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Synopsis of *Stictocardia* with another Madagascan species, *S. mojangensis* (*Convolvulaceae*)

Abstract

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The Madagascan endemic *Ipomoea mojangensis* is transferred to *Stictocardia* and the combination *S. mojangensis* validated. This species differs from most others in *Stictocardia* by having large clusters of white to pinkish or pale lavender flowers, reflexed mature fruits with a “cap” and a honey-like liquid that surrounds the seeds and dries to produce a shiny surface. Also in contrast with the other known species, leaves are absent when flowers are present. The species is placed in *Stictocardia* even though the fruits are in certain respects different from all other known members of that genus. Yet, the endocarp with the pockets that hold the seeds is constant in all known *Stictocardia* species. The species is described and illustrated, and a key and distribution map are given for all known members of the genus. Furthermore, the species is characterized phytochemically (occurrence of pyrrolidine/nortropane alkaloids and cyanogenic glycosides).

Although the flora of Madagascar is being destroyed apace by human over-population, many endemic organisms are still being discovered by the scientific community. For example, Staples (1990) and Deroin (1991, 1992, 1996, 1997, 1998) have found a number of previously unknown species, within the *Convolvulaceae* alone. Moreover, in the species known from the island, there are unusual relationships within the family (e.g., Sebsebe & Austin 1996).

Deroin (2001) treated one of the species on this island as *Ipomoea mojangensis*, although he noted that “cette plante présente des analogies superficielles avec *Stictocardia beraviensis*.” Indeed, the two species differ mostly in flower colour and fruits. Yet, several aspects of *I. mojangensis* including the fruits and indumentum indicate that it is incorrectly placed in *Ipomoea*. We have been studying these plants since shortly after the second author returned from a trip to the island in 1990. Numerous traits suggest that the species is best placed in *Stictocardia* and we make that change here along with a synopsis of the other species in that genus.

Stictocardia previously was known from 10 species in Africa and Asia, with a single species (*S. tiliifolia*) that has been spread around the world at least partly through cultivation (Austin & Sebsebe 1997). As currently delimited, the genus is defined by fruits that have a unique endocarp with “pockets” that hold the seeds until they are dispersed. There is a suite of other traits that distinguish the genus from the related members of the family (Austin & Sebsebe 1997), but the fruiting characters are most distinctive.

Fig. 1 illustrates the relative geographic relationships of the *Stictocardia* species. The following key compares the morphology of *S. mojangensis* with that of the other known taxa. The key is partly adapted from Ooststroom (1953) and Verdcourt (1963).

1. Calyx shaggy with long pubescent filamentous outgrowths below *S. incompta* (Hallier f.) Hallier f.
- Calyx smooth 2
2. Corolla salverform, white, apparently adapted for moth pollination *S. jucunda* (Thwaites) C. R. Gunn
- Corolla funnellform, ranging from white to pink or purple to crimson, apparently adapted for bee or bird pollination 3
3. Corolla crimson or scarlet, with or without internal yellow nectar guides; apparently adapted for bird pollination 4
- Corolla white to pinkish or purple; apparently adapted for bee pollination 5
4. Corolla crimson, 4.5-5.5 cm long *S. beraviensis* (Vatke) Hallier f.
- Corolla scarlet, 5.5-7 cm long *S. macalusoii* (Mattei) Verdc.
5. Outer sepals distinctly cordate at the base, the basal lobes up to 2 mm long *S. cordatosepala* Ooststr.
- Outer sepals rounded at the base 6
6. Sepals in anthesis 12 mm long or mostly longer, corolla 8-10 cm long *S. tiliifolia* (Desr.) Hallier f.
- Sepals in anthesis less than 12 mm long, corolla mostly smaller 7
7. Inflorescence 11-30-flowered, corollas 3.5-6 cm long, the limb white to pinkish or pale lavender, the throat somewhat darker *S. mojangensis* (Vatke) D. F. Austin & Eich
- Inflorescence mostly 1-6-flowered (to 15-flowered in *S. beraviensis*), corolla 5-9.5 cm long, mauve, pink, or violet. 8
8. Stems, leaves and inflorescences sparsely pubescent or glabrous 9
- Stems, leaves and inflorescences densely pubescent to tomentose 10
9. Sepals 9-11 mm long, ciliate, corolla pilose on the apices of the mid-petaline bands *S. discolor* Ooststr.
- Sepals 5.5-8 mm long, sparsely pilose, corolla glabrous *S. lutambensis* (Schulze-Menz) Verdc.
10. Corolla 6.5-9.5 cm long, campanulate, pink *S. laxiflora* (Baker) Hallier f.
- Corolla 5-6 cm long, funnel-shaped, violet *S. neglecta* Ooststr.

