

Sagina diffusa (Hook.f.) Timaná, comb. nov.
(Caryophyllaceae), a new combination for
the flora of Île St. Paul (Southern Indian
Ocean), with some historical notes

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***Sagina diffusa* (Hook.f.) Timaná, comb. nov. (Caryophyllaceae), a new combination for the flora of Île St. Paul (Southern Indian Ocean), with some historical notes**

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ABSTRACT

A new combination, *Sagina diffusa* (Hook.f.) Timaná, comb. nov., Caryophyllaceae, from the Île St. Paul (Terres Australes et Antarctiques Françaises) is proposed to replace *Colobanthus diffusus* Hook.f. *Sagina diffusa*, comb. nov. is characterized by an upright pedicel and appressed sepals during and after capsule development. A historical account of putative type specimens is presented.

RÉSUMÉ

Sagina diffusa (Hook.f.) Timaná, comb. nov., Caryophyllaceae, une nouvelle combinaison pour la flore de l'Île St. Paul (sud de l'Océan Indien), avec quelques notes historiques.
Une nouvelle combinaison, *Sagina diffusa* (Hook.f.) Timaná, comb. nov., Caryophyllaceae, de l'Île St. Paul (Terres Australes et Antarctiques Françaises) est proposée pour remplacer *Colobanthus diffusus* Hook.f. *Sagina diffusa*, comb. nov. se caractérise par un pédicelle érigé et des sépales apprimés pendant et après le développement de la capsule. Un historique des spécimens de types putatifs est présenté.

INTRODUCTION

In *Flora Antarctica* (Part 1), Sir Joseph D. Hooker (1844–1847) described two species of *Colobanthus* Bartl. found on the southern Indian Ocean islands: *C. kerguelensis* Hook.f. and *C. diffusus* Hook.f. The first species is currently known in the Kerguelen archipelago, Prince Edward Islands, Crozet Island, and Heard Island. *C. diffusus* was erroneously reported for Île Amsterdam, and thus, the identity of this species has long remained enigmatic, for it has not been collected in recent years and the type specimen has not been studied in detail for nearly one hundred years. Here I report the true identity of this species as a member of the genus *Sagina*.

The genus *Sagina* L. (Caryophyllaceae) consists of approximately 15 to 30 species of annual and perennial herbs (Crow 1978; Bittrich 1993; Lu & Rabaler 2001; Hernández-Ledesma *et al.* 2015), distributed mostly in northern temperate regions of North America, Europe and Asia, although endemic species have been reported in Australia (Adams 1996), New Guinea (Larsen 1998) and the Kerguelen phytogeographic zone (Hooker 1844–1847). The genus *Colobanthus* includes nearly 20 species distributed across the southern temperate regions, from southern South America, temperate Australia, New Zealand and adjacent subantarctic islands, to the Kerguelen phytogeographic zone (Moore 1970; Bittrich 1993; Hernández-Ledesma *et al.* 2015). Phylogenetic studies have demonstrated that *Sagina* and *Colobanthus* are closely related (Harbaugh *et al.* 2010; Greenberg & Donoghue 2011). Morphologically, they differ from each other by the presence of petals in *Sagina* (none in *Colobanthus*) and epispalous stamens in *Sagina* (alternispalous in *Colobanthus*) among other characters (Table 1). The only extant type specimen of *Colobanthus diffusus* Hook.f. (*Staunton s.n.* [BM 000513207]) shows floral characters corresponding to the genus *Sagina*, and thus the taxonomic transfer is necessary.

THE GEOGRAPHIC SETTING: ÎLE SAINT PAUL AND ÎLE AMSTERDAM

Île Saint Paul (38°43'S, 77°31'E) and Île Amsterdam (37°50'S, 77°30'E) are, along with Îles Kerguelen and Îles Crozet, part of the French Terres Australes et Antarctiques Françaises (TAAF). They are both among some of the most isolated islands in the world, located between 3100 and 3200 km from Madagascar, SE Australia and Antarctica. Given their strategic geographic location, almost in the center of the southern Indian Ocean, both islands were of great importance for transoceanic voyages, as well as stopping points for sealers and fishermen during the 18th and 19th centuries (Lebouvier & Frenot 2007; Váñas *et al.* 2014).

