A synoptic revision of the Malagasy species of *Scolopia* Schreb. (Salicaceae, Scolopieae)

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**ABSTRACT**
A synoptic revision of the Malagasy species of *Scolopia* is presented. Fourteen species are recognized, of which all are endemic and ten are threatened. One species, *S. delphinensis* Appleq. & G.E.Schatz, sp. nov., is newly described and illustrated. An identification key to the Malagasy species of *Scolopia* is provided.

**KEY WORDS**

**MOTS CLES**
INTRODUCTION

Scolopia Schreb., which was traditionally placed within Flacourtiaceae, has recently been transferred to an expanded Salicaceae (Chase et al. 2002). The genus includes about 40 species of woody plants that are characterized by racemose or 1-3-flowered inflorescences, hermaphrodite flowers with petals present (and sepals and petals usually at least 4), numerous stamens, and superior ovaries with two or more placentas. A row of small glands is often present on an extrastaminal disk. The genus ranges from Africa, Madagascar and the Comores and Mascarenes to southern and southeastern Asia and the Pacific, with one species in Australia (Sleumer 1972a).

The species of interest to the present synoptic revision are those native to Madagascar, all of which are endemic. The first publication related to the genus in Madagascar was by Sleumer (1938), who published a single species, *S. madagascariensis* Sleumer. Perrier de la Bâthie (1940, 1946) published a revision and *Flore de Madagascar* treatment recognizing nine Malagasy species, all newly described (*S. madagascariensis* was overlooked). A revision of the entire genus was published by Sleumer (1972a) in which 13 Malagasy species were recognized, six of them newly described; one of Perrier de la Bâthie's species was placed into synonymy and two others transferred to *Ludia*, where they were considered conspecific (Sleumer 1972b). An updated treatment of the Malagasy species was necessary because with many more specimens now available from Madagascar, it had become clear that some of Sleumer's species delimitations were not satisfactory. Also, better data regarding plant distributions can now be provided for conservation purposes.

MATERIAL AND METHODS

Herbarium specimens at Paris (P) and St. Louis (MO) were examined, as were then-undistributed duplicates for exchange available at those herbaria and images available through JSTOR of types held by other institutions. Definition of species utilized a taxonomic species concept (e.g., Grant 1981), the most widely used and usually most practical approach in plant taxonomy; three fixed differences are required to recognize taxonomic entities at the species level, with conspicuous ecological preferences potentially being considered as supporting characters. Preliminary evaluation of conservation status according to the IUCN Red List Categories and Criteria (IUCN 2012) was performed for each species recognized. The Extent of Occurrence was calculated as the area of a minimum convex polygon encompassing all known sites of extant occurrence. Within the Extent of Occurrence, a minimum Area of Occupancy based solely on the localities where herbarium specimens have been collected, and where the habitat appears to remain suitable, was calculated as the summed area of occupied grid squares using the recommended 2 × 2 km grid cell. Because such a calculation of Area of Occupancy possibly underestimates the true Area of Occupancy, in some cases where extensive suitable habitat remains, an estimated potential maximum Area of Occupancy reflects the area of suitable habitat within the Extent of Occurrence that might be occupied by the taxon. As a location is considered to be an area that could be affected by a single threatening event, whether including one or multiple subpopulations, locations were defined in consideration of the most serious threats potentially affecting the taxon.

TAXONOMIC TREATMENT

Genus *Scolopia* Schreb.

*Genera Plantarum* 1: 335 (1789). — Type: *S. pusilla* (Ga-errn.) Willd.

REMARKS

*Scolopia* strongly resembles *Ludia* Comm. ex Juss., which is confined to Madagascar, East Africa, and several groups of Indian Ocean islands, except that *Ludia* lacks petals. Sleumer (1972a) noted that species of *Scolopia* with caducous petals had been erroneously placed within *Ludia* in prior literature, while a few apetalous species known from inadequate material had been erroneously placed within *Scolopia*. He found that characters of the anther connective, style and venation did not correspond to generic boundaries, so the presence of petals is the only reliable distinction between the two genera. It seems possible that *Ludia* evolved within *Scolopia*, but in the absence of molecular evidence supporting that hypothesis, we maintain the traditional generic circumscriptions.

