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The genus *Sideroxylon* (Sapotaceae) on the Madeira, Canary Islands and Cape Verde archipelagoes

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This paper is dedicated by W. Lobin to Professor h.c. Loki Schmidt who plays an outstanding role in German Botanic Gardens and by A. Santos to Dr. Juan José Bacallado for his contribution to the development of Natural Sciences at Canary Islands so as his friendship.

RESUMEN: Se revisa la taxonomía del género *Sideroxylon* en los archipiélagos de Canarias, Cabo Verde y Madeira. Se reconocen tres especies: *S. mirmulans* endémico de Madeira e islas adyacentes, que es el nombre válido para la especie conocida normalmente como *Sideroxylon marmulano*; *S. canariense* spec. nov., de las islas Canarias, se describe como nueva para la ciencia y *S. marginata* de las islas de Cabo Verde, considerada previamente como sinónimo o variedad de *S. marmulano*, se reconoce como especie independiente. Se da una clave de identificación, descripciones, ilustraciones, mapas de distribución y datos sobre la ecología de las especies mencionadas.

Palabras clave: Sapotaceae, *Sideroxylon*, taxonomía, Macaronesia.

ABSTRACT: The genus *Sideroxylon* is revised for the Canary, Cape Verde and Madeira archipelagoes. Three species are recognized: *S. mirmulans* which is endemic to Madeira and adjacent islets and which is the valid name for the species usually known as *S. marmulano*; *S. canariense* spec. nov. from the Canary Islands is described as new to science; *S. marginata* from

the Cape Verde Islands has formerly been regarded as synonym or as a variety of *S. marmulano* and is now recognized as a separate species. A key for identification, descriptions, illustrations, distribution maps and data on the ecology of the species are given.

Key words: Sapotaceae, *Sideroxylon*, taxonomy, Macaronesia.

INTRODUCTION

The species known as *Sideroxylon marmulano* Banks ex Lowe is a member of the pantropical distributed family Sapotaceae. As this species was traditionally known to occur as an endemic species thought to be distributed on Madeira, the Canary Islands and as well as the Cape Verde Islands (fig. 1), it attracted the interest of one of us (W.L.) for phytogeographic investigations. From all the archipelagoes the species was reported as being rare. During several excursions the authors have been able to observe and collect plants with flowers and fruits on all three archipelagoes. Comparison especially of floral morphology revealed clear distinctness in several characters and led to the conclusion that each of the three archipelagoes houses its own distinct endemic species. Moreover, the well known name *S. marmulano* is illegitimate, because of the existence of an older epithet - *S. mirmulans* R. Brown published in L. von Buch (1825) - which has been overlooked in literature.

The first specimen of *Sideroxylon* in this region had been collected on Madeira by Banks & Solander between 13-18.9.1768, later by F. Masson between 5.1776 - 10.1778 and in 1783-1785 (Britten, 1904). They were described by R. Brown (1825) as *S. mirmulans*.

In 1816, Ch. Smith collected on the Cape Verde Islands (Santiago) material from a tree (fig. 2) which he thought to be identical with the Madeiran species: "*Sideroxylon marmulana* (Madeira)" (Tuckey, 1818). In 1839 John Dalton Hooker collected some specimens in the same islands (Santiago), which have been described by Decaisne in Webb (1849) as *Sapota marginata*. Coutinho (1915) placed this taxon within the genus *Sideroxylon* as *S. marginata*. Later, Chevalier (1935) reduced *S. marginata* to a variety of *S. marmulano* and described another, new variety, (var. *edulis*) for the Cape Verde Islands. This taxonomic treatment has been maintained by Lobin (1986) and Hansen & Sunding (1993).

The first collection of *Sideroxylon* specimens on the Canary Islands was conducted by R.P. Murray in Tenerife in 1902 between Realejo Alto and Realejo Bajo. A few months later was also collected by Dr. Pérez at the same locality. This record was mentioned by Bornmüller (1904) as *S. mermulana* Lowe. Additional collections have later been made from other islands of this archipelago and all have been determined as belonging to this species.

On the three archipelagoes the former distribution is very difficult to assess. Today the trees are only found in isolated populations in more or less inaccessible sites, although many different locations are known. Most likely, present distribution represents only a relictual one.

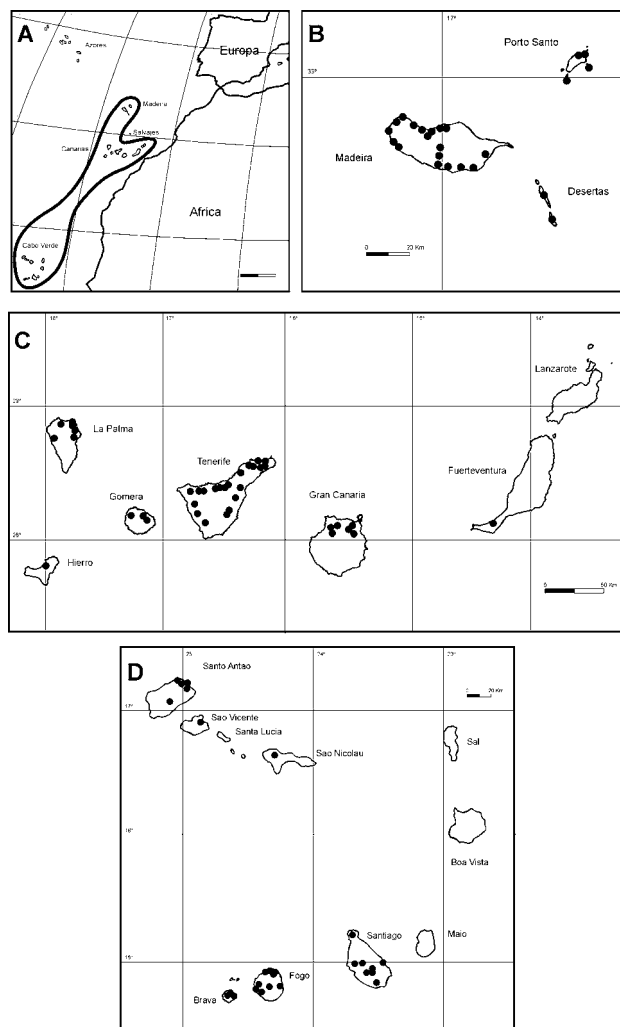


Fig. 1. A: The area of investigation. B: distribution of *S. mirmulans* on Madeira archipelago. C: distribution of *S. canariense* on the Canarian archipelago. D: distribution of *S. marginata* on the Cape Verde archipelago.

MATERIAL AND METHODS

This study is based on field-observations on the Cape Verde Islands during 8 excursions from 1978-1995 by W.L., numerous fieldtrips by I.G. and 5 excursions by T.L. from 1993-1997 and one by A.S. in 1998, on the Canary Islands during numerous fieldtrips by A.S. and 3 excursions by A.S. & W.L. in 1991-1995 and on Madeira during numerous fieldtrips by H.C.N., three excursions by A.S. in 1976, 1998 and 2004, and two by W.L. in 1996 and 2001. Additionally, herbarium specimens from various Herbaria were investigated.

Special attention was been given to the flower morphology, as a number of specimens from each archipelago were collected in flower and preserved in alcohol. Other characters of interest were the morphology of the leaves as well as the indumentum on different organs.

TAXONOMIC TREATMENT

The genus *Sideroxylon* is represented by *S. mirmulans* on Madeira and adjacent islands, by *S. canariense* spec. nov. on the Canary Islands and *S. marginata* on the Cape Verde Islands (fig. 1). The main diagnostic features are summarized in table I.

Key to the species:

1. Stamens never exceeding the corolla *S. marginata*
 1*. Stamens always exceeding the corolla 2
 2. Flowers at least with pinkish parts, leaves elliptic to obovate *S. mirmulans*
 2*. Flowers white, leaves oblong *S. canariense*

Sideroxylon marginata (Decne.) Cout. in Arq. Univ. Lisboa 2: 43, 1915.

≡ *Sapota marginata* Decne. in Hooker, Icon. Pl. 8: Taf. 761, 1848; ≡ *Calvaria marginata* (Decne.) Dubard, Ann. Mus. col. Marseille 20: 88, 1912; ≡ *Sideroxylon marmulano* var. *marginata* (Decne.) Chevalier, Rev. int. Bot. appl. Agric. Trop. 15: 925, 1935. Type: rocky summit of a mountain 2000 feet high; valley of St. Domingo, in St. Jago, [11.1839], J.D.H[ooker] [114] (K holo- and isotype) [backside of the holotype with original drawing].

= *Sideroxylon marmulano* var. *edulis* Chevalier, Rev. int. Bot. appl. Agric. trop. 15: 926, 1935: Type: Fogo, Ferme de Pico Pires, 600 m alt., Chevalier 45226 (holo: P; iso: COI, K).

= *Sideroxylon marmulano* sensu Chr. Sm. ex Tuckey, Narrat. Exped. River Zaire: 252, 1818 nom. illeget., fig. 2.

Nom. ind.: Marmulano.