Île St. Paul is a small, uninhabited volcanic island of 7 km², located about 90 km south of Île Amsterdam (Headland 1989; Lebouvier & Frenot 2007). The island was first sighted by Haewick Claesz van Hillegom, Captain of the Dutch East India Company's *Zeewolf* in 1617 (Vélain 1893). Île Amsterdam is nearly 55 km² and was first sighted in the early 16th

century by the crew of Magellan's expedition on their way back to Europe. The first reported landing, however, was by the Dutch sailor Willem de Vlamingh in 1696 (Aubert de la Rüe 1966; Lebouvier & Frenot 2007). Île Amsterdam should not be confused with "Amsterdam Island," a name given by Dutch explorer Abel Tasman in 1643 to the island currently known as Tongatapu, Kingdom of Tonga, in the South Pacific. Tongatapu was visited by James Cook's second expedition in September 1773 (Beaglehole 1992); Johann R. Forster was the leading botanist of this expedition and thus, his main collections are kept at the BM herbarium, citing "Amsterdam Island" as collecting locality.

A brief historical account of the two islands has been presented by Aubert de la Rüe (1966); the flora and vegetation of these two islands have been studied by Hemsley (1884), Schenck (1905) and Aubert de la Rüe (1932), however, as Frodin (2001) indicated, a modern flora of these islands is still lacking.

HISTORICAL ACCOUNT

In the early history of exploration and scientific research, much confusion arose over the names of these two neighboring islands since the current names were reversed in most naval charts and botanical works, as in, for example, Hooker's *Flora Antarctica* (1844–1847; but see Hooker 1875). Therefore, as Hemsley (1884) explained, the plant species recorded in Hooker's *Flora Antarctica* from Île Amsterdam were actually from Île St. Paul. This error also applies to the specimens collected earlier by Sir George Leonard Staunton mentioned by Reichardt (1871).

J. D. Hooker described *Colobanthus diffusus* in 1845 (Hooker 1845: 249) based on two gatherings, one collected by Sir George L. Staunton and the second by Lieut. Alexander J. Smith, both from the island currently named Île St Paul (and both specimens erroneously labeled as coming from Île Amsterdam). Years later, Reichardt (1871) proposed another species, *Sagina hochstetteri*, based upon on two other specimens: a duplicate of Staunton's gathering and one collected by Ferdinand von Hochstetter, geologist and member of the Austrian *Novara* expedition. At this point, there were four specimens involved, all from Île St. Paul. Yet, of all these, only one of Staunton's duplicates, currently held at the Natural History Museum of London Herbarium (BM 000513207; Fig. 1), appears to be extant. The specimens examined by Reichardt at the Naturhistorische Museum in Vienna were most probably destroyed during World War II (Petrač 1948) and are no longer extant (Dr B. Wallnöfer pers. comm. 2017). Alexander Smith's collection was housed at the RBG Kew Herbarium; however, after many attempts to find the specimen, it could not be located (Dr R. Borosova pers. comm. 2017). What follows is a brief historical account of the collectors and collections involved.

THE STAUNTON SPECIMENS

British diplomatist, physician and botanist Sir George Leonard Staunton (1737–1801) was a member of the expedition

TABLE 1. — Comparison of the genera *Sagina* L. and *Colobanthus* Bartl.

	<i>Colobanthus</i> Bartl.	<i>Sagina</i> L.
No. of species	c. 20	15-30
Distribution	Across the southern temperate regions, from southern South America, temperate Australia, New Zealand, Kerguelen phytogeographic zone	Mostly in northern temperate regions of North America, Europe and Asia. Some endemic species in New Guinea, Australia and the Kerguelen phytogeographic zone
Petals	Absent	Present; sometimes caducous or absent
Stamens to sepals	Alternisepalous	Episepalous
Stamens to capsule valves	Opposite	Opposite
Style	Episepalous	Alternisepalous
Capsule valves	Alternisepalous	Episepalous

which, on board the HMS *Lion* and *Hindostan* (plus the brig *Jackal*), visited Île St. Paul in February 1793 while on a mission to transport Lord George Macartney to China as the first British Ambassador to that country (Wheeler 1898; Robbins 1908; Headland 1989). This expedition was exhaustively described in Staunton's *An Authentic Account...* (Staunton 1797), which dedicated Chapter VI in Volume 1 to this isolated region. The botanical specimens assembled by Staunton also included some of the most important Chinese collections of the time and eventually were sent to Sir Joseph Banks (1743-1820). The Banksian herbarium constituted one of the foundations of what later became the herbarium of the Botany Department at the Natural History Museum of London (Gunther 1904). In addition, extracts of Macartney's own narrative were published by H. H. Robbins in 1908, including the exact dates of their visit to St. Paul.