Stictocardia mojangensis* (Vatke) D. F. Austin & Eich, *comb. nova

≡ *Ipomoea mojangensis* Vatke in *Linnaea* 43: 515. 1882. – Holotype: Madagascar, “prope Mojangá” [= Majunga, Mahajanga], 5.1880, *Hildebrandt 3410* (B [destroyed]; isotype: P, n.v.) – Fig. 2.

Perennial climber, woody, the stems twining, white-pubescent-appressed when young, glabrescent, bleeding a brownish yellow syrup-like liquid (white in cultivated & regularly watered plants) when cut, older stems brown to gray. *Leaves* simple, with petioles 5-6 cm long, heterophyllous with ovate to pandurate forms (Fig. 2d); lamina coriaceous, broadly ovate to pandurate, 4.6-13.5 cm long, 4.6-10.7 cm wide, entire, the apex acute and mucronulate on pandurate leaves, acuminate on ovate leaves, the base almost truncate to cordate, sparsely pubescent above, white-appressed-pubescent below (often becoming black when dried), venation palmate below, pinnate above, with 5-8 pairs of secondary veins, conspicuous above and below; petiole canaliculate, 3.5-11.5 cm long, finely appressed-pubescent. *Inflorescences* compound monochasial, 11-30-flowered, terminal on lateral branches, rachis 3-7 cm long. *Flowers* on peduncles 0.5-1.5 cm long, glabrous; pedicels 1-1.3 cm long, glabrous, bracts scale-like, 0.5 mm long, trian-

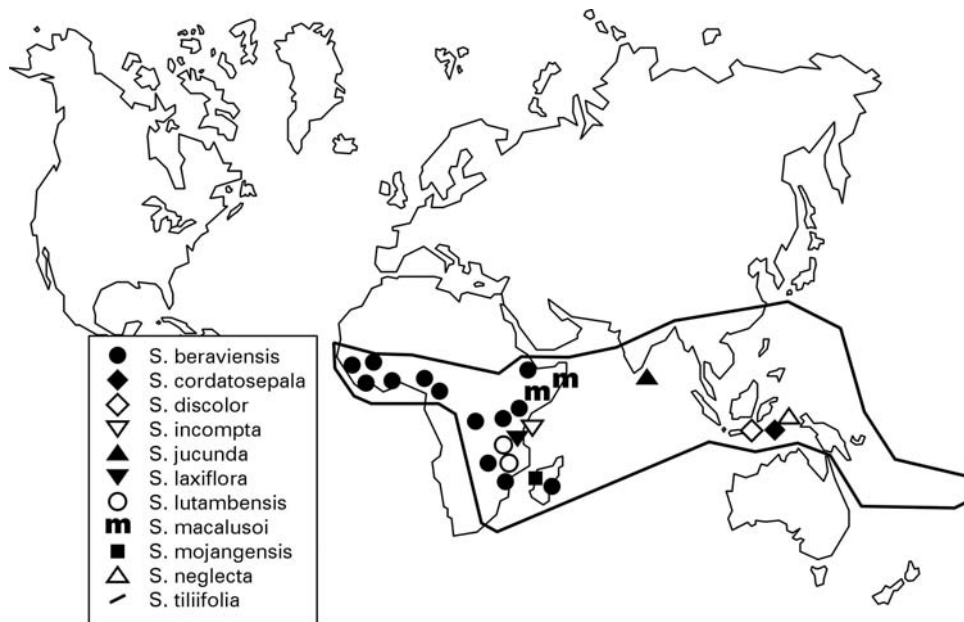


Fig. 1. Known native distribution of the species in the genus *Stictocardia*. Beyond this range, *S. tiliifolia* has been introduced and escaped into several parts of the New World tropics.

gular, glabrous. *Sepals* unequal, imbricate, the inner 3 longer than the outer 2, more or less orbicular, the outer 4-4.5 mm long and wide, inner 6-7 mm long and wide, more or less orbicular, basally and apically rounded, the margins entire, coriaceous, scarious, glabrous, accrescent in fruit. *Corolla* induplicate-valvate and convolute, funnel-shaped, 3-3.5(-4) cm long, the limb white (pinkish or lavender when dried), the throat somewhat darker, glabrous on the mid-petaline bands, the tube cylindrical but with the apex constricted below the flaring limb, glabrous, shiny; the limb entire but emarginate. *Stamens* included, unequal, 6-10 mm long (2 are 10 mm, 2 are 6 mm and 1 is 7.5 mm), the filaments fused to the corolla tube 6-7 mm above base, glandular pubescent at the triangular base, the anthers 3-5 mm long, pollen large, echinate-clavate, pantoporate; nectary inconspicuous or absent. *Ovary* conic, 2-2.5 mm long and wide, tapering to the base of the style with a swollen attachment point, glabrous, the style single, 11-12 mm long, the stigma capitate, bilobed, 1.5 mm wide. *Fruits* capsular, reflexed when mature, 2-locular, 8-9 mm long (from sepal to base of apiculum), 7-8 mm wide, exocarp dehiscent from the base to produce a "cap" with 4 lobes separating from the receptacle and falling separately, retaining a darker brown apiculum 3-5 mm long from the style base, endocarp whitish, with 2 cavities that retain the seeds. *Seeds* (1-)2(-4), 4-6 mm long, 3-4 mm wide, oblong to ovoid, dark brown, glabrous, covered with a honey-like liquid that dries to produce a shiny surface.