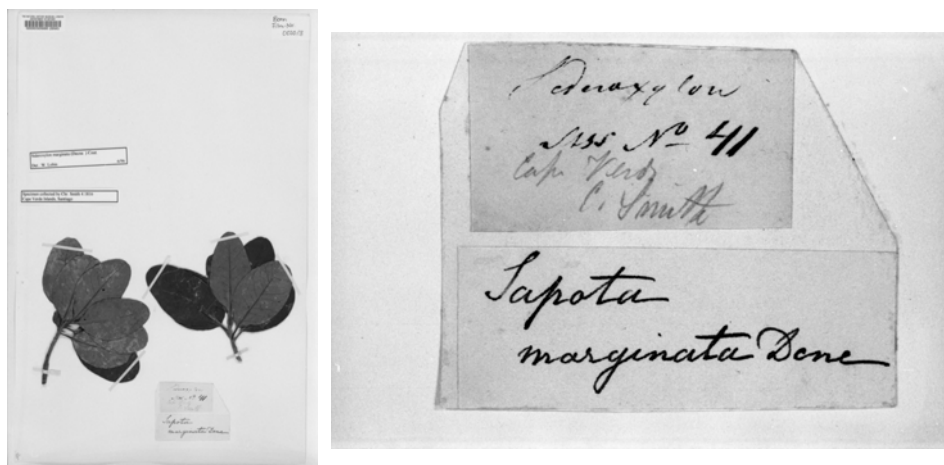


Fig. 2. *Sideroxylon marginata* (Decne.) Cout., collected by C. Smith (1816)(Photo Ch. Salz, Bonn).

Icons: Decaisne in Hooker, 1848: Taf. 761; Webb in Hooker, 1849: tab.13 (1-3); Gomes *et al.*, 1995: 30; Leyens & Lobin, 1996: 58; Brochmann *et al.*, 1997: 271.

Literature records: Bowdich, 1825: 381 (sub *Elaeodendron argam* Retz.); Webb in Hooker, 1849: 169; Schmidt, 1852: 251; Chevalier, 1935: 925-927; Petterson, 1960: 34; Barbosa, 1961: 88; Sunding, 1974: 18; Nogueira, 1976: 30; Sunding, 1982: 127; Lobin, 1986: 139, 141; Hansen & Sunding, 1993: 180; Gomes *et al.*, 1995: 30; Leyens & Lobin, 1996: 48, 51-53, 55-57; Brochmann *et al.*, 1997: 269-272.

Description

Small, evergreen tree, 1-5(12) m. Bark reddish-brown to dark grey with high amount of latex. Young branches often densely covered with a reddish brown, wooly indumentum, in older stages often turning glabrous. Leaves leathery, elliptic, broad elliptic to almost roundish or obovate, (4.1)5.0-10.8(15.0) x (2.9)3.6-6.5(9.2) cm, with a length to width ratio of (1)1.3-2.0(2.8), adaxially dull green, glabrous, sometimes with very fine hairs, abaxially of lighter colour, covered with fine often reddish brown indumentum, sometimes also with longer hairs, older leaves often glabrous, leaf margin \pm slightly revolute. Petioles 0.7-1.8(3.0) cm. Flowers generally in clusters of 3-10(12), rarely solitary, concentrated in upper third of the branches. Flower buds broadly ovate with pointed tip, green to reddish. Pedicel (0.7)1.1-2.2(2.6) cm, pubescent, seldom glabrous. Sepals 5, 0.2-0.45 cm, united for ca. 1/3 of their length, overlapping at the margins, orbicular, greenish sometimes running into reddish, with a 0.4-0.7 mm broad membranaceous margin, pubescent, turning glabrous. Bracts scale-like, densely pubescent with reddish-brown trichomes. Petals 5, 0.45-0.48 cm, red to whitish, round, united for ca. 1/3 of their length, free lobes bend outward. Staminodes 5, 0.22-0.30 cm long, alternating with the petals, vertically aligned, small elliptical, whitish. Stamina 5, 0.2-0.3 cm long, as long as or shorter than the petals, never exceeding the corolla, united with the petals for most of their length. Petals, staminodes and stamina forming a tight, very fleshy cup. Gynoeceum 0.4 cm, ovate, surface tuberculate. Fruit a drupe, globose to roundish sometimes obovoid, 0.7-1.5 x (0.6)0.8-1.4 cm, style persistent, pedicel 0.7-1.2 cm, dark brown - blackish. Seed 1, 0.7 x 0.9 cm, brown, hard.

Distribution and ecology

Sideroxylon marginata is recorded from Sto. Antão, S. Vicente, S. Nicolau, Boavista, Santiago, Fogo and Brava. Obviously, the species has been more frequent in former times on the Cape Verde Islands. Chevalier (1935) collected and observed it in various locations, all of which have disappeared. The number of individuals of *S. marginata* has been declining significantly and rapidly, and today, the populations consist only of few individuals each (see Brochmann *et al.*, 1997).

The species is growing in mountain areas mainly on steep cliffs. It is distributed from sea level up to 1350 m, the majority of the collections or observations were made between 200 - 1000 m (table II).

Discussion of the single island distribution:

Sto. Antão: Chevalier (1935) found the species at two localities, both could not be reconfirmed. One of his plants grew at Ponta do Sol at rather low elevation. This specimen can with certainty be excluded, as it has been wrongly determined by Chevalier and does not represent *S. marginata*, perhaps it represents *Psidium guajava* L., but the specimen is too young to identify it with certainty. L.A. Grandvaux Barbosa

(Nogueira, 1976) collected it at a third location and T.L. and I.G. added another four. Only at these last four locations - crossing point of Ribeira da Torre and Ribeira da Garça (coll. Leyens CV-95-255, 1995, coll. I. Gomes, 1997), Ribeira Fria (coll. Leyens CV-95-329 & 330, 1995, coll. I. Gomes, 1996), Ribeirãozinha at Paúl (coll. Leyens CV-95-429, 1995) and Ribeira das Patas, 1200 m (coll. I. Gomes)- *S. marginata* has been observed and collected after 1960.

S. Vicente: In the very detailed study of the vegetation of this island written by Krause (1892), *S. marginata* is not mentioned. Chevalier (1935) reported it as "... ajuord'hui disparu". His record is based on a collection made by C. Bolle, Chevalier himself didn't observe the species. Apparently, Bolle was the only one to collect this species at the Monte Verde until the recent discoveries. Although he didn't publish his collection, we could see one of his specimens (COI). On his herbarium label, he quoted a single tree, "arbor unica". In Kew one specimen collected by T. Vogel exists, unfortunately without any exact location. As this material is not cited by Webb (1849), it must remain doubtful whether this collection was made on S. Vicente (if so, then most likely at the Monte Verde) or on Sto. Antão. In 1972 Sunding recollected the species (Sunding, 1974) at the Monte Verde; in 1978 W.L. (together with K. Lewejohann) gathered material at the same location and in September 1994 I.G. & W.L. (together with K.H. Schmidt) could again observe flowering specimens and count c. 6 trees in the steep walls.

S. Nicolau: In 1976 P. Sunding collected some material E of Cachaço at 650 m (Sunding, 1982), but since then the presence has never been reconfirmed.

Sal: Chevalier (1935) recorded quaternaire fossils.

Boavista: *S. marginata* is extinct, if it ever occurred on this island. The record is based on Bowdich (1825) who listed "*Elaeodendrum argam*" (= *Sideroxylon spinosum* L. = *Argania sideroxylon* Roem. & Schult = *Argania spinosa* Skeels) which could have been mistaken for *S. marginata*. No herbarium material has ever been seen.

Santiago: The first collection of a *Sideroxylon* on the Cape Verde Islands has been made by Chr. Smith in 1816 on this island (fig. 2). The species has been collected and observed at several locations since 1839. At two sites, Pico da Antonia and S. Jorge dos Orgãos, it has regularly been observed. In the Pico da Antonia area, the species is known since 1934 when A. Chevalier collected it. In 1937 M. Baptista photographed and gathered specimens at the same location (COI, K). Recently, in 1982, one collection was made (Lobin 2439), but during the fieldtrip in Dec 1993 - Jan 1994 only 2 specimens were seen at inaccessible sites (T.L. together with N. Kilian). In 1995 it was collected in the Ribeira Seca at c. 200 m (coll. Leyens CV-95-432) and observed at two locations near the town of Assomada and in northern Santiago at the Mte. Graciosa. In 1997, I.G. together with C. Monteiro observed one specimen in Ribeira Chuva Chove at 1050 m. Several collections have been made in the surroundings of S. Jorge dos Orgãos, but these specimens may have been planted.

Fogo: *S. marginata* was recorded by Chevalier (1935) from several locations, but after Chevalier, the species was found at only six sites (Ribeira Marmulano, Ribeira de S. Jorge, Ribeira Tania, Ribeira Miguel Gonçalves, Ribeira da Fugido and Ribeira Trindade, east of S. Filipe) by W.L. and T.L. At all other places where Chevalier saw trees, its presence could not be reconfirmed, but it was observed additionally at two other sites (Ribeira Pia and Ribeira de Mte. Piorno) in 1995.

Table I: Main diagnostic features to distinguish *Sideroxylon canariense* spec. nov., *S. marginata* and *S. mirmulans*

	canariense	marginata	mirmulans
Leaf shape:	Oblong	elliptic - roundish, obovate	elliptic – obovate
Leaf margin	not revolute	revolute	revolute
Length/width ratio of leaf	2.2-3.1(3.3)	(1)1.3-2.0(2.8)	(1.6)1.8-2.6
Petioles	(1.3)1.7-2.7(3.3)	0.7-1.8(3.0)	(1.2)1.5-2.7
Position of flowers on branch	between and below the leaves	in upper third of branches between the leaves	in upper third of branches between the leaves
Flower color	white	whitish with reddish parts	rose – red
PediceL	0.4-1	(0.7)1.1-2.2(2.6)	0.4-0.9(1.1)
Stamens	well exceeding corolla	never exceeding corolla	exceeding corolla

Brava: The only record dates from 1956, when Barbosa collected some material in Cruz da Fajã (Nogueira, 1976). Observations have been made at two sites (Ribeira da Rasca and near Furna) by T.L in 1995.