Unfortunately, due to the confusion in names of the islands at that time, both Staunton and Macartney erroneously reported that the expedition had landed on Î. Amsterdam, rather than Île St. Paul (curiously, Staunton was fully aware that the Dutch had, correctly, named the northern island as Amsterdam). Therefore, their specimens were mislabeled accordingly.

In Macartney's narrative the entry for Friday, February 1st, 1793 is as follows:

"In the afternoon I went on shore in the twelve-oared barge, accompanied by Sir George Staunton, Dr. Gillian and [...]" (Robbins 1908: 203).

Later he adds,

"We visited the warm mineral springs and the sugar-loaf rock, and collected a few plants that grew within our reach. We then returned to the ship, and got on board just as the evening closed, intending to make a more extensive excursion the following day" [that is, Feb. 2nd] [...] *Sir George added to this cabinet such uncommon nondescript plants as the place furnished [...]"* (Robbins 1908: 205).

According to Macartney, the expedition left Île St. Paul (or Amsterdam as he erroneously called it), the night of Saturday February 2nd (Robbins 1908: 211), implying the type specimen of *Sagina diffusa*, comb. nov. was gathered either early

that day, or on February 1st. The time of collecting coincides with the flowering season of most caryophyllaceous species in the southern hemisphere.

In his introduction to the *Flora Antarctica*, Hooker (1845) follows Staunton's geographic nomenclature:

"The names of St. Paul and Amsterdam have been applied indiscriminately by various navigators, the latter [Amsterdam] I continue to give the southern island, in accordance with Sir George Staunton's and with recent south circumpolar charts, where, however, the southernmost island is represented as the larger instead of the smaller of the two [...] The latter alone [Amsterdam, sensu Hooker] has been visited by Sir G. Staunton, who has published an excellent account of it, and by Lieut. Smith who had the kindness to forward me most interesting particulars regarding of it and a collection of all the plants he was enabled to detect there" (Hooker 1845: 220).

And thus, Hooker's botanical treatment follows this geographic error, as in the case of *Colobanthus diffusus* (Hooker 1845: 249). Nevertheless, he later recognized this geographic mistake (Hooker 1875: 474).

The Staunton collection became part of the Banksian herbarium (Hooker 1875: 476; Gunther 1904); however, duplicates were acquired by Eduard Fenzl for the Herbarium of the Natural History Museum in Vienna (Beck 1888). These specimens were, initially, part of the private collection of French botanist Alphonse Maille (1813-1865), who amassed a large herbarium from many countries which was sold after his death (Clokier 1964). The few surviving specimens at the W herbarium carry the watermark "Duplic. Banks. Herb. Maille". In his *Note sur l'herbier de M. Maille*, Fournier (1869: 57) reported Staunton's specimens from Asia. It is assumed that, among them, were five specimens collected in Île St. Paul, including that described by Hooker as *Colobanthus diffusus*. The collection was examined by Heinrich Wilhelm Reichardt (Reichardt 1871), then professor of botany at the University of Vienna. Since Staunton's locality reference was inverted, Reichardt incorrectly cited these acquired specimens as originating from Île Amsterdam. He proceeded to describe his *Sagina hochstetteri* based upon on two specimens: the one collected by Hochstetter on St. Paul and the Staunton duplicate.

THE ALEXANDER SMITH SPECIMEN

Hooker (1845) also cited a specimen collected by A. J. Smith when describing *Colobanthus diffusus*. Lieut. Alexander John Smith, R.N. (1812-1872), was a member of Capt. Ross' British Antarctic Expedition (1839-1843) on board HMS *Erebus* as First Mate, an expedition in which Hooker also participated (Boumphrey 1964; Ramsland 2011, 2013). Neither Île St. Paul nor Île Amsterdam were part of the *Erebus*' itinerary during Ross' expedition; thus, the specimen of interest here was collected years later by Smith. In the introduction to his *Flora Antarctica*, Hooker provided information about Smith's stopover at St. Paul Island: "[...] [the island has been visited] very recently by my former companion and zealous cooperator in all scientific pursuits, Lieut. A. Smith, R.N." (Hooker 1845: 220). Taking into account that part 2 (13) of *Flora Antarctica* was published the first week of December 1845 (Stafleu & Cowan 1979), I will attempt here to establish a timeline of when Smith might have collected the relevant specimen.