Fourteen species of *Scolopia* are herein recognized in Madagascar, one of them newly described and all endemic. These can be divided into two groups: the first consists of five species native to relatively dry habitats, which have single-flowered inflorescences and usually bear spines, while the second comprises nine species found usually in humid and littoral forests, which have more than one flower per inflorescence and lack spines. Flowering specimens are more easily identified than fruiting specimens, as known fruits of all species are similar in appearance (red, subglobose, the individual species' size ranges fairly large and overlapping too much to make size a useful character), while useful characters such as stamen number, flowering pedicel length, and anther morphology are obscured in fruit. (As far as can be determined, all Malagasy species have anthers with long extended connectives; this is not the case for all species of the genus, and the character helps to distinguish certain Malagasy species from similar species of the Mascarenes.) However, most herbarium specimens collected are fruiting, so the key presented here emphasizes vegetative features and those characters visible in fruit as much as possible.
KEY TO THE MALAGASY SPECIES OF _SCOLEPIA_ SCHREB.

1. Shrub or small tree, usually spiny; inflorescences 1-flowered; W, S, or extreme N or SE Madagascar, in dry to transitional forests or bush ................................................................. 2
   — Tree or seldom a large shrub, never spiny; inflorescences few- to several-flowered; E to extreme N or SE Madagascar, usually in humid or littoral forests ......................................................... 6

2. Ovary pubescent; glandular disk virtually absent; extreme SE and SW ...... 8. _S. meridionalis_ Capuron & Sleumer
   — Ovary glabrous; glandular disk present, with small inconspicuous glands ........................................... 3

3. Spines few or absent; leaves (2-3-6(-8)) cm, elliptical to subovate, the apex short-acuminate to subacute; NW Madagascar ................................................................. 5. _S. inappendiculata_ H.Perrier
   — Spines usually present; leaves 1-2.5 cm, obovate to oblong-oblong or suborbicular, the apex obtuse and often crenate; S or extreme N Madagascar ......................................................... 4

4. Leaves sometimes suborbicular; secondary veins 2-4 pairs, more conspicuous than tertiary veins, usually slightly curving and forming relatively broad angle with midrib; abaxial surface of sepals glabrous; S Madagascar ................................................................. 12. _S. spinosens_ Sleumer
   — Leaves always much longer than broad; secondary veins several pairs, very fine, straight and forming a narrow angle with midrib; abaxial surface of sepals minutely pubescent; extreme N Madagascar ......................................................... 5

5. Leaves narrowly oblong-obovate to oblong-oblate, (3-4-6(-8)) mm wide; stamens 40-60 .............................. 11. _S. septentrionalis_ Capuron & Sleumer
   — Leaves ovate, 7-12 mm wide; stamens 80-120 ........................................ 1. _S. calcicola_ Capuron & Sleumer

6. Adaxial surface of sepals and petals appressed-puberulent; perianth strongly accrescent in fruit; N Madagascar ................................................................. 7. _S. manongariviae_ H.Perrier
   — Adaxial surface of sepals and petals glabrous; perianth slightly or not accrescent ................................. 7

7. Leaves variable in shape and size, at maturity usually >6.5 cm long except in _S. delphinensis_, sp. nov. (where smaller leaves are common); pedicels >3-4.5 mm long in flower, >4.5 mm long in fruit; stamens 80-100 or more .... 8
   — Leaves relatively small, at maturity <6.5 (in _S. montana_ to 7.5) cm long; pedicels <3 mm long in flower, <4.5 mm (very rarely to 8 mm) long in fruit; stamens 20-50(-60) ................................................................. 11

8. Leaves narrowly elliptical to narrowly oblong-elliptical or oblongate (rarely elliptical), (2.5-3.5-7.3-9.3) × 1.3-2.9(-4.7) cm, with petiole 3-6(-8) mm long; apex acute to rounded (rarely obtuse or cuspidate); endemic to extreme SE near Fort-Dauphin ............. 2. _S. delphinensis_ Appleq. & G.E.Schatz, sp. nov.
   — Leaves elliptical to oblong-elliptical, sometimes somewhat obovate, or broadly elliptical, usually with most leaves >7.3 cm long or >2.9 cm wide, if smaller then with petiole at least 6 (rarely 5) mm long; apex variable, sometimes acuminated; widely distributed ................................................................. 9

9. Leaves elliptical to broadly elliptical, (5.2-7.5-12.4(-14)) × (3.2-3.8-7.7(-9.6)) cm, usually less than twice as long as broad; apex cuspidate (rarely rounded or emarginate); base convex, usually broadly so, to rounded; littoral forests ................................................................. 6. _S. madagascariensis_ Sleumer
   — Leaves elliptical to oblong-elliptical or narrowly elliptical (to somewhat obovate), normally <11.5 cm long and more than twice as long as broad; apex variable, often mostly acuminate or mostly rounded; base convex, usually acutely (infrequently cuneate to attenuate) ................................................................. 10

10. Leaves usually drying brown (rarely green, mostly from near-coastal habitats); apex acuminate to long-cuspidate (rarely to obtuse or rounded); usually low- to mid-elevation humid forests, rarely coastal .......... 4. _S. hazomby_ H.Perrier
    — Leaves normally drying pale, greenish to olive or gray-green; apex rounded to obtuse (infrequently cuspidate, emarginate); littoral and sublittoral forests ................................................................. 10. _S. orientalis_ Sleumer