Threats

Protection of this species is urgently needed to save it from extinction. The tree is appreciated for its hard wood and thus good firewood qualities. Today the species is only found in steep cliffs. In the Red Data Book of the Cape Verde Islands (Leyens & Lobin, 1996, see also Brochmann *et al.*, 1997) *S. marginata* is classified as “Endangered”, but it is “Critically endangered” on the islands of S. Vicente, S. Nicolau, Santiago and Brava, thus being in severe risk of extinction on these islands.

Two different hypothesis of its original distribution on the Cape Verde Islands are possible:

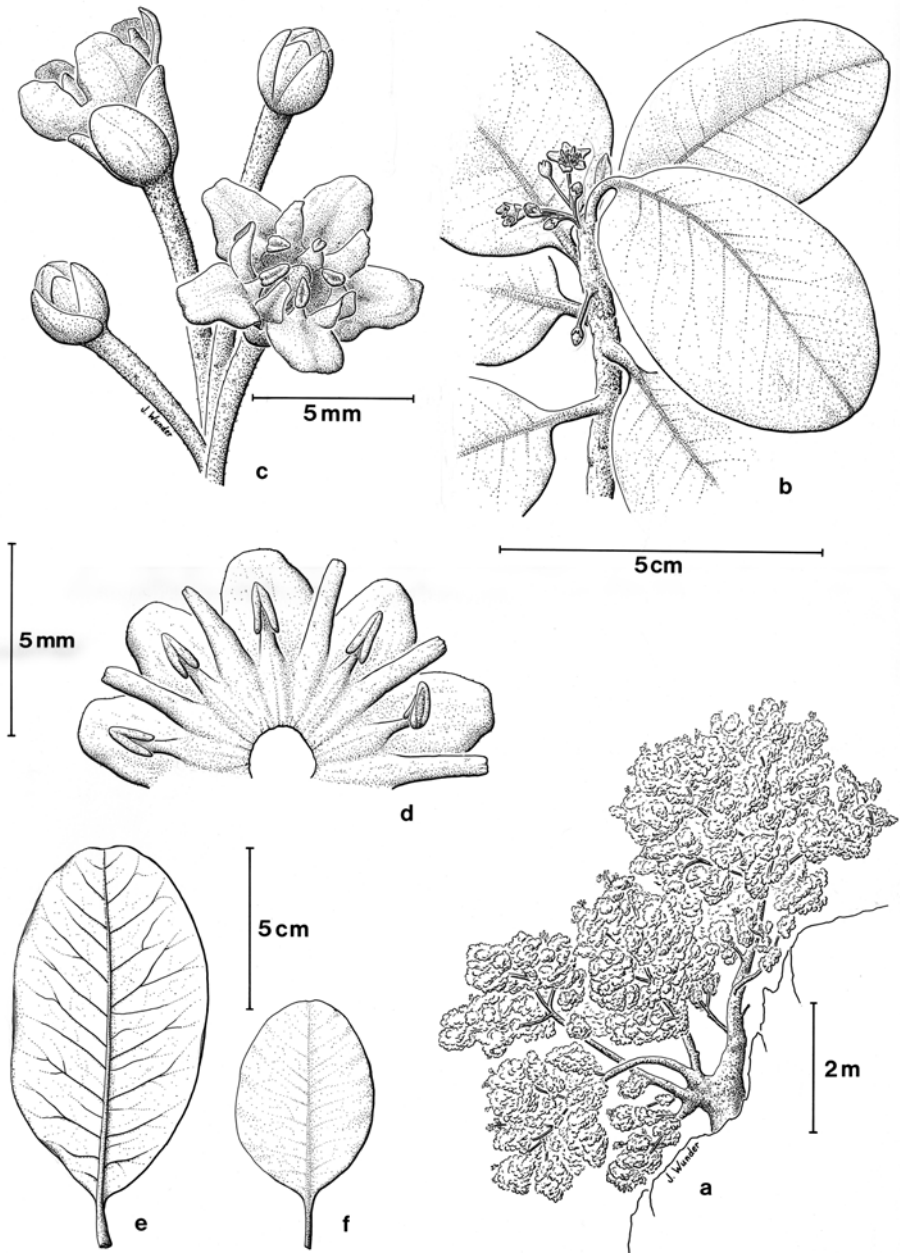


Fig. 3. *Sideroxylon marginata*: a) habitus; b) part of flowering stem, showing flowers and leaves; c) flowers and bottoms; d) perianth of single flower showing position of anthers; e-f) single leaves (Drawings: J.Wunder).



Fig. 4. a & b. Lectotype and Iso-Lectotypes of *Sideroxylon mermulano* Banks ex Lowe and *Sideroxylon mirmulans* R. Brown in Buch (Photos by courtesy from the Natural History Museum, London).

1. either it has always been a species of the steep mountain sites. This is supported by J.D. Hooker, who in 1839 observed *S. marginata* and wrote “Only two specimens of this tree were seen on the top of a peak in the valley of Sto. Domingo, at 2000 feet” (backside of a herbarium sheet collected by J.D. Hooker in K and Decaisne in Webb 1849), and also Chevalier during his journey in 1934 found the species mainly at higher altitudes and very often mentions on his herbarium-labels “dans les rochers”;

2. or *S. marginata* once had a wider distribution on the archipelago and occurred even at lower altitudes. This is supported by some collections and observations of trees at altitudes of 300 m or lower near the sea (Sto. Antão, Santiago, Fogo and Brava), also by local people remembering the tree “to have grown further down”. Observations of *Sideroxylon* growing on the Canary islands and Madeira show, that the species is part of a thermophilous arborescent communities (*Rhamno crenulatae-Oleetea cerasiformis* Santos ex Rivas Martínez 1987) which links in the Canary Islands the succulent *Euphorbia* spp. communities with the laurel forests (Santos, 1983). These communities were in former times widely distributed, but are today critically endangered. The *Sideroxylon* species therefore seem to have had a wider distribution and are nowadays restricted to inaccessible sites, where it is difficult to observe the species. *S. marginata* still occurs at several locations, but each site consists of few individuals only, the exact number is impossible to estimate.

Table II: Altitudinal gradient of *Sideroxylon marginata* in the Cape Verde islands. ● verified herbarium specimens with information on altitude. ■ observations in inaccessible sites.

	Sto.Antão	S.Vicente	S.Nicolau	Santiago	Fogo	Brava	Archipelago
1750-2000 m							
1250-1500 m					●■		● ■
1000-1250 m				●			●
750-1000 m	●●			●●●	●●		●●●●●●●●
500-750 m		●●	●		●■		●●●●■
200-500 m	●			●		■	●●■
100-200 m	■			●	●●■	■	●●●■ ■■
0-100 m				●			●

Specimens investigated:

Sto. Antão: Ribeira between Ribeira das Patas and Ribeira da Garça, R.T. Lowe, 16.1.1866 (K); Campo do Cão, Chevalier 45335, 13.-15.9.1934 (P); Ribeira de Velha, L.A. Grandvaux Barbosa 6049, 19.3.1956 (INIDA, LISC); steep escarpment below the road Rib.Grande - Cova, at crossing point of Rib.da Torre and Rib.Garça, 750 m, Leyens CV-95-255, 2.2.1995 (Herb.Lobin); Ribeira Fria, ca. 700-800 m, steep escarpments, Leyens CV-95-329 & 330, 6.2.1995 (Herb.Lobin); Ribeirãozinha (= side Ribeira of Ribeira do Paúl, ca. 350 m, Leyens CV-95-429, 17.8.1995 (B, Herb. Lobin, INIDA); Paúl Bordeira de Santa Isabel, 800 msm, riscos cerca de viviendas y cultivos, 25°01' 30''N-17°07' 30'' O, A. Marrero & R. Almeida, 12.7.04 (LPA 8151,8152 y 8153); Ribeira Cha de Pedras, Cha de Fora, en el camino de Pia de Cima a Agriões, 575 m., A. Marrero & R. Almeida, 13.7.04 (LPA 8218,8219 y 8220).

S. Vicente: Monte Verde, arbor unica, C. Bolle (COI); ibid. NW-slope, 560 m, Sunding 2894, 7.11.1972 (O); ibid., NO- und NW-Hänge, einzelne Bäume in den Felswänden, Lobin 109, 19.12.1978 (FR, Herb.Lobin); ibid., NW-Seite, ca. 625 m, Lewejohann CV-78-78, 19.12.1978 (GOET).

S. Nicolau: E of Cachaço, 650 m, Sunding 3804, 23.11.1976 (O); ibid, duplicate LPA 13651.

Santiago: (R.T. Lowe, 24.3.1864, P, 26.3.1864, K, P); circa portum Prayae in convalle Trinidad et montibus Pico St. Antonio confinibus ad altitudinem circiter 3000 pedum, C. Smith MSS No.41, 4.1816 (BM); ad apicem montis abrupti alt. circiter 2000 ped. vallis S.Dominici protecta, J.D. Hooker 114, 11.1839 (K); S.Jorge dos Orgãos, Espírito Santo 3232, 30.7.1953 (COI, LISC), ibid. Leyens CV-96-673, 13.12.1996 (Herb. Lobin), ibid., travessa de Tanque Novo, F. Veiga 14, 28.3.1984 (LISC), ibid., probably planted, C. González-Coviella Ulrich 4140, 10.5.1987 (INIDA), ibid., Cardoso de Matos 6320, 22.11.1987 (LISC), ibid., próx. do Jardim Botânico, ca. 400 m, M.C. Duarte & I.

