

A revision of *Stephanodaphne* Baill. (Thymelaeaceae)

Zachary S. ROGERS

Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299 (USA)
and University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, MO 63121 (USA)
zachary.rogers@mobot.org

ABSTRACT

A taxonomic revision of *Stephanodaphne* Baill. (Thymelaeoideae, Thymelaeaceae) based on morphology is provided. Nine species are recognized, eight endemic to Madagascar and one endemic to Mayotte in the Comoro Island Archipelago. Three previously described species, *S. capitata* (Leandri) Leandri, *S. oblongifolia* Leandri and *S. pulchra* Leandri, are now placed into synonymy under *S. geminata* Leandri. Three new species are described, *S. pedicellata* Z.S. Rogers, *S. pilosa* Z.S. Rogers and *S. schatzii* Z.S. Rogers. The taxonomic treatment includes a key to species in English and French, full descriptions, exsiccatae; and distribution maps and provisional conservation assessments are provided for all nine species using IUCN (2001) criteria. Five are narrow endemics and qualify as endangered (EN): *S. cremostachya* Baill., *S. cuspidata* Leandri, *S. humbertii* Leandri, *S. perrieri* Leandri, and *S. schatzii*. One species, *S. pedicellata*, known only from the type collection, is provisionally considered critically endangered (CE).

KEY WORDS

Malvales,
Thymelaeoideae,
Thymelaeaceae,
Stephanodaphne,
Madagascar,
Mayotte,
conservation.

RÉSUMÉ

Révision de *Stephanodaphne* Baill. (Thymelaeaceae).

Cet article présente une révision taxonomique de *Stephanodaphne* Baill. (Thymelaeoideae, Thymelaeaceae) basée sur la morphologie. Neuf espèces sont reconnues, dont huit endémiques de Madagascar et une de Mayotte dans l'archipel des Comores. Trois espèces décrites antérieurement, *S. capitata* (Leandri) Leandri, *S. oblongifolia* Leandri et *S. pulchra* Leandri sont mises en synonymie de *S. geminata* Leandri. Trois nouvelles espèces sont décrites : *S. pedicellata* Z.S. Rogers, *S. pilosa* Z.S. Rogers et *S. schatzii* Z.S. Rogers. La partie taxonomique inclut une clé de détermination des espèces en français et en anglais, des descriptions complètes et des cartes de distribution. Les besoins de conservation sont provisoirement évalués à l'aide des critères de l'IUCN (2001), cinq espèces endémiques d'une zone très restreinte sont classées dans la catégorie « en danger » : *S. cremostachya* Baill., *S. cuspidata* Leandri, *S. humbertii* Leandri, *S. perrieri* Leandri et *S. schatzii*. Une espèce, *S. pedicellata*, uniquement connue de la localité type, est provisoirement considérée comme en danger critique (CE).

MOTS CLÉS

Malvales,
Thymelaeoideae,
Thymelaeaceae,
Stephanodaphne,
Madagascar,
Mayotte,
conservation.

INTRODUCTION

Thymelaeaceae, a family originally described by A.-L. DE JUSSIEU (1763), is composed of *c.* 45 genera and 700-800 species (MABBERLEY 1997; HERBER 2002). The family is cosmopolitan, almost entirely woody, and easily recognizable by its fibrous bark and estipulate fibrous leaves with entire margins. A recent molecular study (BAYER *et al.* 1999) utilizing *rbcl* and *atpB* sequence data has suggested that the family is a basal lineage in the order Malvales Dumort., and probably sister to *Tepuianthus* Maguire & Steyerl. (= Tepuianthaceae Maguire & Steyerl.) (WURDACK & HORN 2001).

The tropical genus *Stephanodaphne* Baill. (Thymelaeoideae, Thymelaeaceae) is composed of nine species of small to medium-sized trees, eight of which are endemic to Madagascar, and one is endemic to Mayotte, a small island located about 200 km off the northwestern coast of Madagascar. In the most recent classification of the family, HERBER (2002) treated *Stephanodaphne* as *incertae sedis* within tribe Daphneae Meisn., the largest tribe in the family (*c.* 40 genera, 670 species); however, he provisionally appended the genus to his “*Linostoma* group” within that tribe (*c.* 9 genera, 60 species). Nearly all of the genera in the group are lianescent and every genus except for *Stephanodaphne* has characteristic closely-parallel secondary venation which terminates in a prominent marginal vein.

The only molecular-based phylogeny of Thymelaeaceae conducted to date (VAN DER BANK *et al.* 2002) did not identify the sister-group of *Stephanodaphne* with *rbcl* and *trn-F* sequence data, but some preliminary findings based on those same sequences have shown that four Malagasy species (*S. cremostachya*, *S. cuspidata*, *S. geminata*, *S. humbertii*) group together with 100% bootstrap support (Michelle VAN DER BANK unpubl. data), which along with the morphological data, suggests that the genus is monophyletic.

TAXONOMIC HISTORY OF *STEPHANODAPHNE*

The goal of the present paper is to provide an updated taxonomic framework for *Stephanodaphne*

based on morphology, part of which is supported by a multivariate analysis of morphological data taken from herbarium specimens. The results of this paper are the most significant taxonomic findings taken from the author's Masters thesis research, conducted at the University of Missouri-St. Louis, Missouri, USA and the Missouri Botanical Garden, St. Louis, Missouri, USA. Additional results of the thesis include leaf anatomy and SEM micromorphology of *Stephanodaphne* and support some of the taxonomic decisions presented here (see also ROGERS 2003).

Stephanodaphne was originally based on two species, *S. cremostachya* Baill., endemic to southeastern Madagascar, and *S. boivinii* Baill., endemic to Mayotte, both of which still represent the geographical extent of the genus (BAILLON 1875). BAILLON established *Stephanodaphne* based on its unique combination of floral characters, following traditional generic delimitation in Thymelaeaceae. For *Stephanodaphne*, the combination of the annulus (i.e. the ring formed by the partial fusion of scale-like appendages borne at the mouth of the hypanthium; Fig. 1), the unarticulated hypanthium, the 10 diplostemonous stamens, and the absence of an extragynoecial disc clearly separated the genus from other genera of Thymelaeoideae. The name, *Stephanodaphne*, comes from the Greek words, *stephanos* meaning crown, obviously referring to this annulus, and *daphne*, meaning “false-laurel”, which was previously applied to the family Lauraceae Juss., but is now widely applied to the family Thymelaeaceae (BROWN 1956), including *Daphne* L. itself.

Some 50 years later, Jacques LEANDRI published a series of papers on Malagasy Thymelaeaceae, some specifically on *Stephanodaphne*. A third species, *Stephanodaphne geminata* was described in LEANDRI (1930a), and later that same year *S. cremostachya* was divided into three allopatric subspecies in the first of two revisions of the genus (LEANDRI 1930b). In his second revision, LEANDRI (1947) raised his subspecies to the species level and described five additional species, bringing the total number to nine. LEANDRI's final work on the genus was his treatment of the family for the *Flore de Madagascar et des Comores* (LEANDRI 1950), in which no significant changes to the taxonomy of *Stephanodaphne* were proposed. The genus has received little attention since the treatment in the *Flore*.