11. Leaves ovate to elliptical (lanceolate) with a usually long-caudate apex and rounded base .... 14. _S. thovenonii_ H.Perrier
    — Leaves variable in shape, but not primarily ovate nor with a caudate apex ............................................ 12

12. Leaves broadly elliptical (to elliptical or slightly ovate or obovate), usually less than twice as long as broad; apex rounded (obtuse, emarginate); base convex and obtuse (to round) ...................... 13. _S. taimbarina_ H.Perrier
    — Leaves obovate (to oblongate) or narrowly oblong to oblongate-oblong, usually at least twice as long as broad; apex mostly short-cuspidate or mostly rounded; base cuneate (to attenuate) ......................................................... 13

13. Leaves obovate (to oblongate), (1.7-2.5-5.3-6(-6)) × (0.9-1.2-2.3-3.2) cm, with apex usually rounded (to somewhat obtuse or emarginate); littoral and sublittoral forests ........................................... 3. _S. erythrocarpa_ H.Perrier
    — Leaves narrowly oblong to oblongate-oblong, 3.5-7.5 × 1.4-3 cm, with apex short-cuspidate to rounded (rarely obtuse); low- to moderately high-elevation humid forests .......................................... 9. _S. montana_ Sleumer
Leaf shape is a valuable character for identification of species. In the humid and littoral forest species, leaf shape can be quite variable within species and the ranges of variation in related species overlap, but significant average differences exist. As these differences can be difficult to describe verbally, a figure showing “typical” leaf shapes in these species (Fig. 1) has been provided to facilitate use of the key. The color of the leaves upon drying is not entirely consistent within species, but shows strong trends that are correlated with ecological preferences. Collections from low- to high-elevation humid forests and dry bush almost always dry brown to dark brown, very rarely greenish brown, while most taxa of littoral and sublittoral forests almost always dry a pale color, usually greenish to gray-green or olive on at least one surface, or rarely dark-mottled. Since this pattern is observed from numerous localities and collections made over several decades, it is unlikely to be merely an artifact of varying specimen processing techniques; rather, it seems likely to reflect substantive differences in leaf anatomy or biochemistry correlated with adaptation to different habitats.

**Fig. 1.** — Representative leaf shapes from humid and littoral forest species of *Scolopia* Schreb.: A, *S. hazomby* (Razakamalala et al. 3507); B, *S. thouvenotii* (Schatz 2741); C, *S. taimbarina* (Antahirimena et al. 4309); D, *S. montana* (Randrianalavo et al. 608); E, *S. manongarivae* (Miller & Randrianasolo 4475); F, *S. manongarivae* of high elevation (Birkinshaw 885); G, *S. erythrocarpa* (Rahelohitra et al. 4800); H, *S. orientalis* (Ludovic 746); I, *S. madagascariensis* (Razakamalala et al. 160); J, *S. delphinensis*, sp. nov. (Ramison 475).
1. *Scolopia calcicola* Capuron & Sleumer


**Distribution and Habitat.** *Scolopia calcicola* is known only from a single collection, from Montagne des Français in the extreme north (Fig. 2).

**Remarks**

Notes from the type indicate that *Scolopia calcicola* is a spiny large shrub or small tree (“arbuste”) with platanoïd bark. It is distinguished from other species in the xerophytic group by its small obovate leaves and glabrous ovary.

**Conservation Status**

The preliminary assessment of the conservation status of *Scolopia calcicola* is Critically Endangered (CR B2ab(iii)). The single known location has not been protected, though efforts are currently underway to provide it some degree of protected status, and the area has suffered obvious anthropogenic degradation. Since the area of Montagne des Français is relatively often visited by botanical collectors, the lack of additional specimens is evidence that the population is likely to be small.

2. *Scolopia delphinensis* Appleq. & G.E.Schatz, sp. nov. (Fig. 3)

*Tree without spines; leaves drying pale green, narrowly elliptical, up to 8.6 × 2.9 cm, with apex acute to somewhat cuspidate or rounded, base convex to cuneate, petiole 4-6(-8) mm; inflorescences 3-7-flowered; pedicels post-flowering 6-7 mm; sepals and petals glabrous except for minutely ciliolate margins; stamens very numerous, with connective 2 to 3 times longer than thecae.*


FIG. 3. — *Scolopia delphinensis* Appleq. & G.E.Schatz, sp. nov.: A, flowering branch; B, flower, post-anthesis; C, stamen; D, abaxial leaf surface with major veins shown on right side, smaller veins on left; E, perianth in top view. A-E, Zarucchi et al. 7618 (holotype, MO). Scale bars: A, D, 2 cm; B, 2 mm; C, E, 1 mm.
**Revision of Malagasy Scolopia Schreb.**


**DISTRIBUTION AND HABITAT.** — *Scolopia delphinensis*, sp. nov. is confined to the region around Fort-Dauphin in the extreme southeast; it occurs in littoral forest and humid coastal forest (Fig. 4).