Table III: Altitudinal gradient of *Sideroxylon mirmulans* in the Madeira archipelago. ● verified herbarium specimens with information on altitude. ■ observations of inaccessible sites.

	Madeira	Porto Santo	Ilhéu de Cima	Ilhéu da Cal	Deserta Grande	Bugio	Archipelago
500-800 m							
200-500 m	●●●●	■					●●●●■
100-200 m	●■				●	●	●●■
0-100 m	●●■	■	●	●			●●●●■

Gomes 645, 20.7.1993 (LISC); Ribeira de Cumba, próx. da foz, 40 m, M.C. Duarte & I. Gomes 620, 17.7.1993 (LISC); Pico da Antonia, Chevalier 44772, 24.8.1934 (COI, P), junto de Pico d'Antonia, 23°39'W, 15°03'N, 950 m, M. Baptista, 12.5.1937 (COI, K), *ibid.*, 900-1100 m, Lobin 2439, 30.10.1982 (FR, Herb.Lobin), *ibid.*, W-Seite, ca. 1000 m, Lewejohann CV-82-309, 30.10.1982 (GOET); Ruy Vaz, Chevalier 44652, 26.8.1934 (P), Ponta da Cruz, aborde do pic S.Antonio, Chevalier 44774, 15.7.1934 (COI, K, P); Ribeira das Aguas Belas, L.A. Grandvaux Barbosa 6082 & 6085, 26.12.1955 (INIDA); na estrada Sta.Catarina - Porto Rincão, 6.2 km depois do Ribeira de Engenho, próx. do P 129, L.A. Grandvaux Barbosa 6082 (sic), 26.12.1955 (LISC); Serrado de S. Jorge, Ribeira Seca, 200 m, T. Leyens CV-95-432, 2.7.1995 (B, Herb. Lobin, INIDA); Estação Agronomica, E. Sventenius, 20.3.1970 (LPA 9014, 9017); *ibid.* (LPA 13650).

Fogo: San Filipe, Chevalier 45045, 28.7.1934 (COI, K, P), Chevalier 45157, 5.8.1934 (COI, K, P); Pico Pires [600 m], Chevalier 45226, 8.8.1934 (COI, K, P); Espia prés Mosteiros, Chevalier 45144, 1.8.1934 (K, P) & 45135 (P), entre Espia et Mosteiros, Chevalier No.1 (sic), 31.7.1934 (P); Monte Velha, in der Ribeira Marmulano, Lobin 2370, 22.10.1982 (FR, Herb.Lobin), *ibid.* Lewejohann CV-82-207, 22.10.1982 (GOET), *ibid.*, 1350 m, Leyens CV-95-412b, 16.2.1995 (Herb.Lobin); Ribeira da Fugido, at 800 m, Leyens CV-97-850, 4.11.1997 (Herb.Lobin, INIDA); Ribeira de S.Jorge, between Galinheiros and S.Jorge, c. 150-200 m, Kilian 3259 & Leyens, 21.1.1994 (B, INIDA, Herb.Kilian, Herb.Lobin); Ribeira Tania, north of Ribeira de S.Jorge, ca. 150 m, Leyens CV-95-395, 14.2.1995 (Herb.Lobin); Ribeira Miguel Gonçalves, 760 m, Leyens CV-96-672, 11.12.1996 (B, Herb. Lobin).

Brava: Monte da Cruz da Fajã, prox. do P287, L.A. Grandvaux Barbosa 6625, 10.2.1956 (INIDA, LISC).

Sine loc.: Cape Verd. Isls (K); Cape Verde Isls., Niger Exp., Vogel (K)[Sto. Antão or S. Vicente].

Notes

For a long time *Sideroxylon marginata* has been regarded as a variety or even identical to *S. mirmulans* (under its synonym *S. marmulano*), from which it is easily distinguished by the different shape of the leaves and the stamens. Due to the fact that all *Sideroxylon* species in the region, are difficult to find, the most striking character, the stamens, has probably been overlooked, as this feature can be observed at best in fresh material only.

Sideroxylon mirmulans R. Brown in Buch, Physic. Beschreibung der Canarischen Inseln: 193, 1825.

Type: *F.N. Masson* (Lectotype BM) (see below).

= *S. mermulano* Solander ex Lowe in Trans. Cambridge Phil. Soc. 4: 22, 1831 [nom. Superfl.]; ≡ *S. marmulano* Solander ex Lowe 1868: 18; ≡ *Calvaria mermulana* (Solander ex Lowe) Dubard, Ann. Mus. Col. Marseille 20: 88, 1912. Type: Banks & Solander 1768 (BM Lectotype) (see below).

Typification:

There are in the herbarium of the Natural History Museum (BM) two sheets with printed labels “Madeira 1768 Banks & Solander” from the Banks-herbarium (fig. 4 a & b) (see also the remarks in “notes” further down):

On one of the sheets (fig. 4a) the material, two twigs with leaves, is rather homogenous, indicating, that it represents a single collection only. At the bottom of the sheet “*Sideroxylon mirmulano* Lowe” is written in pencil. This sheet contains a printed label “Madeira 1768 Banks & Solander”, and represents their original collection. The printed label is glued on a bigger one, above which “Mirmulano” is written by hand in ink and below the printed label “conf: Heberden Descr. MSS” is placed. On the backside and also in front a remark “Madeira Cook’s 1st Voyage” is found. Lowe (1831) bases his description on “*Sideroxylon mermulano*, Herb. Banks!”. He does not refer to Masson’s collections. In Lowe (1868), he only refers to some own collections. We therefore select this sheet as the Lectotype (upper specimen) and Iso-lectotype of *S. mermulana* Solander ex Lowe.

The other sheet obviously consists of two different collections, one plant at top, and two at the bottom of the sheet (fig. 4b). The plant at the top has the printed label “Madeira 1768 Banks & Solander”. As this twig consists of leaves only and resembles the other Banks & Solander specimen we assume that it belongs to the same collection as the one on the other sheet and is also a Iso-lectotype. Below the two specimens at the bottom of the same sheet, and most likely referring to them, are two lines written in pencil, one reading “- *mirmulans* Br. In Buch Canar. 193”, the other, more faint, saying “*Sideroxylon mermulano*”. These two plants differ clearly from the upper specimen in having both, leaves and flower-buds. In our opinion the handwriting “- *mirmulans* Br. In Buch Canar. 193” indicates to the Masson-collection, to which Brown (1825) clearly refers. This is supported by writings on the backside of the sheet supplying the information “1. Madeira JB [J.Banks] & DS [D.Solander] 1768”, obviously referring to the upper plant and “2. Madeira Fr. Masson” thus referring to the two specimens on the lower part from the sheet from which we select the left-handed plant as Lectotype (branch with flowers and bottoms) and the right-handed as Iso-Lectotype for *S. mirmulans* R. Brown in Buch.

Nom. Ind.: Marmulano, mermulano, mermulana, mirmulano, marmeleiro (Porto Santo).

Icones: Sub *S. marmulano*: Vieira, 1992 (plates not numbered); Press & Short, 1994: Plate 32.

Literature: Lowe, 1831; Lowe, 1868: 17-19, Sub *S. marmulano*; Engler, 1897: 143; Britten, 1904: 1-3; Menezes, 1914: 111; Hansen, 1969: 32; Mabberley, 1980: 62, Sub *S. mirmulans*; Vieira, 1992: 88; Hansen & Sunding 1993: 180; Press & Short, 1994: 254; Costa Neves *et al.* 1992: 9-10; Mabberley, 2002: 179, Sub *S. mirmulano*.