Upon return to England in September 1843, Alexander Smith was placed in charge of the Rossbank Observatory at Hobart, Tasmania from 1844 until c. 1851 (Boumphrey 1964; Savours & McConnell 1982). He departed the port town of Gravesend (NW Kent) on board the barque *Pestonjee Bomanjee* ("*Shipping Intelligence*", Sept. 14, 1844), along with Francis G. Simpkinson to relieve Lieut. Peter Scott and Joseph Dayman at the Rossbank Observatory (Savours & McConnell 1982; also reported in the *Launceston Advertiser* ("*Hobart Town*", Sept. 14, 1844). The *Pestonjee Bomanjee* arrived in Rio de Janeiro June 29th and departed July 6th ("*Hobart Town*", Sept. 28, 1844). After crossing the south Atlantic and southern Indian Ocean, this vessel arrived in Hobart, Tasmania, on September 11th, 1844 as reported by several local newspapers ("*Shipping Intelligence*", Sept. 14, 1844; "*Shipping Intelligence*", Sept. 17, 1844). Based on these reports and dates, I conclude that the most probable collecting date from I. St. Paul must have been in mid-August, 1844. On January 11th, 1845 the *Shipping Gazette and Sydney General Trade List* reported that the *Pestonjee Bomanjee* "is expected to leave tomorrow week"; her cargo included, among other items, are listed "17 cases specimens' natural history." ("*Vessels Laid on for England*", Jan. 11, 1845). While, there is no way to confirm that these cases actually contained Smith's collections, one cannot fail to see this as a possibility. Assuming an eastbound clipper route trip from Sydney to England (via Cape Horn) of around five months, I would estimate Smith's specimens could have arrived in London no later than June 1845. Considering that part 2 (13) of Hooker's *Flora Antarctica* was published before December 4th, 1845 (Stafleu & Cowan 1979), it is quite reasonable to assume that he received Smith's specimens in time to include it in his work.

THE HOCHSTETTER SPECIMEN

On April 30th, 1857 the Austrian frigate SMS *Novara* departed from the port city of Trieste beginning her voyage around the world under the command of Captain Freiherr von Pückh and the scientific leadership of Bernhard von Wöllerstorff-Urbair (Scherzer 1861). During the next 28 months, until August

1859, the *Novara* would take her crew of 352 seamen and scientists across the Roaring Forties from the southern tip of temperate South America to the more tropical southeast Asian archipelago, Shanghai, Australia, and New Zealand.

From November 19th to December 6th, 1857 the expedition visited and studied Île St. Paul, and on December 7th, Île Amsterdam (Scherzer 1861), both islands being correctly identified. Although the official botanists of the expedition were Dr Edward Schwarz and Anton Jelineck, it was C. G. Ferdinand von Hochstetter (1829-1884), geologist of the expedition, who collected the specimen relevant to this study. While the botany of the expedition was treated in the official report (Grunow *et al.* 1870), this document did not include flowering plants, which were treated by H. W. Reichardt in his *Über die Flora der Insel St. Paul im indischen Ocean* (1871), along with the cryptogamic flora. Most of the descriptions are based on Jelineck's gathering, although specimens by Hochstetter are also cited. Reichardt also reported some of Staunton's specimens (previously acquired for the Vienna herbarium, Beck 1888), although he continued to incorrectly cite Île Amsterdam as the provenance. His description of *Sagina hochstetteri* is based upon Staunton's and Hochstetter's gatherings, the latter being cited as "rare and in places near the crater rim" (Reichardt 1871: 35). Unfortunately, and despite the tremendous efforts by the curators, the Vienna herbarium suffered the impact of WWII, losing thousands of specimens. Petrak (1948) listed the Caryophyllaceae as among those plant families that were destroyed, including the two that Reichardt used to describe *S. hochstetteri* (B. Wallnöfer, pers. comm.).