**DESCRIPTION**

Tree to 12 m, dbh 22 cm, or less often a shrub; bark smooth; young twigs pale gray, glabrous. Leaves narrowly elliptical (to somewhat oblong, oblanceolate, or, in exceptional leaves, elliptical), (2.5-)4-7.5(-9.3) × (1-)1.4-2.9(-4.7) cm, persistent, drying pale green to olive (or pale greenish brown) on abaxial surface, green to gray-green or dull, usually greenish or grayish brown on adaxial surface; petiole 3-6(-8) mm, glabrous; apex acute to rounded (obtuse, cuspidate), base convex to cuneate, margins entire, both surfaces glabrous, venation pinnate with major secondary veins brochidodromous, the first pair arising above the base conspicuous, otherwise weak and poorly differentiated from intersecondary veins. Inflorescences single, (1-)3-8-flowered, 1.5-3(-3.5) cm long, not elongating in fruit, glabrous or minutely papillate; pedicels (5-)6-8.5(-10) mm, not elongating in fruit, glabrous (minutely papillate). Flowers 4-5-merous; sepals lanceolate to narrowly deltoid or deltoid, 1.2-1.8 mm, glabrous, margins ciliolate; petals ovate to deltoid or oblong, often slightly longer and broader than sepals, 1.5-1.8 mm, glabrous, margins ciliolate; petals ovate to deltoid or oblong, often slightly longer and broader than sepals, 1.5-1.8 mm, glabrous, margins ciliolate; receptacle pubescent; stamens probably >100, filaments c. 2.5 mm, anthers 0.6-0.8 mm with thecae only c. 0.2 mm, connective exceeding them 2-3 times; ovary glabrous; style 3.5-5 mm; stigma shallowly lobed. Fruit globose to subglobose, often with persistent style, 9-12(-15) mm diameter, red (orange) at maturity; perianth in fruit mostly caducous and remains not accrescent; seeds 1-4, tan with a pale annulus at base, broadly ellipsoid to ovoid with apex obtuse and base truncate, 3.5-5.2 mm.

**REMARKS**

Two collections of *Scolopia delphinensis*, sp. nov. were mentioned by Sleumer (1972a) under *S. orientalis*, though they were kept separate from Tomasina specimens and noted to differ in having smaller leaves. The leaves of *S. delphinensis*, sp. nov. are usually smaller and proportionately narrower than those of *S. orientalis* as herein circumscribed, and have shorter petioles when they overlap in size; the inflorescences are also smaller. Another littoral species, *S. erythrocarpa*, has relatively small leaves and occurs sympatrically with *S. delphinensis*, sp. nov. at two localities; *S. erythrocarpa* has obovate to oblanceolate leaves with usually rounded apices, much shorter pedicels (to 3 mm in fruit), and fewer than 40 stamens.

**ETHNOBOTANY**

The wood of *Scolopia delphinensis*, sp. nov. is used to make boards (*Réserves Natuerles 46-R-87*).

**VERNACULAR NAMES**

Lampivahatra (*Service Forêtiere 2850, 3360*); Lapivahatra (*Réserves Natuerles 46-R-87* [Antanosy dialect]); Mena-hily (*Ramison et al. 475*); Zora (*Rabenantoandro et al. 396, 1584; Ramison & Armand 320; Randriatafika & Ramisy 407*).

**CONSERVATION STATUS**

The preliminary assessment of the conservation status of *Scolopia delphinensis*, sp. nov. is Endangered (EN B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v). With an Extent of Occurrence of 174 km², and an Area of Occupancy of c. 36 km², the species currently exists at four locations. While some of the habitat is protected, the remainder is subject to ongoing degradation and clearing for mining; recent collections show that the species is still easily found in those areas.

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Fig. 4. — Distribution of *Scolopia delphinensis*, sp. nov. (▲); *S. orientalis* Sleumer (●); and *S. taimbarina* H.Perrier (■).
3. **Scolopia erythrocarpa** H.Perrier


**DISTRIBUTION AND HABITAT.** — *Scolopia erythrocarpa* is confined to littoral and sublittoral forests, on sand; it is widely distributed on Madagascar's east coast where littoral forests survive (Fig. 5). Prior literature on this species (Perrier de la Bâthie 1940, 1946; Sleumer 1972a) wrongly states that it occurs at up to 800 or 900 m and that the types of both *S. erythrocarpa* and *S. louvelii* came from Analamazaotra. This arises from confusion involving *Perrier 5976*, originally a syntype of *S. erythrocarpa* that was collected at Analamazaotra; this collection is identifiable as *S. taimbarina*. *Scolopia erythrocarpa* is always found close to sea level.