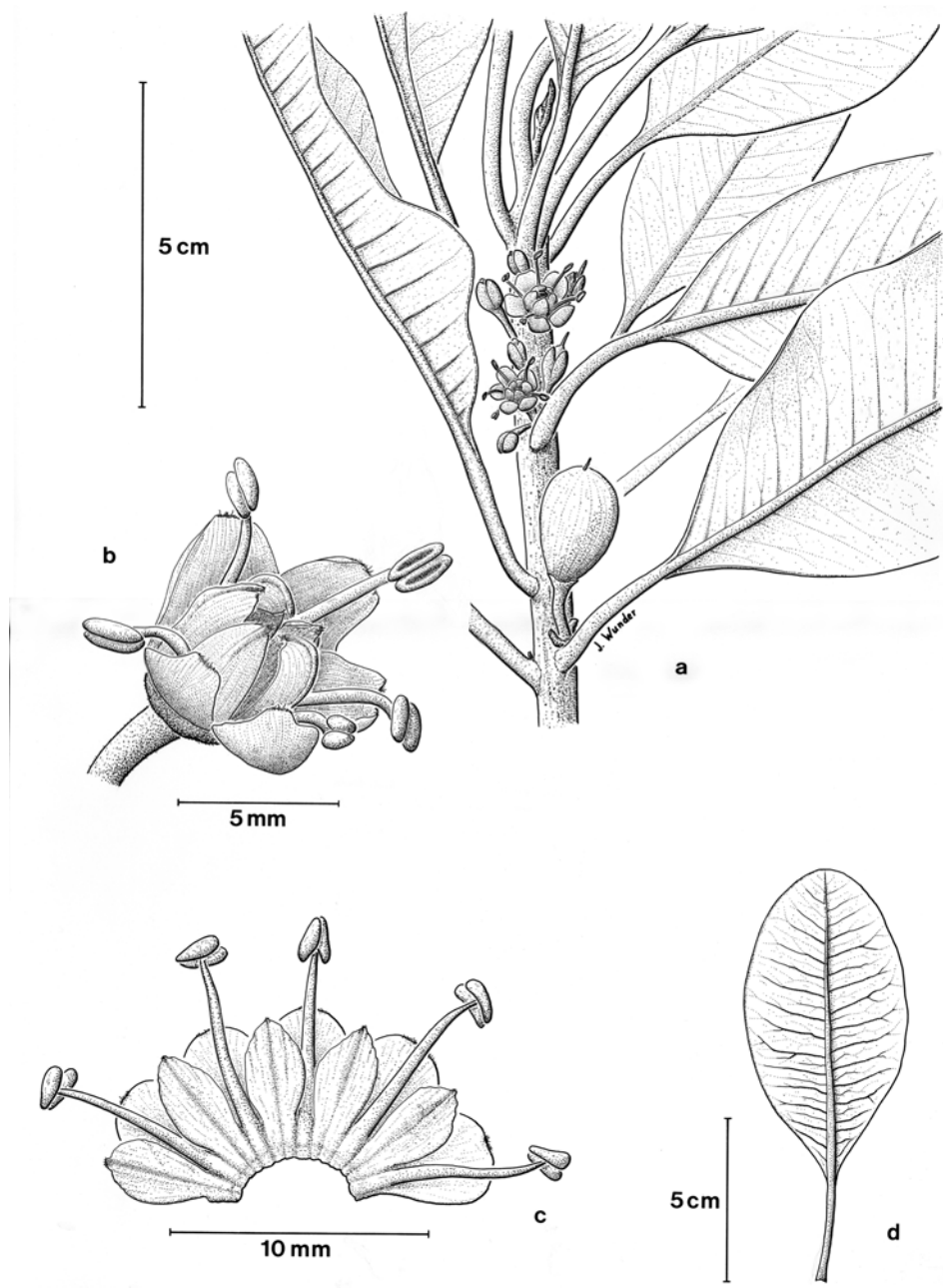


Fig. 5. *Sideroxylon mirmulans*: a) part of flowering stem, showing fruits, flowers and leaves; b) single flower, c) perianth of single flower showing position of anthers, d) single leaf (Drawings: J. Wunder).

Description

Evergreen tree, 3-5 m, reddish brown to dark grey bark, young branches reddish brown with short fine indumentum, branches becoming glabrous in age. Leaves leathery, elliptic to obovate, (4.7)5.7-10.8(11.8) x (2.9)3.2-5.5(6.1) cm, with a length to width ratio of (1.6)1.8-2.6; entire, apex rounded to obtuse, leaf base cuneate, adaxially glabrous, abaxially glabrous to sparsely pubescent in younger leaves, leaf margin irregularly slightly revolute. Petioles (1.2)1.5-2.7 cm long, especially young ones densely covered with a short indumentum. Flowers in clusters of 1-10, generally 3-6, in fruiting stage mostly solitary, concentrated in the upper third of the branches. Flower buds ovate with pointed tip, reddish brown. Pedicel 0.4-0.9(1.1) cm long, usually hispid with short, appressed reddish brown trichomes. Bracts scale-like, densely pubescent with short reddish brown trichomes. Sepals 5, 0.3-0.55 x 0.25-0.35 cm, orbicular with a strongly ciliate margin, sepals imbricate overlapping, only united at their very base but fused with the receptacle, forming a fleshy cup, densely hirsute with reddish brown short appressed indumentum. Petals 5, 0.5-0.7 x 0.25-0.30 cm, broadly obovate, cochleariformous, only slightly spreading with the apical margins upwardly aligned; petals united for c. 1/5 of their length, whitish rose to light or dark purple especially in the center of the flower. Margin of the petals often ciliate, especially in its upper part, tip often with brown wooly hairs. Staminodes 5, alternating with the petals, petallike in shape and colour, 0.4-0.6 cm long, united with the corolla, vertically to inwardly bend, margin fringed especially at the tip, tip often with brown wooly hairs. Stamens 5, united with the petals, well exceeding the corolla. Filaments 0.55-0.9 cm long, frequently bend outward for their last part. Anthers 0.2 cm long, brownish. Petals staminodes and stamens forming a tight cup. Ovary compound with free-central placentation, 0.2-0.4 cm long, ovate, densely covered with short reddish brown indumentum, 5 ovules, style 0.2-0.25 cm long glabrous to \pm pubescent in the lower part. Fruit a drupe, obovate, 1.0-1.5 cm long with persistent style, glabrous, pedicel 0.8-1(1.4) cm long. Calyx persistent, even after fruit falls off.

Distribution and ecology

Madeira, Porto Santo (Porto Santo, Ilhéu de Cima and Ilhéu da Cal), Desertas (Deserta Grande and Bugio) (fig. 1).

On Madeira, *S. mirmulans* is restricted to mountains where it is found mainly in steep moist cliffs from sea level (one collection made at c.30 m) up to 500 m (see table III). The species is found on the S and N side of the island, but seems to be more abundant on the North.

On Porto Santo it occurs on several locations from 20-500 m (Jardim & Fontinha, 1998). It is also recorded from Ilhéu de Cima and Ilhéu da Cal (Fontinha & Jardim, 1999).

On Deserta Grande, the species is common on W and E cliffs at an altitude of 200 m, the same applies for Bugio (Costa Neves *et al.*, 1992).

Threats

Presently, the species seems “Not to be threatened” on Madeira, Deserta Grande and Bugio. There are several populations in rather inaccessible locations and the populations are not so limited, as in the Canary and Cape Verde Islands, to single trees only.

On Porto Santo the species is “threatened“. On the small islets around Porto Santo only single trees exist: three on Ilhéu de Cima and nine on Ilhéu da Cal and *S. mirmulans* is “endangered” on these islands.

Specimens investigated

Madeira (s.coll., COI; s.coll. "G.L. ", K; sea cliffs, Jan.1838, K; N.H.Mason 1856, K, P; M. Mason 347, 1857, P; 1868, No. 30, P; sea-cliffs, Lippold, I.1838, BM, E); Hab. in rupibus convallium, a mare remotis, R.T. Lowe 533, 14.6.1828 (BM); cliffs to the East(io and ...), R.T. Lowe 533 2.3.1829 (sic)(BM); sea cliffs, R.T. Lowe 533*, Dec.1829 (K); östl. von Funchal, Niger Exped. T. Vogel (K); in rupibus maritimis do Funchal, G.Mandon 173, 4-5.1865-66 (GOET, K, P, Z)¹; S. Gonçalo, a little to the E. of Funchal, 12.1858 (K); Serra d' Agoa, Hillebrand 1177, s.dat. (Z); Cabo Girão, Nóbrega, 7.3.1982 (MADJ 5238), *ibid.*, perto da Ribeira da Quinta Grande, Nóbrega, 25.2.1990 (MADJ 2979); Câmara de Lobos, Küstenklippe, 450 m, Lewejohann & Paland, Mad-96-179, 181 & 183, 18.3.1996 (FR, GOET, Herb. Lobin, MADM); SW-Küste, Umgebung Prazères, Weg vom Hotel Jardim Atlantico - Paúl do Mar, 360 m, Ittenbach, Lobin & Paland 7613, 8.3.1996 (Herb.Lobin, MADM), *ibid.* Lewejohann, Mad-96-010, 8.3.1996 (GOET); S-Küste, Steilhänge bei Ovelha, c. 500 m, Ittenbach, Lobin & Paland 7689, 12.3.1996 (Herb. Lobin, MADM), *ibid.* Lewejohann, Mad-96-129, 14.3.1996 (GOET); São Vicente, Nóbrega, 25.5.1982 (MADJ 2944), *ibid.* 40 m, J.C. Quinn 499, 5.7.1995 (MADM), *ibid.* Steilabfall oberhalb des Ortes, 40 m, Ittenbach, Lobin & Paland 7641, 9.3.1996 (Herb.Lobin, MADM), *ibid.* Lewejohann, Mad-96-046, 9.3.1996 (GOET); Ponta Delgada, Miradouro Boaventura, Nóbrega, 17.11.1987 (MADJ 5240), *ibid.*, 160 m, Ittenbach, Lobin & Paland 7693, 13.3.1996 (Herb.Lobin, MADM), *ibid.* Lewejohann, Mad-96-115, 13.3.1996 (GOET); between São Vicente and Seixal, near Ribeira dos Caimbos, cliffs, 250 m, CB078313, Ø.H. Rustan 524, 26.6.1978 (O); Seixal (LISU), *ibid.* Lleken das Croulas, M.Nóbrega 276, 25.7.1952 (LISU); al Oeste de Pico Garajau, A.Santos, 8.8.1976 (ORT 24756); Ponta do Pargo, Fontinha & Paulo, 29.1.1991 (MADJ 2780); Achadas da Cruz, UTM: BB9337, Fontinha, A.Carvalho & Palmeira, 23.11.1991 (MADJ 2490); Machico, Bemposta, Nóbrega, 7.3.1993 (MADJ 7853); Campanário, Fontinha, F.Fernandes, Coelho & Baeta, 25.10.1994 (MADJ 8227); Porto Moniz, J.Lucas, 10.5.1960 (MADJ 5235); Fajã da Areia e Ponta Delgada, R.Vieira, 25.1.1964 (MADJ 5236); entre a Serra de Agua e Ribeira Brava, na Serra Alta do Espigão, Noia, Pita, Santos & Nóbrega, 22.2.1982 (MADJ 5237); S.Vicente – Espigão, Noia, Pita & Nóbrega, 8.6.1982 (MADJ 5239); zwischen São Vicente und Ponta Delgada, hinter Fajã de Areia, 20 m, Ittenbach, Lewejohann, Lobin & Paland, 13.3.1996 [ca. 50 Ex.]; zwischen São Vicente und Seixal, ca. 3 km hinter São Vicente, Steilwand, ca. 20 m, Ittenbach, Lewejohann, Lobin & Paland, 9.3.1996; westliche Steilwand der Ribeira Brava, ca. 5 km vor dem Ort Ribeira Brava, 160 m, Ittenbach, Lewejohann & Lobin, 17.3.1996 [ca. 20 Ex.]; entlang der Straße von Fajã de Ovelha nach Paúl do Mar, Steilwand vor dem 1. Tunnel, Ittenbach & Lobin, 17.3.1996 [ca. 5 Ex.]; west of Seixal, A. Santos & A. Reyes, 12.9.2004 (ORT 37789).