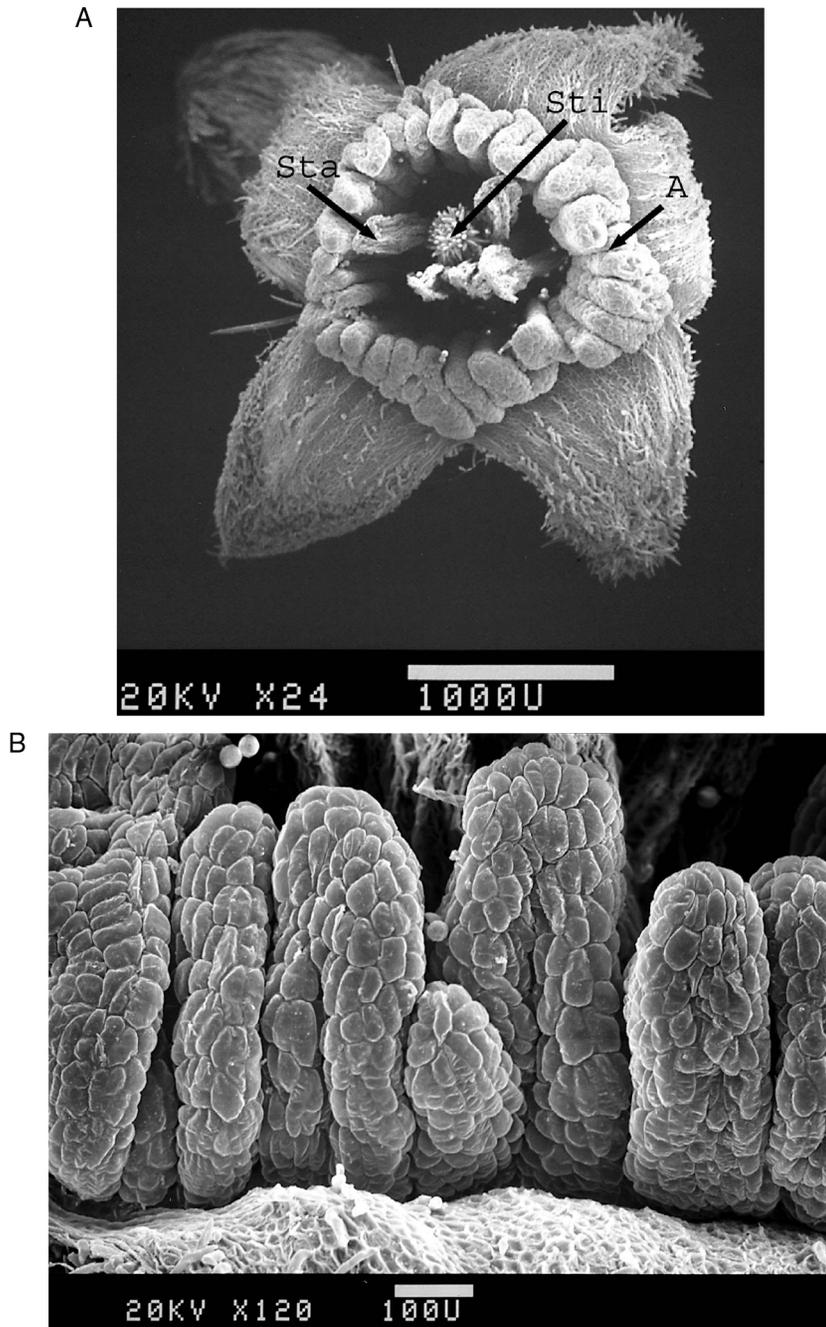


FIG. 1. — Flower SEM of *Stephanodaphne cremostachya* Baill.: **A**, flower (A, annulus; Sta, upper whorl of stamens; Sti, stigmatic surface); **B**, detail of the annulus and scale surface. Rogers *et al.* 93.

TABLE 1. — The 64 collections of *Stephanodaphne* included in the principal components analysis.

Collection	Species
Derleth 126	<i>S. perrieri</i>
Dorr 3987	<i>S. cremostachya</i>
Dumetz 518, 583	<i>S. cremostachya</i>
Dumetz 715	<i>S. pilosa</i>
Dupuy MB531	<i>S. pilosa</i>
Gautier 3452	<i>S. geminata</i>
Humbert 13938	<i>S. humbertii</i>
Humbert 29045	<i>S. pilosa</i>
Humbert 32022, 32023	<i>S. geminata</i>
Leandri 834, 1988	<i>S. geminata</i>
Leeuwenberg 13984	<i>S. pilosa</i>
Leeuwenberg 14328	<i>S. geminata</i>
Perrier de la Bâthie 4605	<i>S. perrieri</i>
Perrier de la Bâthie 15241, 16856, 17557	<i>S. geminata</i>
Rabenantoandro 803	<i>S. cuspidata</i>
Rabevohitra 2032, 2198	<i>S. cremostachya</i>
Rakotomalaza 978, 1171	<i>S. geminata</i>
Rakotovaao 860	<i>S. schatzii</i>
Randriamampionona 231	<i>S. pilosa</i>
S. Randrianasolo 223	<i>S. geminata</i>
Randrianjanaka 616	<i>S. geminata</i>
Randriantafika 64	<i>S. cremostachya</i>
Rasoavimbahoaka 187	<i>S. pedicellata</i>
Razafimandimbison 110	<i>S. geminata</i>
Réserves Naturelles 4690	<i>S. geminata</i>
Réserves Naturelles 10041	<i>S. pilosa</i>
Rogers 47, 48	<i>S. pilosa</i>
Rogers 52, 53, 56	<i>S. schatzii</i>
Rogers 70, 73	<i>S. cuspidata</i>
Rogers 93, 94	<i>S. cremostachya</i>
Rogers 95	<i>S. humbertii</i>
Rogers 96, 97, 98, 99	<i>S. pilosa</i>
Rogers 105, 111	<i>S. cremostachya</i>
Rogers 113, 115	<i>S. pilosa</i>
Rogers 129, 137, 141, 146	<i>S. geminata</i>
Rogers 168, 173	<i>S. pilosa</i>
Schatz 2578	<i>S. schatzii</i>
Scott Elliot 2403	<i>S. cremostachya</i>
Service Forestier 6764, 22054, 22633	<i>S. geminata</i>
Sweeney 1338	<i>S. pilosa</i>
Turk 756	<i>S. schatzii</i>

MATERIALS AND METHODS

PRINCIPAL COMPONENTS ANALYSIS

Sixty-four fertile collections in good condition, representing all nine species recognized by LEANDRI (1947, 1950), were selected for the principal components analysis (PCA; see Table 1). Nineteen morphological characters showing apparent species-specific variation were chosen

TABLE 2. — The 19 characters used in the principal components analysis (PCA).

Character	Code for PCA
Length of longest blade	LBL
Width of longest blade	LBW
Length/width ratio of longest blade	L/W LONG
Length of widest blade	WBL
Width of widest blade	WBW
Length/width ratio of widest blade	L/W WIDE
Indument density on abaxial blade (per cm ²)	TRI_DENS
Indument aspect (adpressed; erect)	IND_ASP
Trichome length on abaxial blade	TRI_L
Number of secondary veins	#SEC_VEINS
Angle of secondary veins	ANGLE_SEC
Distance between secondaries	DIST_B/T_VEINS
Distance of submarginal vein from margin	DIST_LOOP
Inflorescence type (capitate; spicate; umbellate)	INFL
Peduncle length	PED_L
Number of flowers per inflorescence	#FL/INFL
Flower length	FL_L
Fruit length	FR_L
Fruit beak length	FR_BEAK

for study (Table 2). Two qualitative characters were included in the analysis (inflorescence type, INFL; indument aspect, IND_ASP). Values for each of the 17 quantitative characters were assigned by taking the mean of three measurements on a representative herbarium sheet for each of the 64 collections. The statistical package SPSS (version 11.0) was used to conduct the PCA using the default settings. Measurements were standardized *a priori* in the software.

TAXONOMIC TREATMENT

A total of 187 herbarium collections of *Stephanodaphne* were available for study. Specimens were examined from the following herbaria: BM, BR, K, G, GH, P, MO, NY, TAN, TEF, US, WAG (herbarium citation follows HOLMGREN *et al.* [1990]). I spent two months of field work collecting additional material of *Stephanodaphne* in Madagascar, which account for 63 numbers (34% of the total number of examined collections), and includes six of the nine species recognized in this revision. Complete collection data for cited exsiccatae, and photographs of types and other representative collections, are available on the

W³TROPICOS database at: <http://mobot.mobot.org/W3T/Search/vast.html/>. Historical collections lacking geographic coordinates were post-facto georeferenced using the web-based “Gazetteer to Malagasy Botanical Collecting Localities” (SCHATZ & LESCOT 2003; <http://www.mobot.org/MOBOT/Research/madagascar/gazetteer/>), and are surrounded by square brackets in the citation of examined exsiccatae. Species distribution maps were created using ESRI ArcView software (version 3.2a). Distributions were mapped over the five simplified bioclimatic zones of Madagascar (SCHATZ 2000, following CORNET 1974). Conservation status has been assigned following the IUCN (2001) *Red List Categories and Criteria* version 3.1. The calculation for the area of occupancy is based on a 10 km² grid cell size for all species except *Stephanodaphne cremostachya* and *S. cuspidata*, for which a 1 km² cell size was more appropriate when considering their narrow distributions and smaller extents of occurrence. Descriptive terminology follows STEARN (1992).