**REMARKS** *Scolopia erythrocarpa* is probably closely related to *S. orientalis* and *S. delphinensis*, sp. nov., likewise species of littoral forests. It is a tree growing to at least 15 m tall, with dbh to 80 cm; the bark is smooth and whitish, the flowers white to greenish, and the fruits red at maturity. It is distinguished by usually small, obovate to oblongate leaves with rounded apices and small dense inflorescences with very short pedicels even in fruit. The leaves do not dry greenish as consistently as those of the three other coastal species, and the stamens are 40 or fewer, rather than usually 100 or more as is typical of those species.
**ETHNOBOTANY**

The wood of *Scolopia erythrocarpa* is used for construction (Ludovic 710; Ludovic & Bona Kondro 501; Service Forestier 16204, 17806).

**VERNACULAR NAMES**

Aferonakavy (*Service Forestier 17806* [Betsimisaraka dialect]); Aferonkavy à p [étites] [feuilles] (*Service Forestier 18156*); Fotsirony (*Service Forestier 16204* [Taisaka dialect]); Fotsony (*Ludovic 710*); Hazofotsy (*Rabevohitra et al. 4089, 4800; Ratovonon 1992*); Hazomainty (*Randrianatavo et al. 1920*); Hazomboatranona (*Service Forestier 15456*); Menahy (*Service Forestier 5865*); Menavahatra (*Rabevohitra et al. 4764*); Voatonakala (*Louvel 204; Louvel 213; Rabevohitra et al. 4709; Service Forestier 15488*); Vononakala (*Koopman et al. 126*); Zora (*Rabevohitra & Rabenantoandro 3829*).

**CONSERVATION STATUS**

*Scolopia erythrocarpa* is known from 20 locations and has an Extent of Occurrence of 46,498 km². However, it is restricted to littoral forest, a highly threatened ecosystem of which only fragments remain, with an estimated minimum Area of Occupancy of 120 km². The degree of fragmentation suggests that *S. erythrocarpa* be assigned a preliminary assessment of Vulnerable (VU B2ab(iii)). The species occurs in the Protected Areas of Mahabo, Mandena, Masaola, and Sainte Luce.

**4. Scolopia hazomby** H.Perrier


**Fianarantsoa.** Aferonan-kavy, forêt de Sorata, 15°1′19″S, 49°18′48″E, 1025 m, 9.X.2008, fr., *Forestier et al. 6968*.

Scolopia hazomby is a large tree (to 20 m, 60 cm dbh) with relatively smooth, whitish or grayish bark; its leaves are usually oblong-elliptical to elliptical and usually have acuminate (to cuspidate, or rarely oblong to rounded) apices. The leaves, which are variously stated to be persistent or caducous, generally dry brownish with the surfaces differently colored; the adaxial surface is sometimes olive and the abaxial surface sometimes reddish. The leaves never dry strongly red, which is one means of distinguishing this species from the similar-looking *Ludia scolopoides* Capuron & Sleumer; another is that its fruits never exceed 1.5 cm in diameter, whereas those of *L. scolopoides* may be over 2 cm and conspicuously bumpy. The long-pedicelled flowers are greenish white and the fruits red; the inflorescences are often relatively large. Most specimens have been labelled as *S. madagascariensis*, which represents a misapplication of that name following Sleumer’s (1972a) excessively broad and heterogeneous circumscription (see discussion below); true *S. madagascariensis* is broader-leaved, with leaves usually cuspidate and drying greenish, and is consistently littoral.

Several specimens mentioned above as having affinities to *Scolopia hazomby* may represent variants of that species, hybrids, or a cryptic taxon; the available material does not suffice to clarify their status. They have leaves drying greenish, which is atypical of *S. hazomby* and *S. madagascariensis*, and are variously stated to be persistent or caducous, generally with weak veins; flowers are only present on one specimen but are not obviously distinctive. This coastal form is easily mistaken for *S. orientalis*, a possibly closely related species, except that the leaves are usually acuminate. One specimen (*Service Forester 14057*), from the north, has a somewhat unusual leaf shape and very large styles; this may represent a distinct species or subspecies, but the specimen is in poor condition and would not serve as an adequate type. Further investigation of these populations would be highly desirable.

