Ezanga Lake, 24 Nov. 2013; Lachenaud *et al.* 2032 (BR), near Onangué Lake, 23 Oct. 2014; McPherson 15232 (BR, WAG), near Ezanga Lake, 9 Feb. 1991; Sonké *et al.* 6068 (BR), *sin. loc.*, 16 Oct. 2012; van Nek 589 (WAG), c. 20 km S of Ezanga, 31 Jan. 1991; Wilks 2445 (WAG) Ezanga, 1991.

Notes — Judged by several field notes that describe both staminate flowers and (young) fruits, it seems staminate and pistillate or bisexual flowers may be present on the same individual. However, all the sheets we saw bear either staminate flowers or fruits. Since it is not 100 % sure the field notes are based on single individuals we cannot be sure the species is monoecious or dioecious.



Fig. 2 *Salpingifera ngounyensis* (Pellegr.) Breteler & Wieringa. Older staminate flower (Bidault 941). — Photo by E. Bidault.



Fig. 3 *Salpingifera ngounyensis* (Pellegr.) Breteler & Wieringa. a. Inflorescence with buds; b. detail of Fig. 2, showing trumpet-like glandular organs in the inflorescence with ants drinking exudate (Bidault 941). — Photos by E. Bidault.



Fig. 4 *Salpingifera ngounyensis* (Pellegr.) Breteler & Wieringa. a. Inflorescence with buds and fresh male flowers; b. branch with fruits (a: Bidault 441; b: Bidault 1584). — Photos by E. Bidault.

We have only studied staminate flowers. Therefore we do not know whether fruits develop from bisexual or from pistillate flowers. Likely, when the species is dioecious, pistillate plants flower less abundantly and/or less frequently than staminate plants and are less likely to be collected by botanists.

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