The species concept used in this revision is the general lineage concept of DE QUEIROZ (1998), in which species are defined as “segments of population-level evolutionary lineages” (p. 72). The species criterion (i.e. the way species are recognized) is based on phenetic similarity, so that species are considered “assemblages of individuals with morphological features in common, and [are] separable from other such assemblages by correlated morphological discontinuities in a number of features” (DAVIS & HEYWOOD 1963: 92). Species as recognized in this taxonomic treatment retain their morphological distinctiveness even in sympatry. No infraspecific taxa are recognized.

RESULTS

PRINCIPAL COMPONENTS ANALYSIS (PCA)

The morphological data were explored in multivariate space by running a number of analyses on all 64 measured specimens, as well as on smaller subsets of geographically restricted data to investigate local patterns of variation. Of the 64 specimens included in the analysis, only 17 (27%), representing six of the nine species, could be scored for all characters, because the majority

of specimens lacked open flowers and mature fruits. Thus, so that all 64 specimens and every species could be analyzed, the PCA discussed here does not include flower and fruit characters (see ROGERS 2003 for additional results).

Several specimens representing *Stephanodaphne schatzii*, the species with the most distinctive linear leaf shape, were the most discrete from the other specimens in the bivariate scatter plot of PC1 vs PC2 (Fig. 2). Specimens of the other taxa grouped together, but the individual species did not separate clearly from one another. The first principal component explained 37% of the variation, whereas the second, third, and fourth extracted components together accounted for c. 50% of the total variation explained in the PCA (Table 3). Characters such as leaf length and width (LBW, WBL, WBW), number of secondary veins (#SEC_VEINS), and the distance of the submarginal loop from the margin (DIST_LOOP) were the most heavily loaded on PC1 (Table 4), and leaf blade length to width ratio (L/W LONG, L/W WIDE) was the most heavily loaded character on PC2. The inclusion of the two qualitative characters had little effect on the analyses.

The results demonstrate that multiple specimens of most species cluster together quite well in multivariate space. However, only specimens of *Stephanodaphne schatzii*, the species with the most dissimilar vegetative morphology, separated clearly from the main clustering of specimens. This PCA also suggests that the results underestimate the distinctiveness of several taxa (e.g., *S. pedicellata*, *S. humbertii*) for which sufficient specimens with critical morphological data, such as variation in floral and fruit morphology, are lacking.

Several species recognized in the taxonomic treatment were not strongly supported by the principal components analyses for two primary reasons. First, some of the diagnostic morphological characters clearly separating the species were excluded from the analysis, because those characters in particular were difficult to quantify, unavailable on some specimens, or were related to micromorphology. Second, the inclusion of species displaying a large degree of quantitative morphological variation (e.g., *Stephanodaphne*

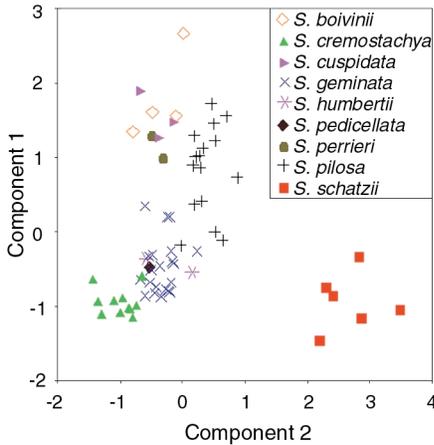


FIG. 2. — Graphical representation of the specimens of *Stephanodaphne* and their variation on the first two principal components.

geminata Leandri) produced extra “noise” in multivariate space, which caused some species group appear less discrete.

TAXONOMIC TREATMENT

STEPHANODAPHNE Baill.

Adansonia 11: 302 (1875).

TYPE. — *Stephanodaphne boivinii* Baill.

Treelets to trees, bark longitudinally striate, young stems sericeous or glabrescent, trichomes unbranched, unicellular, short (*c.* 1 mm long). Leaves alternate, spiral on orthotropic shoots, secondarily distichous on plagiotropic shoots, estipulate; leaf blades undulate or rarely planar, glabrous adaxially, margins entire, revolute, especially near base, midrib grooved adaxially, raised abaxially, venation brochidodromous; leaf buds curved adaxially, sericeous, venation conduplicate; petioles twisted and rugose, articulate, grooved adaxially. Inflorescences supra-axillary, often appearing leaf-opposed or terminal capitate, spicate or umbellate, inflorescence bracts 1 (4 in *S. boivinii*), free, subtending the flowering portion of peduncle, membranous, caducous or persistent, glabrous adaxially. Flowers bisexual,

TABLE 3. — Principal component loadings across the first four principal components.

Component	Total	Initial Eigen values	
		% of variance	Cumulative %
1	5.935	37.096	37.096
2	3.687	23.042	60.138
3	2.515	15.721	75.859
4	1.793	11.206	87.065

TABLE 4. — Character loadings on the first two principal components (*, characters with > 80% of the variation explained on PC1; +, > 80% on PC2).

Character	Component	
	1	2
INFL	-.311	-.430
LBL	.780	.503
LBW*	.918	-.267
L/W LONG+	-.285	.874
WBL*	.818	.442
WBW*	.934	-.267
L/W WIDE*	-.235	.898
PED_L	.139	-.032
#FL/INFL	-.199	-.475
TRI_DENS	.518	.431
IND_ASP	.456	.315
TRI_L	-.105	.334
#SEC_VEINS*	.906	-.008
ANGLE_SEC	.672	-.542
DIST_B/T_VEINS	.198	.639
DIST_LOOP*	.923	-.121

sessile or subsessile, rarely distinctly pedicellate, white or green, rarely pale yellow; hypanthium cylindrical, wider near mouth, articulation absent, glabrous adaxially, covered with dense sericeous indument abaxially, ruptured laterally by expanding fruit; sepals 5, small, spreading or reflexed; petals absent; annulus composed of 15-45 densely-packed scales, borne at mouth of hypanthium, scales partially fused, or rarely free, white (yellow in *S. schatzii*), marcescent soon after flower opens, distinctively black when dry, glabrous, papillate; stamens 10, in two whorls of five, diplostemonous, whorls inserted at different heights, included, introrse, straight in bud, filaments adnate to floral tube, glabrous, slender, short portion free near anthers, anthers oblong, basifixed, often dehiscent before flower opens; extragynoecial disc absent; ovary superior, unilocular, ovoid, densely sericeous, sessile, ovule 1, anatropous, apical, off-center, style terminal,

sericeous to strigose, glabrous near stigma, stigma capitate, simple, included, papillate. Fruits white or yellow at maturity, berry-like, single-seeded, ovoid to subspherical, sericeous when young, usually glabrescent, surrounded at the base by the marcescent hypanthium, style persistent, forming a beak tufted with sericeous trichomes, pericarp

slightly fleshy. Seeds brown, rarely black, ovoid to subspherical, shiny, beaked, glabrous; coat thin and crustaceous; endosperm absent in mature seeds; embryo ovoid to spherical, surrounded by thin membranous layer; cotyledons straight, large, thick and fleshy, radicle short, plumule inconspicuous.