**ETHNOBOTANY**

The wood of *Scolopia hazomby* is used for the manufacture of boards and railroad ties (*Ratovoson et al. 318; Service Forester 14740, 21782, 26659*) and for heating and charcoal (*Service Forester 14740*). Leaves are used to treat stomachache (*Ratovoson et al. 318; Service Forestier 14057*). The fruit is eaten by lemurs (*Kremen et al. 62; Verrall 1900*).
5. *Scolopia inappendiculata* H.Perrier


**DISTRIBUTION AND HABITAT.** — *Scolopia inappendiculata* occurs in dry forest in northwestern Madagascar (Fig. 6), on sand.

**REMARKS**

*Scolopia inappendiculata* is a small tree or large shrub with platanoid bark. It is the only species found around Mahajanga, and is distinguished from species of the xerophytic group known from the extreme north by its larger, often short-acuminate leaves and few or absent spines.

**CONSERVATION STATUS**

The preliminary assessment of the conservation status of *Scolopia inappendiculata* is Endangered (EN B1ab(iii)+B2ab(ii)). It is known from at most four locations in the region of Mahajanga, with an Extent of Occurrence of 165 186 km² and a minimum Area of Occupancy of 16 km²; the maximum potential Area of Occupancy is certainly less than 500 km² given that much of the area within the EOO polygon consists of the delta of the Betsiboka River. The species has not been recollected for almost fifty years, despite the accessible terrain, and the limited remaining natural vegetation in the area is subject to continuing habitat degradation.

6. *Scolopia madagascariensis* Sleumer


Scolopia madagascariensis is known from seventeen locations and has an Extent of Occurrence of 22 166 km². However, it is restricted to littoral forest, a highly threatened ecosystem of which only fragments remain, and has a small minimum Area of Occupancy of 88 km². The degree of fragmentation suggests that S. madagascariensis be assigned a preliminary assessment of Vulnerable (VU B2ab(iii)). The species is fairly common in the Protected Area of Masoala.

7. Scolopia manongarivae H.Perrier


**Distribution and habitat.** — *Scolia* manongarivae is restricted to the northern province of Antsiranana and a small adjacent portion of Mahajanga (Fig. 6); it is found at moderate to high elevations, sometimes along streambanks. Habitat types include xerophytic forest, moss forest, and at lower elevations cloud and valley forest; it is reported to occur on laterite.

**Remarks**

*Scolia manongarivae* is a tree to 15 m tall. The leaves are persistent and coriaceous, with many weak wavy secondary veins; they dry green, often to olive beneath, or less often brown. Most specimens from lower elevations have large, broad leaves (usually 5.5-9.5 cm long, but relatively short-petioled) with often conspicuous venation. A few specimens from the highest elevations, around Tsaratanana, have much smaller and more strongly coriaceous leaves; these may represent a genetically distinct local variety or a phenotypic response to extreme altitude. The flowers are white to pale yellow, with yellow to red glands. The adaxial surface of the sepals and petals is pubescent and the perianth is accrescent in fruit, with sepals elongating to 2.5-3 mm. Fruits are usually described as green, rarely as red, but fully ripe fruits may never have been collected.

**Vernacular names**

Telotritry (Gautier & Chatelain 2782; Miller & Randrianasolo 4478).

**Conservation status**

*Scolia manongarivae* is known to exist at 13 locations; though its minimum Area of Occupancy is only 64 km$^2$, it has an Extent of Occurrence of 12 005 km$^2$ and a potential maximum Area of Occupancy of possibly suitable forest within the EOO. The preliminary assessment of its conservation status is therefore Near Threatened (NT). While it occurs in the Protected Areas of Anjanaharibe-Sud, Manongarivo, Marojejy, and Tsaratanana, there is likely to be decline outside of those protected areas. Additional material examined. — Madagascar. Prov. Toliara, Baie des Galions (Ranofotsy) au SW de Fort-Dauphin, bush xerophile, 1-100 m, 18-21.II.1955, fr., Humbert & Capuron 28979 (P×2). — Ch’t d’Alibert dans le BPL de Ranofotsy, SW de Fort-Dauphin, forêt de transition sur granite, 200-500 m, 27.II.1955, fr., Humbert & Capuron 29134 (P). — Bassin de la Manandabalo dans le Massif de l’Analavolona, au N du Fihetrenaha, vers 1000-1300 m d’alt., 13-15.XII.1962, fl., Service Forestier 22196 (P). — Colline (gneiss) près d’Alibert, baie de Ranofotsy, au SW de Fort-Dauphin, 10.1.1963, fl., fr., Service Forestier 22366 (P×3). — Petites inférieures orientales du massif granitique du Vohitsa Ventrivola, au S de Ranofotsy, 8.XII.1968, fl., Service Forestier 28587 (P×2).