TAXONOMIC TREATMENT

Sagina diffusa (Hook.f.) Timaná, comb. nov.
(Fig. 1)

Colobanthus diffusus Hook.f., *Botany of the Antarctic Voyage, vol. I, Flora Antarctica* 2: 249 (1845). — Typus: "Île Amsterdam" [Île Saint Paul], *Staunton s.n., s. dat.* (1 or 2.II.1793). — Lectotype (designated here), BM! (BM 000513207). The sheet carries an underside annotation: "Island of Amsterdam. Sir Geo. Staunton". — Syntype: "Île Amsterdam" [Île Saint Paul], *Lieut. A.J. Smith s.n., s. dat.* (VIII.1844?), reported to be at K, would presumably be a syntype, but verification was not possible because the specimen could not be located.

Sagina hochstetteri Reichardt, *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 21: 34 (1871), *nom. illegit.* — Typus: "Île Amsterdam" (Île Saint Paul), *Staunton s.n., 1 or 2.II.1793* (W, destroyed); *F. von Hochstetter s.n., s. dat.* (7.XII.1857) (W, destroyed).

DESCRIPTION

Diffuse, loosely spreading herb; branches filiform, sometimes slightly angular, glabrous, 5-8 cm long. Leaves opposite, spreading along the main axis; rosette leaves lacking; lower cauline leaves 4-9 mm long, 0.4-0.7 mm wide; upper cauline leaves 6-7 mm long, (0.3)0.5-1 mm wide; leaves sessile, blade basally connate forming a shallow, scarious cup; apex mucronate; blade glabrous. Inflorescence single-flowered, pedicel filiform, c. 8-10 mm long, upright, glabrous. Flowers bisexual, paired,



Fig. 1. — Lectotype (BM 000513207) of *Sagina diffusa* (Hook.f.) Timaná, comb. nov. Reproduced by permission, ©The Natural History Museum, London, U.K.

terminal or axillary, bracts paired, foliaceous, *c.* 1.6 mm long. Calyx cymbiform, sepals 4 or rarely 5, ovate, apex acute to obtuse, 1.6-1.8 mm long, glabrous, margin hyaline, appressed at the time of capsule maturity. Petals 4 or 5, alternisepalous, ovate to elliptic, apex acute to obtuse, 1.2-1.4 mm long, 0.6-0.7 mm wide, thin, hyaline. Stamens (4)5(6), episepalous; filament 1.2-1.4 mm long, slightly enlarged toward the base, anthers dorsifixed. Pistil ovoid, *c.* 1.5 mm long, stigmatic lobes as many as sepals. Fruit capsule, opening lengthwise by 4 or rarely 5 valves, opposite to sepals, 2.5-2.7 mm long, longer than sepals. Seeds reniform, dark brown.

DISCUSSION

The presence of entire petals, episepalous stamens and capsular valves opposite to sepals confirm the identity of this specimen as a member of the genus *Sagina*, thus supporting the taxonomic transfer. In the protologue of *Colobanthus diffusus* Hooker described capsule valves as opposite to the sepals, a defining character of *Sagina* (Crow 1978, Table 1); this feature is present in the only extant type specimen. It is interesting to notice that Hooker (1845: 248) clearly stated the differences between *Sagina* and *Colobanthus*, among those “*Colobanthus* shows [...] the valves of the capsule being opposite to the stamens and alternate with the sepals, whilst in *Sagina* [...] they are opposite both to the stamens and sepals”. The erroneous interpretation of *Colobanthus* having capsule valves opposite to sepals is also found in Bentham & Hooker (1862), Bentham (1863) and Hemsley (1884). While no comprehensive monograph of *Colobanthus* has been carried out to date, the presence of capsule valves alternate to sepals has been well documented in the genus (see for example Pufal 2010: 117).

Hemsley (1884: 263) listed *Sagina hochstetteri* as a synonym of *Colobanthus diffusus* with some reservations as he was aware that the presence of petals had been reported for the Staunton's specimen in the Vienna herbarium. Reichardt (1871: 35) highlighted the key differences with *Sagina procumbens* L. which are supported by the observations made in the BM specimen. *Sagina diffusa*, comb. nov. does not show the strongly curved pedicel that characterizes *S. procumbens* during capsule development (Crow 1978), nor do the sepals diverge during that period. Instead *S. diffusa*, comb. nov. shows an upright pedicel and appressed sepals even when the capsule is fully opened. In addition, *S. procumbens* may show up to eight stamens, a feature not seen in *S. diffusa*, comb. nov.

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