Key to the species of *Stephanodaphne*

1. Young stems and abaxial surface of leaf blades covered with persistent scabrous or soft indumentum 2
- 1'. Young stems and abaxial surface of leaf blades glabrescent 4
2. Leaf blades linear, length/width ratio *c.* 8-22:1, rarely less, base rounded, margin flat 9. *S. schatzii*
- 2'. Leaf blades broadly elliptic, slightly ovate, or obovate, length/width ratio 2-5:1, rarely more, base attenuate to cuneate, margin undulate 3
3. Indument adpressed; abaxial leaf surface scabrous, margin strigose 3. *S. cuspidata*
- 3'. Indument erect; abaxial leaf surface soft, margin with dense sericeous indument 8. *S. pilosa*
4. Inflorescence spicate 5
- 4'. Inflorescence capitate or umbellate 6
5. Leaf blades broadly elliptic to ovate, rarely obovate, (2.3-)3.3-9.5(-10.1) cm long; hypanthia 4-6 mm long; fruits 8-11 mm long 2. *S. cremostachya*
- 5'. Leaf blades obovate, (6.3-)7.3-20.3 cm long; hypanthia 9-12(-19) mm long; fruits 11-15 mm long 7. *S. perrieri*
6. Flowers and fruits distinctly pedicellate; fruit beak 8-11 × 1.5-3 mm 6. *S. pedicellata*
- 6'. Flowers and fruits sessile or subsessile; fruit beak to 7 × 1 mm 7
7. Secondary veins (10-)11-19 per side, angle of divergence from the midvein 70°-85°; number of inflorescence bracts 4 [Mayotte] 1. *S. boivinii*
- 7'. Secondary veins 4-12(-14) per side, angle of divergence from the midvein 30°-75°; number of inflorescence bracts 1 [Madagascar] 8
8. Inflorescences 2-3(-4)-flowered; hypanthia 0.7-1.1 cm long; sepals spreading [southeastern Madagascar] 5. *S. humbertii*
- 8'. Inflorescences (2-)3-12-flowered; hypanthia (1.3-)1.6-3.9(-4.1) cm long; sepals reflexed [northern, central, and western Madagascar] 4. *S. geminata*

Clé des espèces de *Stephanodaphne*

1. Jeunes tiges et face abaxiale des feuilles couvertes d'un indument persistant scabre ou souple 2
- 1'. Jeunes tiges et face abaxiale des feuilles glabrescentes 4
2. Limbes foliaires linéaires, 5,2-21,4 fois plus longs que larges, base arrondie, marge plane 9. *S. schatzii*
- 2'. Limbes foliaires largement elliptiques, légèrement ovés ou obovés, 1,7-5,4(-6,1) fois plus longs que larges, base atténuée à cunée, marge ondulée 3
3. Indument apprimé ; face adaxiale des feuilles scabre, marge strigieuse 3. *S. cuspidata*
- 3'. Indument dressé ; face abaxiale des feuilles douce au toucher, marge à indument soyeux et dense 8. *S. pilosa*
4. Inflorescence en épi 5
- 4'. Inflorescence en capitule ou en ombelle 6
5. Limbe foliaire largement elliptique à ové, rarement obové, long de (2,3-)3,3-9,5(-10,1) cm ; hypanthium long de 4-6 mm ; fruits longs de 8-11 mm 2. *S. cremostachya*
- 5'. Limbe foliaire obové, long de (6,3-)7,3-20,3 cm ; hypanthium long de 9-12(-19) mm ; fruits longs de 11-15 mm 7. *S. perrieri*
6. Fleurs et fruits distinctement pédicellés ; bec du fruit atteignant 8-11 × 1,5-3 mm 6. *S. pedicellata*
- 6'. Fleurs et fruits sessiles ou subsessiles ; bec du fruit atteignant 7 × 1 mm 7
7. Feuilles à (10-)11-19 nervures secondaires par côté, angle de divergence avec la médiane de 70 à 85° ; bractées d'inflorescence au nombre de 4 [Mayotte] 1. *S. boivinii*

- 7'. Feuilles à 4-12(-14) nervures secondaires par côté, angle de divergence avec la médiane de 30 à 75° ; une seule bractée d'inflorescence [Madagascar] 8
8. Inflorescences 2-3(-4)-fiores ; hypanthium long de 0,7-1,1 cm ; sépales étalés [SE Madagascar] 5. *S. humbertii*
- 8'. Inflorescences (2-)3-12-fiores ; hypanthium long de (1,3-)1,6-3,9(-4,1) cm ; sépales réfléchis [nord, centre et ouest Madagascar] 4. *S. geminata*

1. *Stephanodaphne boivinii* Baill.

Adansonia 11: 302 (1875), as "*Boivini*". — Type: *Boivin 3135*, Mayotte [oritur in ins. Mayotta Comororum, ubi in sinibus montium Moussapéré], 1847-1852, fl. (lecto-, P-00233595!, here designated; iso-, G!, P-00253112!).

Trees to 4 m tall; stems glabrescent, with internodes (0.4-)0.8-2.9 cm long. Leaf blades broadly elliptic to ovate, (6.3-)9-22(-24.4) × (2.2-)3.1-6.6(-8) cm, length/width ratio 2.6-4.5:1, chartaceous, glabrescent, apex acute to slightly acuminate, margin flat, rarely slightly undulate, base cuneate to short attenuate, midrib strongly raised and glabrescent abaxially, venation raised to nearly inconspicuous on both surfaces, secondary veins (10-)11-16(-19) per side, 0.9-2 cm apart, angle of divergence from the midvein 70-85°, submarginal veins 0.4-1 cm from margin; petioles (3-)4-7(-8) mm long. Inflorescences capitate, erect or pendent, borne 1.5-2 mm above leaf axil, 6-8(-9)-flowered, flowers opening simultaneously; peduncles 0.6-4.1 cm long, indument persistent near flowers; inflorescence bracts 4, free, persistent, obovate, 2-5 × 0.9-3 mm, sericeous to strigose abaxially, apex acute, base attenuate. Flowers white; pedicels 0-0.5 mm long; hypanthium 1.4-1.6 cm × 1-1.5 mm, densely sericeous abaxially; sepals ovate to orbicular, 2.2-3.9 × 2-2.7 mm, glabrous adaxially, sericeous to tomentose abaxially, apex rounded and tomentose; annulus 5-7 mm tall; upper whorl of stamens adnate 0-0.2 mm below mouth, lower whorl adnate 2-2.5 mm below upper whorl, free portion of filaments 0.1-0.3 mm long, anthers 1-1.4 × 0.4-0.6 mm; ovary 2.8-3.5 × 1.4-2 mm, style 6-8 mm long, stigma 2.2-2.5 mm below lower whorl of stamens. Fruits yellow, ovoid, 1.8-2.1 × 0.8-1.1 cm, pericarp coriaceous

to slightly fleshy, glabrescent, beak 5-7 mm long, robust. Seeds dark brown or black, ovoid, 1.4-1.7 × 0.8-1 cm, beak 1.9-2.3 mm long; embryo *c.* 9 × 5 mm, radicle 1.8-2 mm long. — Fig. 3.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne boivinii* is endemic to Mayotte in the Comoro Island Archipelago (Fig. 11). The species has been collected at Mount Moussa Péré in the north of the island, and Mount Bénara in the south, at 500-600 m elevation. *Stephanodaphne boivinii* flowers in June to July and fruits in August.

VERNACULAR NAME. — Tsileytri Bé (*Pascal 618*).

CONSERVATION STATUS. — This species is endemic to forests on the eastern slopes of the small Comoro island of Mayotte. It is known from two localities and four collections with an area of occupancy of 200 km². The species is assigned a preliminary status of Vulnerable (VU B1ab).

Stephanodaphne boivinii is easily distinguishable from all other species in the genus by the presence of four free inflorescence bracts subtending the flower-bearing portion of the peduncle; all other species have a single bract. The large, chartaceous leaves of *S. boivinii* have the most highly divergent secondary veins of any species, usually branching from the midrib at more than 75-80° angles.

TYPIIFICATION. — Although both sheets of the type collection housed in the Paris herbarium were annotated in BAILLON's handwriting, the specimen identified as P-00233595 is hereby designated as the lectotype, because the locality data cited in the protologue is handwritten on the label of that sheet, whereas the other sheet deposited at P lacks locality information altogether.