Porto Santo: B.<dolatteht de Saive>, in insulis adjaacentibus Insula Porto-Sanct ad rupes mantina (LISU); Pico da Juliana, Nóbrega, 3.1953 (MADJ 855), *ibid.*, Nóbrega & Santos, 25.3.1982 (MADJ 6281), *ibid.* Fontinha, Fernandes *et al.*, 27.2.1995 (MADJ 8304), *ibid.* F. & H. Fernández, R. Jardim, R. Serra 19.11.1997 (MADJ 8788); Pico Branco, F.& M. Fernandes, Jardim & Serra, 18.11.1997 (MADJ 8787); Encosta da Terra Chã, R.Vieira, 29.8.1976 (MADJ 6280).

¹ The sheet in P bears besides the printed label the additional information as handwriting: 319. = 173 Sideroxylon mermulano Lowe Bord de la mer, Serra de S.Roque & ?, Avril, 7.... ?, 100 à 300 m.

Ilhéu de Cima: A.C. de Noronha, 1903 (COI); Cedlener, Janeiro (LISU). H. Costa Neves, 1997.

Ilhéu da Cal: H. Costa Neves, 1997.

Deserta Grande: (Nóbrega & R. Santos, 13.4.1983)(MADJ 6855); Ponta do Eusadinho, 250 m.s.m, Anonymus 499, 8.11.1990 (MADM).

Sine loc.: Banks & Solander, 1768 (BM); Madeira Herbarium of John Ball (E)(probably, according diary, near Funchal); sine coll. (COI).

Notes on the history of discovery

While preparing the account for *Sideroxylon mirmulans*, the study of the nomenclatural situation of this taxon revealed some very astonishing facts. First we realized that the well-known name *S. marmulano* Banks ex Lowe, was illegitimate. On the search for the first naming of the species we had to go down to unpublished manuscripts in the Herbarium of the Natural History Museum in London, (with the kind help from J.R. Press). Banks named it “*Mermulano Lusitanis*” in his manuscript “Catalogue of plants collected in Madeira, Brazil, Tierra del Fuego and the Society Islands” and Solander made the first description of the species in his “Slip Collection vol.VI, number 1089”. He named it *S. mermulano*. Although a reference is given by Solander to Heberden, the taxon is not mentioned in the letters manuscripts kept in the Library of the Royal Society (S. Cumming in litt.). Although being only a manuscript name, see also Marshall (1978), *S. mermulano* was used later by various botanist (see below for Ch. Smith). Only in 1831 Lowe validated it as *S. mermulano*. The authors combination “Banks ex Lowe” was afterwards used, but correctly it should be “Solander ex Lowe”. Unfortunately Lowe overlooked an earlier publication for this taxon made in 1825 by R. Brown as *S. mirmulans* (see below). This source was then neglected or overlooked and the younger homonym was used. In a later publication Lowe (1868) altered the species name to *S. marmulano*, and finally, this name was used by various authors (e.g. Hansen & Sunding, 1993, Press & Short, 1994).

Ch. Smith, who accompanied the Niger expedition in 1816 as a naturalist and collected a number of plants in the Cape Verde islands, referred in his diary, published after his death during the voyage by Tuckey (1818) to “*Sideroxylon marmulana?* (Madeira)”. Obviously he took the name from another source, as in his plant list all species that he thought to be hitherto undescribed are clearly marked with “sp.nov.” (e.g. *Campanula jacobaea* sp.nov., today with the author combination Chr. Sm. ex Webb). Probably he studied the manuscripts of Solander and Banks while preparing for his voyage to West-Africa.

The valid name for the Madeiran species was published by R. Brown in L. von Buch (1825). According to L. von Buch (op. cit.) and Britten (1904), Brown based his catalogue “Verzeichnifs der auf Madeira wildwachsenden Pflanzen” (published in L. von Buch’s Physicalische Beschreibung, 1825) on various collections, mainly on those of F.N. Masson². He sent plants to Banks, including his own herbarium (c. 444 folios) on the 27th of May 1777 (Britten, 1904). The Masson collections were incorporated into Banks own herbarium. Masson compiled a list from his collections in which he indicated the supposed new species with an asterisk (see Britten, 1904), and in a letter to Banks dated on 4 April 1777 wrote “Marmulano is a species of *Sideroxylon*” .

² This collector lived on Madeira from 1776 to 1778 and returned to this island in 1783 until 1785. During this period he visited Azores (1777) and Canary Islands (1778).

The list published by Brown has been overlooked widely, although Britten (1904) and Mabberley (1980) dealt especially with the names published by R. Brown. It is of interest to note, that Lowe (1868), dealing with *S. marmulano* refers to his own publication (Lowe, 1831 and Appendix 3), De Candolle (1844) and “*S. Mirmulans* Buch ! 193 no. 205”. The local names, to which he refers in 1831 & 1868 are given as “Mermulana” and “Marmulano” respectively.

Sideroxylon canariense T. Leyens, W. Lobin & A. Santos spec. nov.

Diagnosis

S. canariense spec. nov. differt ab *S. marginata* staminibus petalos distincte excedentibus, staminodiis petaloideis et petalis cochleariformibus (*S. marginata* cum petalis rotundatis). Ab *S. mirmulante* staminibus excedentibus sed distincte brevioribus, floribus albis majoribus (*S. mirmulans* cum floribus roseis vel albo-roseis) et foliis oblongis (*S. mirmulans* cum foliis ellipticis vel obovatis) differt.

Type: Kanaren, Teneriffa, Realejo Alto, cementerio S. Francisco, Steilwände des Barranco Godínez, 28°22.946' N - 16°35.122' O, Lobin & Santos, 3.4.1995 (ORT 37924, Holotypus, fig. 7). B, FR, Herb. Lobin n. 7536 (isotypes).

Nom. ind.: Marmolán, marmulano.

Icons: Kunkel & Kunkel, 1974: pl. 40; Kunkel, 1981: pl. 49; Santos, 1979: foto.

Literature records: Sub *Sideroxylon mermulana* Lowe: Bornmüller, 1904: 460; Sub *S. marmulano*: Burchard, 1929: 166; Santos, 1975: 96; Kunkel, 1977: 373; Santos, 1983: 236-237; Santos & Fernández 1984: 173; Suárez, 1986: 250-251; Santos, 1996: 448; Marrero *et al.*, 1990: 31-34.

Description

Evergreen tree, (4)5-7(9-12) m, stoloniferous, dark grey bark, young branches greenish to greyish with short fine indumentum, branches becoming glabrous in age. Leaves leathery, oblong, (6.1)7.6-11.8(14.5) x (2.0)2.4-4.3(6.5) cm, with a length to width ratio of 2.2-3.1(3.3); entire, apex rounded to obtuse, leaf base cuneate, adaxially and abaxially glabrous, dull green, leaf margin not revolute. Petioles (1.3)1.7-2.7(3.3) cm, long, covered with a short indumentum. Flowers in clusters of 2-10(12), generally 4-6, in fruiting stage mostly solitary, distributed between and below the leaves. Flower buds pointed, ovate, green. Pedicel 0.4-1 cm long, ± glabrous. Sepals 5, c. 0.5 x 0.25 cm, broadly ovate, sparsely hirsute, sepals imbricate overlapping, only united at their very base but fused with the receptacle, forming a fleshy cup, sparsely hirsute. Petals 5, 0.45-0.5 x 0.3 cm, broadly obovate; petals united for c. 1/5 of their length, white. Staminodes 5, alternating with the petals, petallike in shape and color, 0.4-0.5 cm long, united with the corolla. Stamens 5, united with the petals, well exceeding the corolla. Filaments 0.5-0.6 cm long. Anthers 0.2 cm long. Petals, staminodes and stamens forming a tight cup. Ovary compound with free-central placentation, 0.15-0.20 cm long, ovate. 5 ovules, style 0.2 cm long. Fruit drupe, obovate, 1.0-1.7 cm long with persistent style, glabrous, pedicel 0.5-1.4 cm long. Calyx persistent, even after fruit falls off.