Distribution. – Known from the western part of Madagascar (Deroin 2001: fig. 20).

Material studied. – Madagascar, road to Andranomena, N from Route Nationale 35, 13 km E of Morondava, 8.1990, *Eich 21a* (B, MO). – Ic.: See electronic supplement, <http://www.bgbm.fu-berlin.de/bgbm/library/publikat/willd31/austin&eich.htm>.

Ecology. – Flowering and fruiting in August, the dry season. At flowering there are no leaves on the plants. When grown in the greenhouse, shape and size of the leaves, as given here (Fig. 2d), are variable. The same variation occurs in wild plants according to Deroin (2001). Altitude: 10-800 m.

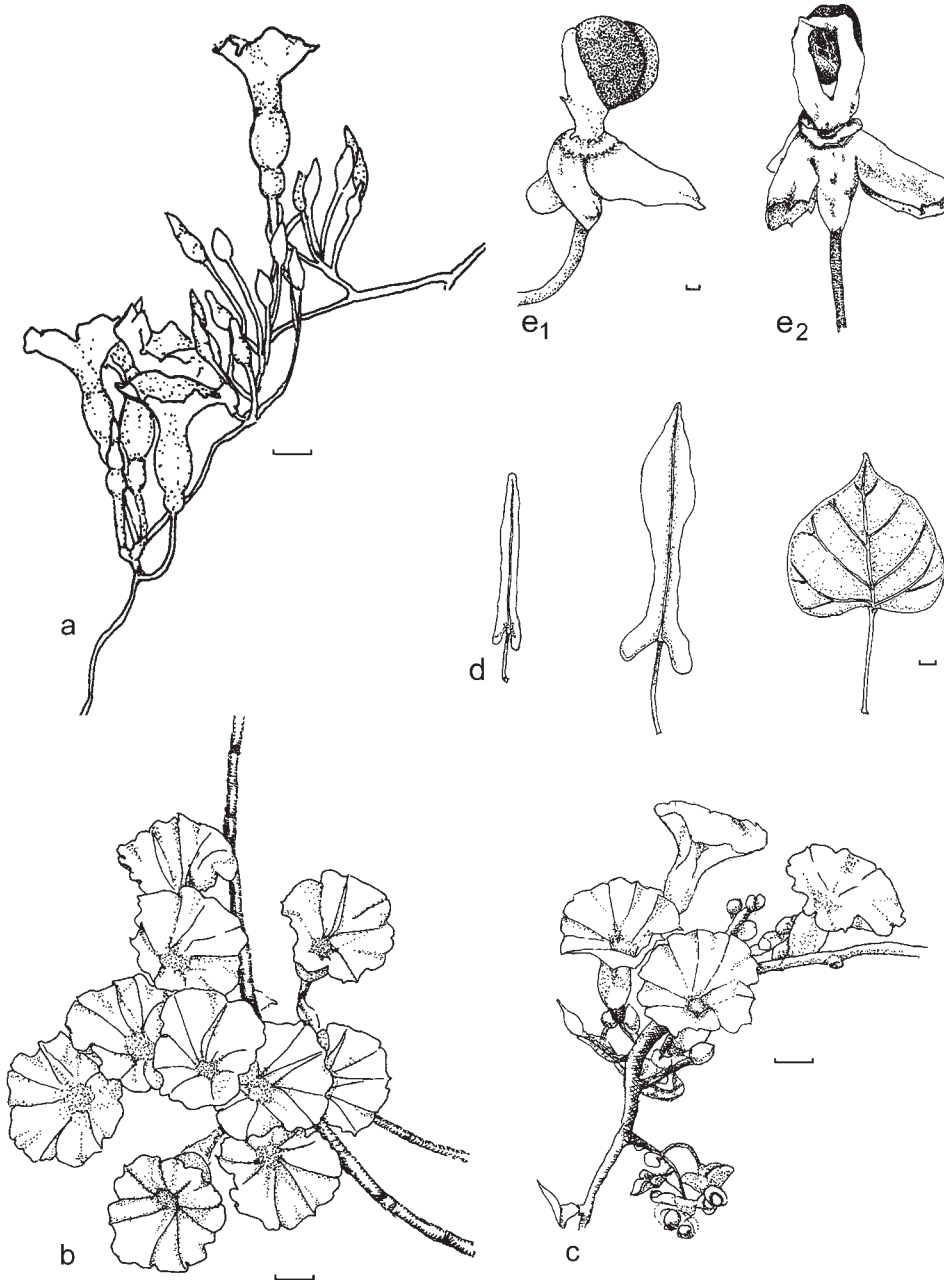


Fig. 2. *Stictocardia mojangensis* (Vatke) D. F. Austin & Eich – a: side view of inflorescence showing the constricted corolla tube apices; b: top view of inflorescence; c: side view of inflorescence with mature fruits on the lower branches; d: leaves showing variation when grown in the greenhouse; e: mature fruits, lateral view of endocarp, with two seeds attached to the right side (e₁) and with seed sitting in cavity on the opposite side (e₂). – Scale bars 1 cm; drawing by Shawn Pennell after Eich 21a.

Table 1. Occurrence of pyrrolidine, tropane and nortropane alkaloids in *Stictocardia mojangensis* determined by GC-MS of the base extract; S = seeds, L = leaves (including branches), R = roots, * = not determined, – = not present.

<i>Pyrrolidine alkaloids</i>			
Hygrine	S	L	R
5-(2-Oxopropyl)hygrine	–	L	–
5-(2-Hydroxypropyl)hygrine	–	L	–
2', 4-N-Methylpyrrolidinylhygrine	–	L	R
2', 3-N-Methylpyrrolidinylhygrine	–	L	R
Cuscohygrine	–	L	R
Nicotine	S	L	–
<i>Tropane alkaloids</i>			
Tropan-3-one (= tropinone)	S	L	–
Tropan-3 α -ol (= tropine)	S	–	–
Tropan-3 β -ol (= pseudotropine)	S	L	–
Tropan-3 α -yl acetate	–	L	–
<i>Nortropane alkaloids</i>			
Calystegine A ₃	*	*	R
Calystegine A ₆	*	*	R
Calystegine B ₁	*	*	R
Calystegine B ₂	*	*	R

Deroin (2001) described the fruits as "... coverts à l'extérieur de sécrétions gommeuses, dorées sur le sec." In live plants examined we found that the seeds and not the fruit have this honey-like covering. This is a unique trait in the family, so far as known, and may be involved with animal dispersal.