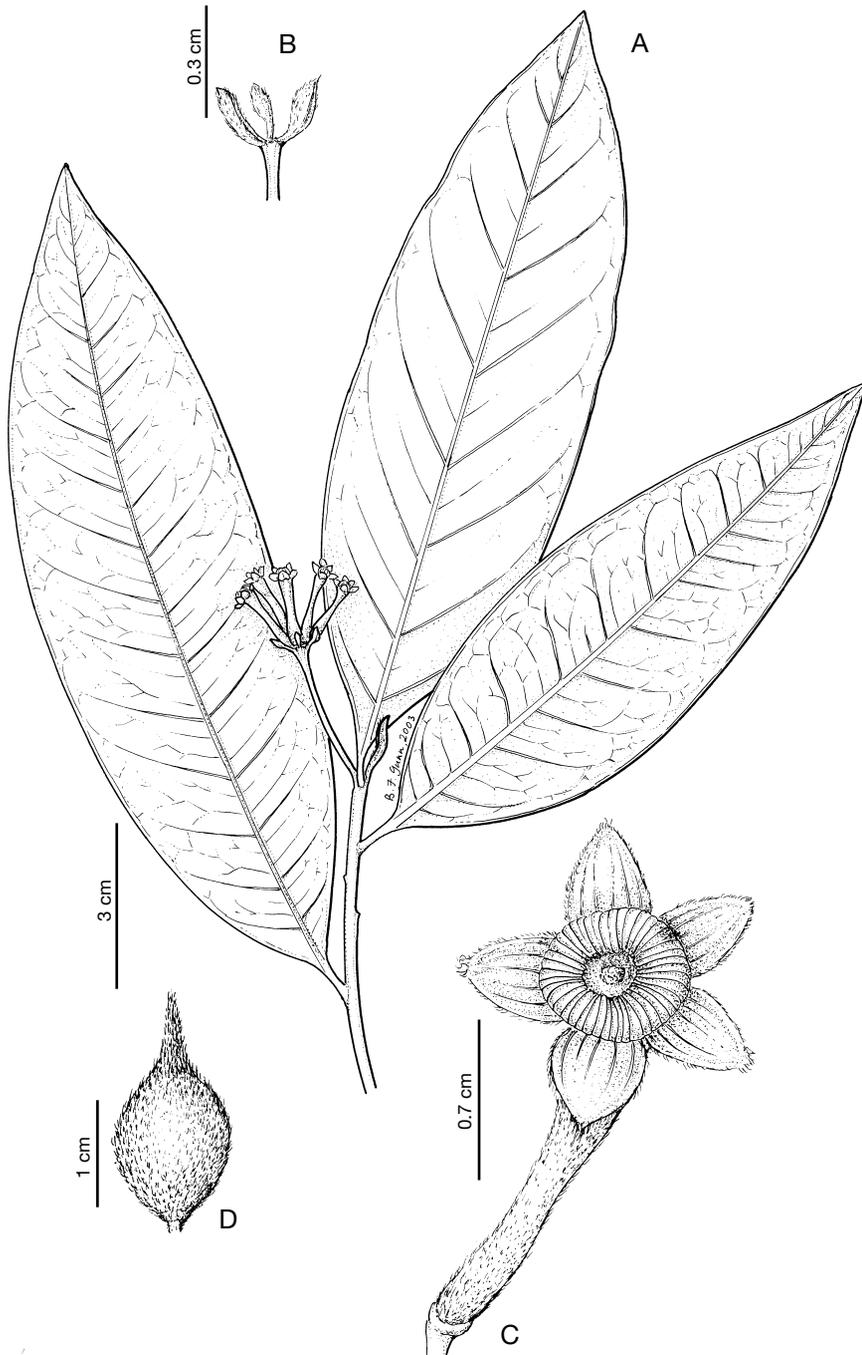


FIG. 3. — *Stephanodaphne boivinii* Baill.: **A**, habit; **B**, inflorescence bracts and peduncle (one bract and flowers removed); **C**, flower; **D**, fruit. Pascal 618.

ADDITIONAL MATERIAL EXAMINED. — MAYOTTE: *Pascal* 587, 599, 618.

2. *Stephanodaphne cremostachya* Baill.

Adansonia 11: 303 (1875). — *Stephanodaphne cremostachya* Baill. subsp. *cremostachya* Leandri, as "*eucremostachya*", Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 673 (1930). — Type: *Commerson s.n.*, Madagascar, without precise locality, fl. (lecto-, P-00253116!, here designated).

Desmostachys longipes H. Perrier, Mém. Mus. Natl. Hist. Nat., Paris, n. s., 18: 298 (1944). — Type: *Humbert* 5960, Madagascar, Prov. Toliara, Fort-Dauphin, entre le Pic Saint-Louis et la mer, [25°00'S, 46°58'E], 1-25 m, 20 Sept.-6 Oct. 1928, fr. (holo-, P-00253113!; iso-, MO!).

Trees to 5 m tall; stems glabrescent, with internodes 0.6-2.8(-3.6) cm long. Leaf blades broadly elliptic, rarely ovate or obovate, (2.3-)3.3-9.5 (-10.1) × (1-)1.7-3.6(-4.2) cm, length/width ratio (1.7-)2-3.6(-4.2):1, chartaceous to subcoriaceous, glabrescent, apex acute to acuminate, acumen to 1 cm long, margin undulate, base cuneate to short attenuate, midrib strongly raised, glabrescent or sparsely strigose abaxially, venation raised to inconspicuous on both surfaces, secondary veins (4-)5-8(-9) per side, 0.4-1.2 cm apart, angle of divergence from the midvein 40-65°, submarginal veins (1-)2-4(-5) mm from margin; petioles (1-)2-4 mm long. Inflorescences spicate, pendent in flower and fruit, borne 0.1-1.4 cm above leaf axil, up to 60 flowers per spike, one to several flowers opening simultaneously; peduncles elongating, 3-12.5 cm long, fertile portion to 4.8 cm long, no more than one-half the total length, glabrescent or sparsely strigose; inflorescence bract 1, persisting until several flowers have opened, linear to narrowly obovate, 1.2-4.8 × 0.5-1.4 mm, sericeous to strigose abaxially, apex acute, base attenuate. Flowers white to white-green; pedicels 0-1.1 mm long; hypanthium 4-5.4(-6.2) × 0.7-1.2 mm; sepals spreading or slightly reflexed, ovate to subtriangular, 1.5-2 × 1.1-1.4 mm, glabrous to sparsely tomentose adaxially, densely sericeous to tomentose abaxially, apex rounded to acute, sparsely tomentose; annulus white, 0.4-0.7 mm tall; upper whorl of stamens adnate 0-0.1 mm below upper whorl, lower whorl adnate 0.3-1 mm

below upper whorl, free portion of filaments 0.1-0.5 mm long, anthers 0.4-0.6 × 0.2-0.3 mm; ovary 1.1-1.9 × 0.6-1 mm, style 1.4-2.9 mm long, stigma at height of upper whorl of stamens to *c.* 2.5 mm below lower whorl. Fruits white, ovoid, 0.8-1.1 × 0.5-0.7 cm, pericarp coriaceous to slightly fleshy; beak 0-2(-3.5) mm long, nearly inconspicuous. Seeds dark brown, ovoid, 7-7.2 × 5.1-5.3 mm, beak 0.1-0.5 mm long; embryo 5.2-5.8 × 4.1-3.7 mm, radicle to 0.9 mm long. — Fig. 4.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne cremostachya* is known from several forested localities in extreme southeastern Madagascar near Fort-Dauphin, Toliara province (Fig. 12). It is very common in the littoral forest at the Mandena Forestry Station to the north of Fort-Dauphin and has been successfully cultivated at the experimental nursery at the site. Other populations occur in the highly disturbed forest fragments around the base of the Pic Saint-Louis, and on the wet, forested slopes of Manantantely forest (*c.* 10-15 km west of Fort-Dauphin). The species grows on both sandy and lateritic soils, and on gneiss and granite rock from sea level to about 220 m elevation. *Stephanodaphne cremostachya* flowers and fruits year round.

VERNACULAR NAMES. — Havao (*Rabevohitra* 3672, 3689, 3703; *Randriantafika* 273); Havoha (*Service Forestier* 383).

CONSERVATION STATUS. — *Stephanodaphne cremostachya* is known to occur at three nearby sites, only one of which is semi-protected (Mandena Forestry Station). All populations are located within 15 km of Fort-Dauphin, the largest city in southeastern Madagascar, and two populations grow along the outskirts of the city in small gallery forest fragments. The extent of occurrence for the species is *c.* 100 km², and the area of occupancy is 10 km². This narrowly endemic species is assigned a preliminary conservation status of Endangered (EN B1ab).