Distribution and ecology

Canary Islands: Fuerteventura, Gran Canaria, Tenerife, La Gomera, El Hierro, La Palma (fig. 1).

In steep cliffs and escarpments, mostly between 200 - 600 m (table IV).

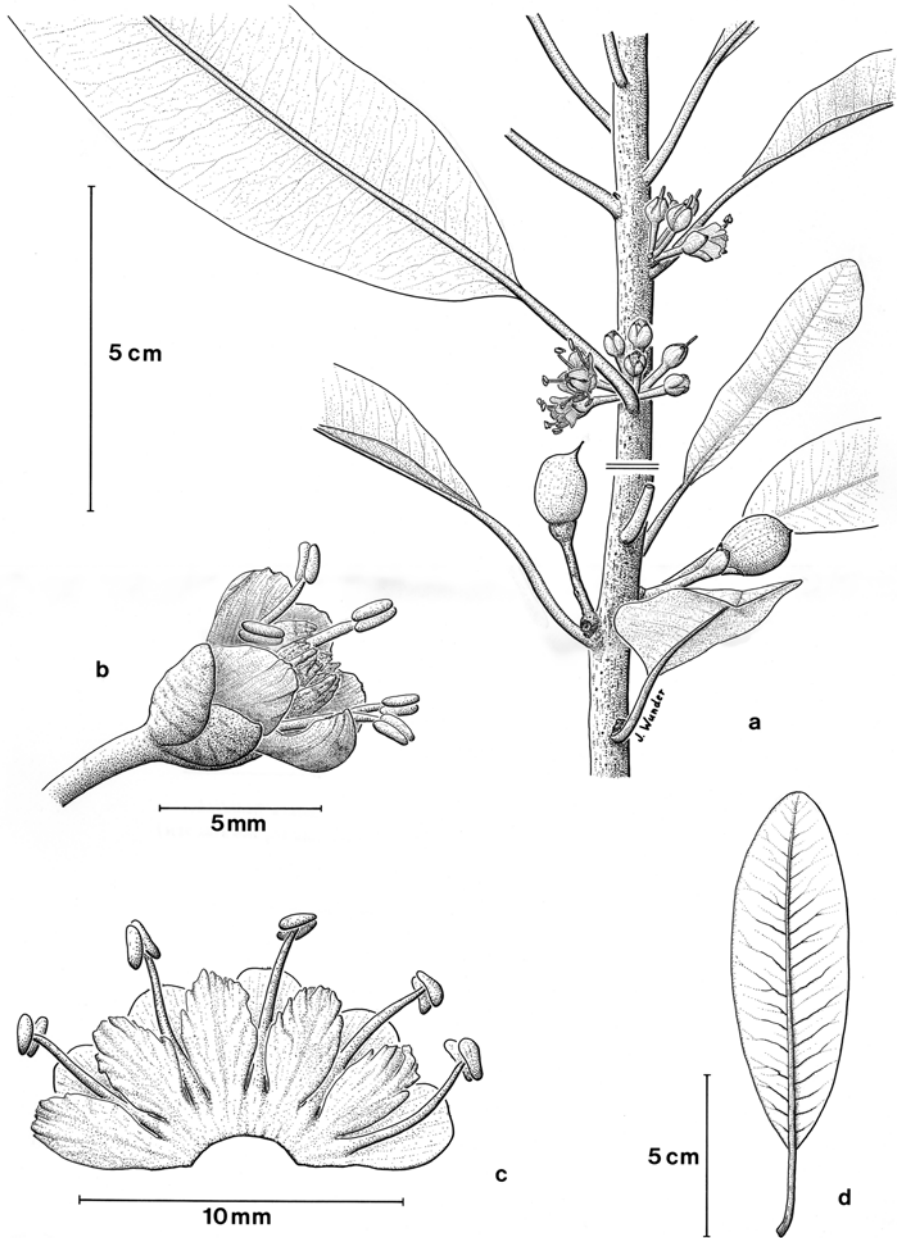


Fig. 6. *Sideroxylon canariense* spec. nov.: a) part of flowering stem, showing fruits, flowers and leaves; b) single flower, c) perianth of single flower showing position of anthers, d) single leaf (Drawings: J. Wunder).

Threats

S. canariense spec. nov. needs protection on all islands, as stated already by Kunkel (1977) for Gran Canaria. It is classified as “Critically endangered” in El Hierro and Fuerteventura, where only one locality per island is known. Several localities are known from Gran Canaria, La Gomera, La Palma and Tenerife. But these populations are diminishing and always consists of few plants only, the species is regarded therefore in these islands as “Endangered”. For the whole archipelago the species is classified as “Endangered”.

S. canariense spec. nov. is not included in the Red Data Book from the Canaries (Gómez Campo, 1996) as well as in the Atlas y Libro Rojo de la Flora Vascular amenazada de España (Bañares *et. al.*, 2003) as it was regarded as a Macaronesian plant and has thus been omitted, as mostly plants endemic to the Canaries were included into the Red List. In a future edition, *S. canariense* spec. nov. must be included.

Specimens investigated:

Tenerife: Bco.de Godínez, R.P.Murray, 4. & 6.5.1902 (K); *ibid.*, close to Realejo Bajo, Dr. Pérez, 14.12.1902 (COI, E, K); in convalle del Patronato supra Realejo Alto, Burchard s.n., 3.1907 (ORT 340, Z); Realejo, Orotava, s.coll., 16.10.1914 (K); Realejo Alto, cementerio S. Francisco, Steilwände des Barranco Godínez, 28°22.946 N, 16°35.122 W, Lobin 7536 & Santos, 3.4.1995 (B, FR, Herb.Lobin, ORT 37924); *ibid.* Lewejohann TF-95-071-1, 3.4.1995 (GOET); *ibid.*, Santos, 23.4.2001 (ORT 36689); *ibid.* Santos, 30.10.1995 (ORT 32372); Realejo, Laderas de Tigaiga, 430 m., E. Barquín *et al.*, 10.12.1976; Arico, Bco. Tamadaya, A. Santos, 10.3.1974 (ORT 36129); Bco.Ruiz, Santos (ORT 25168); *ibid.* E. Barquín *et M.* del Arco, 10.2.1977 (TFC 6462); Laderas de Icod de los Vinos, Sventenius, 31.8.1949 (ORT 16814, 2839); *ibid.*, 5.9.1971 (LPA 9013, 11887); *ibid.*, 600 m, D. Bramwell 1358, 20.4.1969 (E, LPA 11886); Icod, Sventenius, 29.6.1950 (ORT 2840); *ibid.*, 300 m, Sventenius, 29.4.1950, 16.9.1951 y 5.10.1965 (ORT 16813, 16812 and 16816); *ibid.*, D. Bramwell, 850 m., 20.4.1969 (TFC 597); *ibid.*, Las Furnias, 28°21.463 N, 16°43.086 W, Lobin & Santos, 3.4.1995 (Herb. Lobin, 7545, ORT

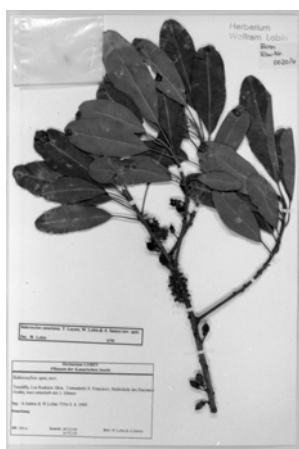


Fig. 7. Holotype of *Sideroxylon canariense* spec. nov.

s.n.); *ibid.* K.Lewejohann TF-95-076, 3.4.1995 (GOET); Ladera above Icod de los Vinos, 600 m.; Icod: Los Pajares (Finca Boquín), 500 m., F. Ardevol, 15.7.1984 (TFC 19918); entre Icod y Garachico, Sventenius, 16.9.1969 (ORT 16811); Los Silos, H. Metlesics, 31.5.1973 (TFC 999); Orotava, Bco. San Antonio, Sventenius, 10.4.1944 and 26.6.1949 (ORT 25031, 16817); *ibid.*, 10.3.1944 (ORT 16818); *ibid.*, Ramos & Scholz, 30.9.1981 (ORT 28261); *ibid.*, Bco. Arena, Delgado, 25.10.1977 (ORT 28478); *ibid.*, Delgado & Fernández, 17.6.1979 (ORT 25434); Los Silos, Bco. Los Pasos, Santos & Fernández, 21.10.1976 (ORT 24863); Barranco del Río, Gallo & Pérez, 12.2.1972 (K, TFC 790, 32165); Bajamar, Santos, 16.6.1974 (ORT 36127); Anaga, Bco. Mina, Santos, 5.12.1970 (ORT 36127); *ibid.*, 5.12.1971 (ORT 36131); *ibid.*, Valleseco, Santos (ORT 36130); *ibid.*, Afur, Santos (ORT 36132); *ibid.*, bajo Mirador de Aguaide, 11.1.1998 (ORT 33966); *ibid.*, Batán de Arriba, 600 m., E. Barquín, s.f. (TFC 22904); *ibid.*, Moquinal, A. Charpin et A. Santos, 10.5.1984 (TFC 20115); *ibid.*, Monte Yedras, 350 m., P.L.Pérez, 15.12.1973 (TFC 4328); Ladera de Güimar, R. Mesa, 5.9.1977 (ORT 29776-79); *ibid.*, Mirador de Don Martín, entlang des Bewässerungskanales, Lobin 7153, 21.2.1989 (Herb.Lobin); Bco. Erques, Santos, 30.7.1986 (ORT 29338); Bco. San Antonio, G. Kunkel 15548, 27.3.1973 (E); Anaga, entre Taganana y Draguillo, Ortuño, 5.9.1950 (ORT 9016 y 16815); *ibid.*, Bco. Jagua, Santos, 14.11.1977 (ORT 25173); Valle Santiago, Sventenius, 3.7.1951 (ORT 16810); Anaga, cerca Roque de Los Pinos, Santos, 6.9.1984 (ORT 28740) & 1.1998 (ORT 33965); *ibid.*, P. Romero et J. Quesada, 5.1980 (TFC 23004); Tegueste, La Orilla, E. Barquín, 5.11.1976 (TFC 20631); *ibid.* A. Santos, 22.2.2005 (ORT s.n.); Bco. del Infierno, 400 m, Santos, 3.1975 (ORT s.n.); Bco. Tamadaya, Santos, 10.3.1974 (ORT 36132); Arico, Bco. de la Rosa Vieja, E. Barquín *et al.*, 24.2.1977 (TFC 20615); Adeje, bajo Roque Imoque, Santos, 24.4.1996 (ORT 32688); Bco. Icor, 650 m., M. Marrero, M. Salas et E. Carque, 17.1.1989 (TFC 29915); Igueste de Candelaria, Bco. de Araca, 550 m., M. Marrero, 19.11.1988; Ladera de Güimar, 500 m., M. Marrero, 2.1.1989 (TFC 29849); *ibid.* W. Wildpret et O. Rodríguez, 6.3.1988 (TFC 28047).