**Distribution and habitat.** — *Scolopia meridionalis* occurs in transitional forest and dry bush in southern Madagascar (Fig. 2). Most collections are from two localities in the extreme southeast; a single collection from the southwest, at the massif of Analavolona, is atypical (see discussion below).

**Remarks**

*Scolia meridionalis* is usually a small tree to 6 m or a large shrub, often with spiny branches, that belongs to the group of xerophytic species with one-flowered inflorescences. It is distinguished from others in that group by its obovate to rhomboid, usually 2-5 cm long leaves and pubescent ovaries. The only collection from the disjunct population at Analavolona was a tree 15-20 m tall with platanoid bark. Although formal taxonomic recognition of this population was not possible given the very limited available material, it may be suspected that it represents at least a distinct subspecies. Further investigation would be desirable.

**Conservation status**

The preliminary assessment of the conservation status of *Scolopia meridionalis* is Endangered (EN B1ab(iii)+2ab(iii)), with an Extent of Occurrence of 1675 km$^2$, and a minimum Area of Occupancy of 12 km$^2$. It is known only from older collections at three locations, two very close together in an area of the extreme southeast subject to continuing habitat degradation and one, whose population may well be genetically and taxonomically distinct, far to the west at Analavolona.

9. *Scolopia montana* Sleumer

Blumea 20: 46 (1972). — Type: Madagascar. Prov. Toamasina [?], forêt orientale des cimes, massif du Bebejana (N de la presqu’ile Masoala), vers 1000 m d’alt., XII.1953, fl., Service Forestier 8824 (holo-. P[P00077432]; iso-. K[K000231289], Lx2[L0011247, L0011248], TEF[TEF000249], photos seen).

Scolopia montana has small, oblanceolate to narrowly obovate leaves, with rounded to obtuse (or rarely cuspidate) apices and cuneate to convex bases, that dry greenish-brown to olive adaxially and brownish abaxially. The pedicels are short in flower; they remain under 2.5 mm in most fruiting specimens but reach 7–8 mm in one. The perianth is probably somewhat accrescent in fruit, but available material does not suffice to confirm this.

**Conservation Status**

The preliminary assessment of the conservation status of *Scolopia montana* is Near Threatened (NT). Collections are known from only five locations, but these include the Protected Areas of Anjanaharibe-Sud, Betampona, Masoala, and Zahamena, which reduces the risk that it will be endangered in the near future. Its Extent of Occurrence is 24,078 km², and although its minimum Area of Occupancy is 20 km², the estimated potential maximum Area of Occupancy based on likely suitable habitat within the Extent of Occurrence exceeds 2000 km².

10. *Scolopia orientalis* Sleumer


**Distribution and Habitat.** — *Scolopia orientalis* is endemic to eastern littoral or sublittoral forests (Fig. 4), on sand.

**Remarks**

*Scolopia orientalis* is a tree to 15 m, or occasionally a climbing shrub, with smooth blackish to brownish bark and persistent, elliptical to obovate-oblong leaves. It is the most widespread of the four littoral species, and as is common in that group, has leaves that dry greenish to grayish-green or olive. The flowers are fragrant and visited by bees (label data from *Schatz et al. 1944*); the calyx is white to pale pink, the petals white to yellowish white, the stamens white, and the gynoecium reddish purple. The fruits are reddish and relatively often have a persistent style. It may most easily be confused with the littoral species *S. delphinensis*, sp. nov. and *S. madagascariensis*, both of which have numerous stamens and usually greenish-drying leaves; the former has smaller and narrower leaves and is endemic to the extreme southeast (where *S. orientalis* does not occur), and the latter has broader leaves whose apices are usually cuspidate rather than rounded.

**Ethnobotany**

The wood of *Scolopia orientalis* is used for construction (*Service Forestier 16498, 16617*).

**Vernacular Names**

Aforonakary (*Service Forestier 16498* [Betimsaraka dialect]); Masopineng (Rabeohivitra et al. 4323); Menahily (*Rabohivelova et al. 222*); Menahy (*Service Forestier 9527, 9748, 16854*); Menahy à [petites] f[euilles] (*Service Forestier 10549*); Tokokintsy (*Service Forestier 16617* [Betimsaraka dialect]).
CONSERVATION STATUS

The preliminary assessment of the conservation status of Scolopia orientalis is Vulnerable (VU B2ab(iii)). It is known from ten locations, and has an Extent of Occurrence of 30 311 km² and a minimum Area of Occupancy of 64 km². It is restricted to littoral forest, a highly threatened and fragmented ecosystem, which is mostly unprotected and subject to ongoing degradation; it occurs in the Protected Area of Masoala.