Stephanodaphne cremostachya is easily distinguished from *S. perrieri*, the only other species of *Stephanodaphne* with spicate inflorescences, by its much smaller leaves, by its slender, truly pendant

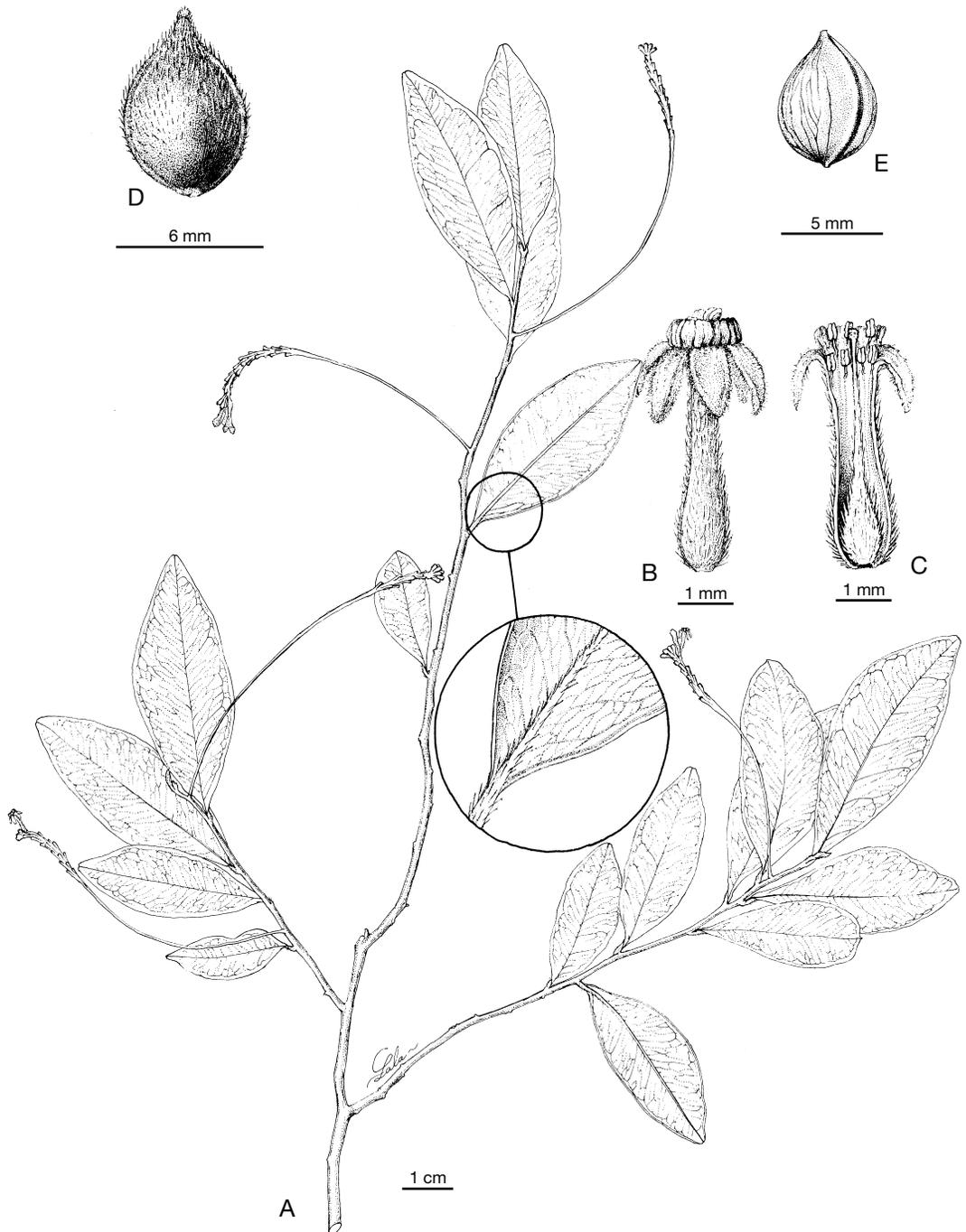


FIG. 4. — *Stephanodaphne cremostachya* Baill.: A, habit; B, C, flower; D, fruit; E, seed. *Rabevohitra* 2198.

peduncles, and its shorter hypanthia and fruits. This species has the smallest flowers in the genus, which never exceed 6 mm in length.

TYPIIFICATION. — The sheet of *Commerson s.n.* housed in the Paris herbarium (P-00253116!) is hereby designated as the lectotype. BAILLON cited two collections when describing *Stephanodaphne cremostachya*, *Commerson s.n.* (P-00253116!) and *Chapelier s.n.* (P-00253117!). The latter specimen appears to have had capitate inflorescences, and thus cannot be *S. cremostachya*. It vegetatively resembles *S. geminata*; however, DORR (1997) noted that Chapelier died before traveling inland from his coastal residence near Toamasina, Madagascar, so it seems unlikely that he would have encountered a population of *S. geminata*, because of its inland distribution. Another sheet of *Stephanodaphne cremostachya* collected by *Commerson s.n.* deposited at G was not annotated by BAILLON and may not even be the same collection because it has smaller leaves that dried much darker than those on the Paris sheet.

ADDITIONAL MATERIAL EXAMINED. — MADAGASCAR, *Commerson s.n.* (without precise locality), **Prov. Toliara:** *D'Arcy & Rakotozafy 1535; Dorr et al. 3987; Dumetz et al. 518, 583; Lowry et al. 4996; McPherson & Dumetz 14637; Rabevohitra 1911, 2032, 2126, 2198, 2237, 3672 (= Service Forestier 35259), 3689, 3703; Rakotozafy 1587; A. Randrianasolo 275; Randriantafika et al. 64, 273; Rauh 1341; Rogers et al. 93, 94, 105, 111; Scott-Elliott 2403; Service Forestier 383, 22319, 34940 (= Rabevohitra 3208); Zarucchi et al. 7524.*

3. *Stephanodaphne cuspidata* (Leandri) Leandri

Notul. Syst. (Paris) 13: 40 (1947). — *Stephanodaphne cremostachya* Baill. subsp. *cuspidata* Leandri, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 673 (1930). — Type: *Perrier de la Bâthie 12620*, Madagascar, Prov. Fianarantsoa, S de Farafangana, May 1919, fl., fr. (lecto-, P!, here designated; iso-, P [2 sheets!]).

Treelets to 3 m tall; stems densely strigose, with internodes (0.5-)0.9-4.9(-6.2) cm long. Leaf blades broadly elliptic to slightly ovate, or obovate, (4-)6.1-20.1(-22.7) × 2.3-7.6(-8) cm, length/width ratio 1.7-4.5:1, coriaceous and thick, scabrous abaxially, abaxial surface covered