Phytochemistry. – With the exception of *Stictocardia tiliifolia* (= *S. campanulata* (L.) Merr.) chemical constituents of the genus are unknown. In contrast to *S. tiliifolia*, which produces ergot alkaloids in the seed (Chao & Der Marderosian 1973, Lee & al. 1979) and in the vegetative aerial parts (Schimming 2001), we could not find these compounds in *S. mojangensis*. This is remarkable, since ergot alkaloids are common constituents of the related genera *Argyreia* and *Turbina* (*Argyreieae*). Also present in *S. mojangensis* are a number of pyrrolidine, simple lipophilic tropane and hydrophylic nortropane alkaloids (Table 1), common constituents of convolvulaceous species. All these alkaloids could be detected by the well-known GC-MS method, which has been already applied for other convolvulaceous species in our group (for experimental details see Jenett-Siems & al. 1998, Schimming & al. 1998). However, our detection of cyanogenic glycosides in the seeds and vegetative aerial parts of *S. mojangensis* by means of the Feigl-Anger test (Tantisewie & al. 1969) is unusual for the *Convolvulaceae*. Studies on structural details are under investigation. To date unequivocal evidence of cyanogenic glycosides is available only for two *Merremia* species, viz. *M. dissecta* (Nahrstedt & al. 1990) and *M. vitifolia* (Jenett-Siems 1996, Jenett-Siems & al. 1996). These glycosides have not been found in a number of other *Merremia* species, or in other convolvulaceous genera (unpublished results).

Résumé

L'espèce malgache endémique *Ipomoea mojangensis* est transférée au *Stictocardia mojangensis*. Cette espèce se distingue des autres de ce genre par de grandes grappes de fleurs blanches, voire rose ou lavande pâle, par des fruits mûrs penchés en arrière munis d'une sorte de bonnet et par un liquide semblable au miel, qui entoure les semences et qui sèche pour produire une surface brillante. De plus, contrairement aux autres espèces connues, celle-ci n'a pas de feuilles pendant la floraison. Cette espèce est décrite, illustrée et incorporée dans la clé de détermination des

membres connus de ce genre. Elle est classifiée comme *Stictocardia* même si ses fruits diffèrent à certains égards de ceux de tous les autres membres connus de ce genre. Cependant, l'endocarpe pourvu de poches est pareil à toutes les espèces connues. En outre, l'espèce est phytochimiquement caractérisée par la présence des alcaloïdes pyrrolidiniques / tropaniques / nortropaniques et des hétérosides cyanogènes.

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