11. Scolopia septentrionalis Capuron & Sleumer


DISTRIBUTION AND HABITAT. — Scolopia septentrionalis is known only from two collections from a single locality, the Sahafary forest, in the extreme north (Fig. 5).

REMARKS

Scolopia septentrionalis is a large shrub or small tree (“arbuste”); the fruit may be reddish. It may be distinguished from other species of the single-flowered xerophytic group by its small and narrow leaves; it also has far fewer stamens than S. calcicola, which occurs nearby.

CONSERVATION STATUS

The preliminary assessment of the conservation status of Scolopia septentrionalis is Critically Endangered (CR B1ab(iii)+B2ab(iii)). With an Extent of Occurrence of 16 km² and an Area of Occupancy of less than 10 km², S. septentrionalis is known from only a single location, the Sahafary forest, which is unprotected and subject to continuing degradation. It has not been recollected for almost fifty years.

12. Scolopia spinescens Sleumer


DISTRIBUTION AND HABITAT. — Scolopia spinescens is endemic to southern Madagascar (Fig. 6), where it occurs in dry forest, degraded bush, and transitional vegetation; one collection is reported from a gneiss substrate.

REMARKS

Scolopia spinescens is a small tree or shrub, sometimes spiny, with planotanoid bark. It is distinguished from similar species by its small, often suborbicular, few-veined leaves and glabrous ovary. The only other southern xerophytic species is S. meridionalis, which has larger, proportionately narrower leaves and a pubescent ovary.

The holotype of Scolopia spinescens is numbered only as Seyrig 331. The isotype at P bears several labels, including a handwritten label with Seyrig’s number 331, later annotated “5374”; a Herbier du Jardin Botanique label numbered 5374; a printed Paris label with Decary’s name; and a typed slip by Sleumer indicating that “Decary 5374 = Seyrig 331”. Sleumer’s protologue of S. spinescens listed the type as “Herb. Decary 5374, leg. Seyrig 331” (Sleumer 1972a: 49). The actual collector’s number, 331, must be used in preference to the later-added cataloguing number, 5374, which is not present on all duplicates.

CONSERVATION STATUS

The preliminary assessment of the conservation status of Scolopia spinescens is Near Threatened (NT). It is known from thirteen locations and has an Extent of Occurrence of 57 289 km² and a minimum Area of Occupancy of 52 km², but an estimated potential maximum Area of Occupancy based upon likely suitable habitat that probably exceeds 2000 km². Except for one collection within the Protected Area of Andohahela, the habitat is almost completely unprotected and subject to ongoing degradation. Only one collection has been made since 1968. It is therefore plausible that this assessment underestimates this species’ actual risk.

13. Scolopia taimbarina H.Perrier


ADDITIONAL MATERIAL EXAMINED. — Madagascar. Prov. Antsiranana, Réserve Naturelle Intégrale de Marojejy, 10.5 km NW Manantena, along tributary at head of Andranomifototra River, Campement 4, 14°26’24”S, 49°44’30”E, 1625 m, 4-13.XI.1996, fl., Rakotozafy et al. 894 (G, MO).

**14. Scolopia thouvenotii** H.Perrier


**DISTRIBUTION AND HABITAT.** — *Scolopia thouvenotii* is found in humid eastern montane forests in the province of Toamasina at low to moderate elevations (Fig. 2).

**REMARKS**

*Scolopia thouvenotii* is a tree up to 30 m tall, with dbh to 40 cm. The ovate or elliptical or occasionally lanceolate leaves are small, persistent, and brown on drying, with a blunt-tipped long-caudate apex. The fruits are white, the pedicels short, and the fruits reportedly green, though probably seen only when immature. Means of distinguishing it from *S. taimbarina* have been remarked above. It also could be confused with *S. hazomby*, which occurs in the same region, and which has more oblong to elliptical leaves and a usually convex (to cuneate) rather than rounded base. From existing material, the upper end of the leaf size range for *S. thouvenotii* is about 6.5 cm long with a 6 mm petiole, whereas this is the lower end of the typical mature leaf size range for *S. hazomby*, which also has much longer petioles.
imum Area of Occupancy based on likely suitable habitat that exceeds 2000 km². Most of the habitat is unprotected and subject to continuing degradation, although the species does occur in the Protected Areas of Andasibe-Mantadia, Masoala, and Nosy Mangabe. We project a decline in population size and suitable habitat at the Ambatovy mining site in the near future.

EXCLUDED NAMES

**Scolopia pinnatinervia** H.Perrier


**Scolopia urschii** H.Perrier


Sleumer (1972b) treated these names, previously considered to represent two distinct Malagasy species, as referring to a single species of *Ludia* from humid forests of central and eastern Madagascar.

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**REFERENCES**


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