with dense adpressed strigose indument, apex cuspidate to acuminate, or rarely acute, acumen to 1.1 cm long, margin slightly undulate and strigose, base cuneate to long attenuate, midrib strongly raised and strigose, venation raised to nearly inconspicuous on both surfaces, secondary veins (9-)10-18(-19) per side, 0.7-1.3 cm apart, angle of divergence from the midvein 55-75°, submarginal veins 4-7(-9) mm from margin; petioles (1-)2-5(-8) mm long. Inflorescences capitate, erect in flower and fruit, borne 0-4(-6) mm above leaf axil, 8-19-flowered; peduncles (1.7-) 2.5-7.8(-8.4) cm long, moderately to densely strigose; inflorescence bract 1, caducous, linear to narrowly elliptic, 0.4-0.7(-1.1) × 0.7-1.4(-1.9) mm, densely sericeous abaxially, apex acuminate, base attenuate. Flowers yellow to yellow-green; pedicels 0-0.1 mm long; hypanthium (1-)1.2-1.3 cm × 1.8-2.2 mm, sericeous abaxially; sepals spreading, ovate to subtriangular, 2-2.8 × 1.5-2 mm, glabrescent adaxially, sericeous abaxially, apex acute to rounded, margin tomentose; annulus white, 0.7-1.2 mm tall; upper whorl of stamens adnate 0-0.2 mm below mouth, lower whorl adnate 0.6-1.3 mm below upper whorl, free portion of portion of filaments 0.2-0.5 mm long, anthers 0.9-1.1 × 0.2-0.3 mm; ovary 2.6-3.5 × 1.6-2 mm, style 2.1-3.2 mm long, stigma 3-4.2 mm below lower whorl of stamens. Fruits white, ovoid, 0.8-1 × 0.9-1.1 cm, pericarp coriaceous, sericeous, beak 0.2-0.9 mm long, nearly inconspicuous. Seeds light brown, ovoid to subspherical, 7-7.9 × 5.8-6.8 mm, beak 0-0.5 mm long; embryo 5.6-7.1 × 5.1-5.3 mm, radicle 0.2-0.4 mm long. — Fig. 5.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne cuspidata* is restricted to southeastern coastal forests of Madagascar around Vohipeno, Farafangana, and Manombo Réserve Spéciale in Fianarantsoa province (Fig. 12). The species grows on lateritic soils from sea level to 110 m elevation; it has never been collected on sandy soil. It is known to flower and fruit in March and October.

VERNACULAR NAMES. — Havoà (*Service Forestier 5249*); Tsarazanahary (Antemoro dialect) (*Beaujard 423*).

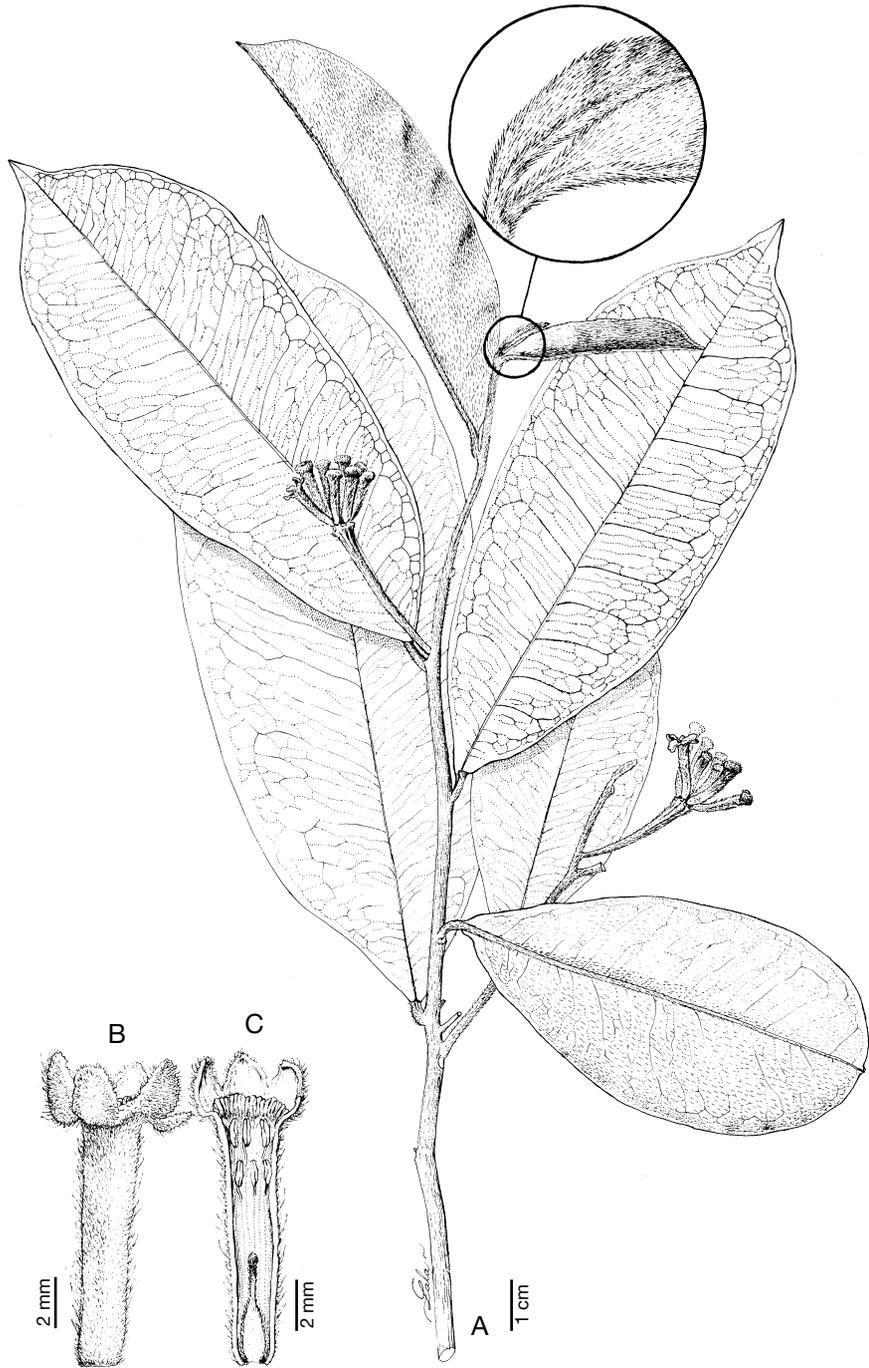


FIG. 5. — *Stephanodaphne cuspidata* Leandri: **A**, habit; **B**, **C**, flower. Service Forestier 23580.

CONSERVATION STATUS. — *Stephanodaphne cuspidata* is a narrow endemic, occurring in low elevation coastal forests near Manombo and Farafangana. Much of the vegetation of the area is probably too highly degraded to support populations of *S. cuspidata*. The extent of occurrence for the species is 100 km², whereas the area of occupancy is 80 km². This species is assigned a conservation status of Endangered (EN B1ab).

Stephanodaphne cuspidata as circumscribed here is distinguished by the dense indumentum composed of short rigid adpressed trichomes on the abaxial surfaces of the leaves, which gives them their scabrous texture. The species also has the thickest and most coriaceous leaves in the genus. It is morphologically most similar to *S. pilosa*, but differs by the afore mentioned characters as well as by its glabrescent stems, rigid leaf blades with slightly wavy margins, wider pale yellow flowers, more robust peduncles, and by the absence of intermingled pilose trichomes on the hypanthia.

LEANDRI (1930b) cited a single type collection (*Perrier de la Bâthie* 12620) when originally describing this taxon (*Stephanodaphne cremostachya* Baill. subsp. *cuspidata* Leandri). Later LEANDRI cited a second collection (*Perrier de la Bâthie* 4468) when raising the taxon to the species level, but this collection is in fact *S. pilosa* (see further discussion under that species).

TIPIFICATION. — Three sheets of *Perrier de la Bâthie* 12620 are deposited in the Paris herbarium, each one of which has the same information on the label and an annotation slip in LEANDRI's handwriting. None of them bears accession numbers, so the sheet in best condition has been chosen and annotated as the lectotype.

ADDITIONAL MATERIAL EXAMINED. — MADAGASCAR, Prov. Fianarantsoa: *Beaujard* 423; *Rabenantoandro et al.* 803; *Randrianaivo et al.* 941; *Rogers et al.* 67, 68, 69, 70, 71, 72, 73, 74, 75, 75A, 75C, 75D; *Service Forestier* 5249, 23580.

4. *Stephanodaphne geminata* Leandri

Bull. Soc. Bot. France 77: 33 (1930). — Type: *Perrier de la Bâthie* 15241, Madagascar, Prov. Antsiranana, Massif du Tsaratanana, forêt à mousses et

à sous-bois herbacé, 1200-1400 m, Feb. 1923, fl. (lecto-, P-00253100!, here designated; iso-, P [2 sheets]!).