La Gomera: Hermigua at cumbre, R.T. Lowe 129, 19.4.1861 (BM, K); Alojera, Santos & Fernández, 19.7.1975 (ORT 26214); *ibid.*, Fernández, 30.9.1977 (ORT 26630); *ibid.*, E. Bañares, 2.1984 (TFC 19970); Bco. Madera, Fernández, (ORT 26215); Hermigua, riscos de Enchereda, ancón del Espanto, V. Voggenreiter, R. Mesa & J.P.Oval, 21.4.2000 (LPA 19008).

La Palma: Sine loc., Kämmer, 1972 ; Bco. Jurado (Tijarafe), 250 m, Santos, 25.3.1988 (ORT 30590); Bco. Seco (S/C de La Palma), Santos, 13.7.1973 (ORT 36122 & 36123); *ibid.*, F. Cabrera, 9.1988 (TFC 25737); Tablado (Garafía), Santos, 23.6.1984 (ORT 36124) ; Bco. de la Herradura, 400 m, con *Osyris*, A. Marrero, 16.8.1991 (LPA 20190) ; below Barlovento, A. Santos (ORT s.n.); Bco. Herradura, 490 m, E. Beltrán et al., 9.4.1998 (TFC 42799).

El Hierro: Sine loc., Kämmer, 1972 ; Entre La Peña y Las Puntas, 550 m, Santos, 4.4.1990 (ORT 31046).

Gran Canaria: Pie de Goyedra, A. Santos, 1974; Lomo de la Vizcaína, pie de risco orientado al sur, 550-600 m., V. Montelongo, 18.1.1986 (LPA 13647, 13648 y 13649); Bco. de Teror, en paredones basálticos, muy rara, A. Marrero, 15.12.1985 (LPA 10395 y 10396); *ibid.* 28°30.490 N, 15°32.392 W, R. Almeida, W. Lobin & A. Santos, 13.4.2000 (Herb. Lobin); Santa Brígida, Bco. Alonso (frente al drago), A. Marrero, 19.6.02 (LPA 19347 y 19348); Agaete, cascada del barranquillo al SE de San Pedro, en paredo-

nes basálticos, en plena floración, A. Marrero, F. González-Artiles & M. González-Martín, 14.10.91 (LPA 20191, 20192 y 20193); Bco. San Lorenzo, A. Marrero, 15.3.1986, (TFC 31234 y 31235); Guía: Bco. de La Capellanía, Hoya del Bardo, 550 m., C. Suárez, 3.11.1985 (TFC 31104, 31105 y 31106); Parte baja del Bco. de Teror, cerca pinar de repoblación, 550 m., C. Suárez, 16.2.1985 (TFC 31108); Entre Presa de los Pérez y Tierra de Manuel, 550 m., C. Suárez, 16.2.1986 (TFC 31101 y 31102); Hoya de Pineda, A. Alamo et E. Barquín, 30.9.1978 (TFC 23277).

Fuerteventura: Bco. Mal Nombre, A. Santos, 24.6.1980 (ORT 27245).

Relationships and phytogeographic affinities

According to Penninngton (1991), the pantropical genus *Sideroxylon* consists of 74 species. The majority of them, 49 species, are distributed in the Neotropics, while 25 occur in the Palaeotropics, with 6 species in the mainland of Africa.

The first comprehensive account on the genus was written by De Candolle (1844). He subdivided the genus into the two sections *Eusideroxylon* and *Synsepalum*. The next to follow was Engler (1897) who recognized 10 sections and listed *S. mirmulans* (as *S. mermulano*) in his first section - *Eusideroxylon* - together with *S. inerme*, *S. fimbriatum* and *S. imbricarioides*. In his work on African Sapotaceae, Engler (1904) subdivided the genus into 3 sections (*Calvaria*, *Eusideroxylon* and *Spiniluma*), again listing *S. mirmulans* in the same section as *S. inerme*.

From herbarium specimens as well as from the drawing in Hemsley (1968: fig. 5), we assume, *S. inerme* to be the next relative of *S. canariense* spec. nov., *S. marginata* and *S. mirmulans*.

S. inerme L. occurs from NE Africa (Somalia, Kenya and Tanzania) to South Africa and is also found on Aldabra Isl (Hemsley, 1968). We saw material from Moçambique, Tanzania (Sansibar), Kenya, Swaziland and the Rep. South Africa. Within its wide distribution area, the species varies considerably, e.g. in size and shape of the leaves, and according to the drawing of Hemsley (op. cit.), also in length and shape of the staminodes and the length of the stamens.

Table IV: Altitudinal gradient of *Sideroxylon canariense* spec.nov. in the Canary islands. ● verified herbarium specimens with information on altitude. ■ observations of inaccessible sites.

	Fuerte- ventura	Gran Canaria	Tenerife	Gomera	Hierro	La Palma	Archipelago
750-1000 m		●					●
500-750 m		●●●●● ●●●	●●●●●	●●	●	■■	■●●●●●●●●● ●●●●●●●●●
200-500 m	●	●●●	●●●●●●● ●●●●●			●	●●●●●●●●●● ●●●●●●●●
100-200 m			●			●●	●●●
0-100 m						●●●	●●●

Concerning the two latter characters, we found in our material from the three archipelagoes a clear correlation of size and shape of staminodes and stamens with geographical distribution. Thus the variation within these characters as described and figured by Hemsley (op. cit.) may hide different taxa. Consequently some authors proposed some subspecific divisions within *S. inerme*. The main difference between *S. inerme* and the three above described taxa are the distinctly smaller, and much more numerous flowers of *S. inerme*.

It is difficult to state how the three described taxa have evolved. The three species might have descended from a single ancestral immigrant that reached one of the archipelagoes and subsequently colonized the other islands. They might also have descended from different ancestral immigrants from the African mainland.

The three species grow under more or less similar ecological conditions and in case of *S. canariense* spec. nov. and *S. mirmulans* present a component of the thermophilous shrub vegetation. Although this vegetation type is almost completely missing on the Cape Verde Islands, the conditions of the habitat of *S. marginata* on this archipelago are comparable to those of *S. canariense* spec. nov. and *S. mirmulans*.

Superficially regarded, *S. mirmulans* and *S. marginata* look quite similar. They strongly resemble each other in leaf shape, position of the flowers on the branches, in flower color and in the general shape of the tree. In contrast, *S. canariense* spec. nov. differs strongly regarding these characters. But as we pointed out, one of the most striking and important difference between the three taxa are the length of the stamens and the shape of the staminodes. Stamens that are distinctly longer than the corolla represent a character shared between *S. canariense* spec. nov. and *S. mirmulans*. Also the petal-like staminodes can be found in these two species. Therefore we assume that the two species are closer related than to *S. marginata*. Regarding these characters *S. inerme* is intermediate: In this species the anthers are only slightly longer than the corolla (thus resembling more *S. marginata*), but the staminodes are petal-like as in *S. canariense* and *S. mirmulans*. Thus, from a morphological point of view, there are some indications towards a double ancestral immigration of two different periods from the African mainland. In this case during one migration the Cape Verde Islands would have been reached, during a second one the Canary Islands and Madeira or one of the latter with succeeding colonization of the other would have been reached.

To clarify this, additional investigations (e.g. molecular analyses) must be carried out.

According to molecular studies the origin and movements of the Flora of the Canary Islands and Madeira are diverse: e.g. *Argyranthemum* (Francisco-Ortega *et al.*, 1997) moved from Madeira to the Canary Islands, *Sonchus* (Kim *et al.*, 1996) and *Aeonium* (Mes, 1995) from the Canary Islands to Madeira and the Cape Verde Islands. Thus it will be interesting to know the relations in the *Sideroxylon*-group based on molecular studies.

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