Stephanodaphne cremostachya Baill. subsp. *capitata* Leandri, Bull. Mus. Natl. Hist. Nat., sér. 2, 2: 673 (1930). — Type: *Perrier de la Bâthie* 17557, Madagascar, Prov. Antsiranana, forêt autour du Camp d'Ambre, 900 m, Jan. 1926, fl. (holo-, P-00253111!; iso-, P [2 sheets]!). — *Stephanodaphne capitata* (Leandri) Leandri, Notul. Syst. (Paris) 13: 40 (1947); *syn. nov.*

Stephanodaphne oblongifolia Leandri, Notul. Syst. (Paris) 13: 42 (1947). — Type: *Perrier de la Bâthie* 16856, Madagascar, Prov. Antananarivo, Manerinerina, sur le tampoketsa entre l'Ikopa et la Betsiboka, [18°00'30"S, 47°09'00"E], c. 1500 m, Dec. 1926, y.fl. (holo-, P-00253119!); *syn. nov.*

Stephanodaphne pulchra Leandri, Notul. Syst. (Paris) 13: 42 (1947), nom. inval. (Art. 34.1b); *syn. nov.*

Trees to 15 m tall; stems glabrescent, with internodes 0.4-3.4(-4.1) cm long. Leaf blades broadly elliptic to broadly obovate, rarely narrowly elliptic or slightly ovate, 2.7-15.5(-16.8) × (1-) 1.2-4.9(-5.7) cm, length/width ratio 1.6-5.8 (-6.1):1, coriaceous to chartaceous, glabrescent, apex acute to acuminate, rarely cuspidate, acumen 0.3-2.3 cm long, margin flat, rarely slightly undulate, base cuneate to long attenuate, midrib raised and glabrescent abaxially, venation raised to inconspicuous on both surfaces, secondary veins (4-)5-12(-14) per side, 0.6-2.3(-3.2) cm apart, angle of divergence from the midvein 30-75°, submarginal veins 1-5(-6) mm from margin; petioles (1-) 2-5(-7) mm long. Inflorescences capitate, erect in flower, erect or pendent in fruit, borne 0-1.5(-1.8) mm above leaf axil, (2-)3-9 (-12)-flowered; peduncles 0.3-10.2 cm long, indument persistent near flowers; inflorescence bract 1, caducous in flower, linear to obovate, (2-)5-9 × 0.4-1(-1.3) mm, sericeous to glabrescent abaxially, apex acute, base attenuate. Flowers white or green-white; pedicels 0-2(-3) mm long; hypanthium (1.3-)1.6-3.9(-4.1) cm × 0.7-1.4 mm, sericeous abaxially; sepals strongly reflexed, obovate to ovate, rarely subtriangular, 1.5-4 × 1.1-3 mm, tomentose adaxially, sericeous to tomentose abaxially, apex acute to rounded, base glabrescent; annulus white, 0.7-1.2 mm tall; upper whorl of stamens adnate 0-3.1 mm below mouth, lower whorl adnate (0.2-)1.8-5.1 mm below upper whorl, free portion of portion of filaments 0.1-0.6 mm

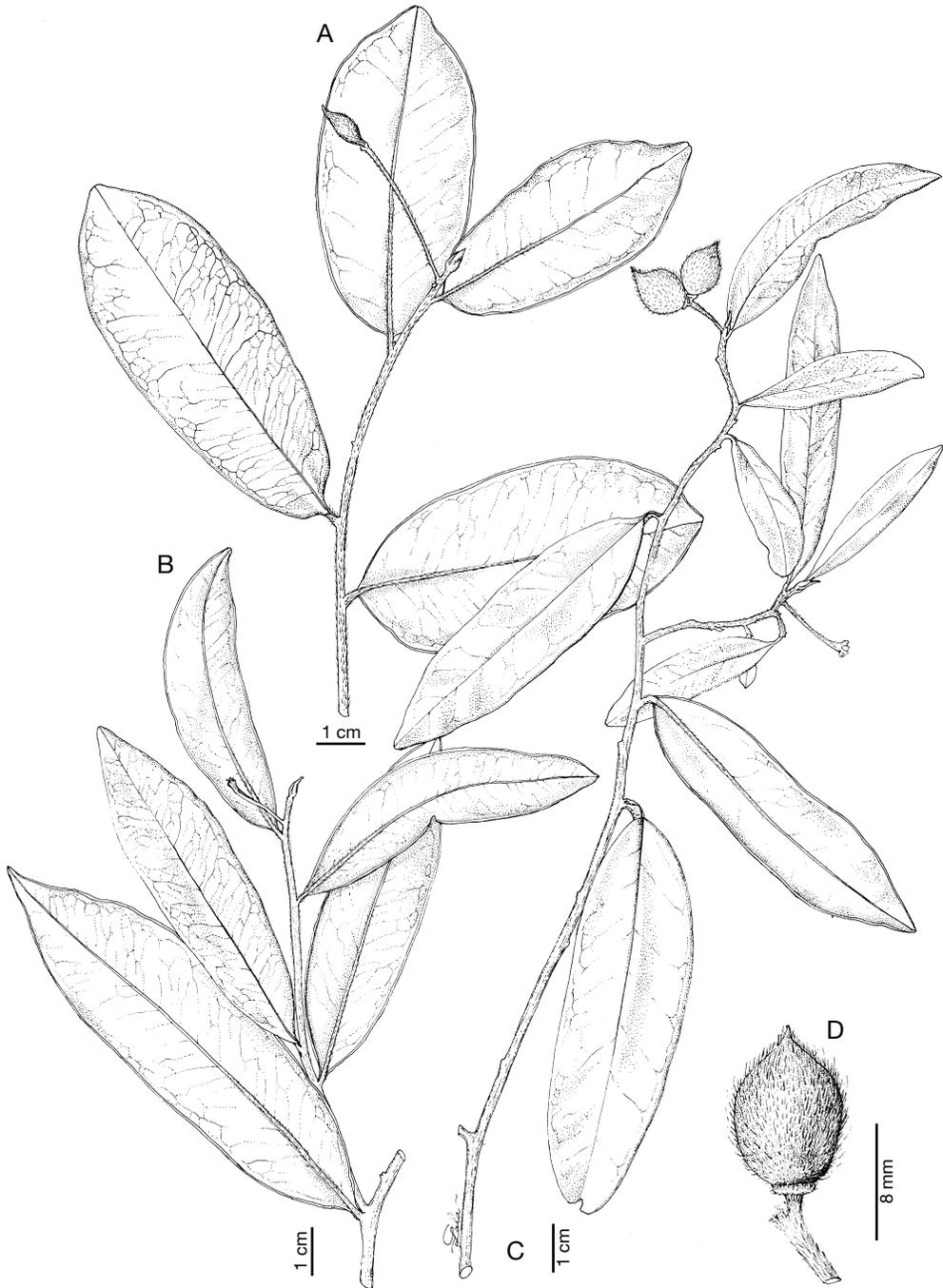


FIG. 6. — *Stephanodaphne geminata* Leandri: **A-C**, habit, note variation in vegetative morphology; **D**, fruit. A, *Rogers et al. 139*; B, *Rogers et al. 127*; C, D, *Rogers et al. 129*.

long, anthers 0.9-1.3 × 0.2-0.3 mm; ovary 1.9-3.2 × 0.9-1.6(-2.1) mm, style 5.4-6.6 mm long, stigma 2-9 mm below lower whorl of stamens. Fruits white, ovoid to subspherical, 1.3-1.9(-2.2) × 0.6-1.9(-2.3) cm, pericarp coriaceous, glabrescent to sericeous, rarely tomentose, beak 1-7 mm long, slender. Seeds light or dark brown, ovoid to subspherical, 1.1-1.6 × 0.7-1.4 cm, beak 0.1-1.3 mm long; embryo 7.7 × 6.1 mm, radicle 0.1-0.6 mm long. — Fig. 6.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne geminata* is a very widespread inland species occurring throughout the northern half of Madagascar from 150-1600 m elevation (Fig. 12). The species grows on lateritic soils, volcanic rock, granite, gneiss and “tsingy” limestone. It has never been collected near the coast or on sandy soils. *Stephanodaphne geminata* probably flowers and fruits year round, but at present has only been collected in flower from October to March and in fruit for all months except for July, August, October and November.

VERNACULAR NAMES. — Amontaimbo (*Service Forestier 32594*); Tsilaihamadinidravina (*Réserves Naturelles 9073*); Tsilaitra (*Peltier 975*; *Service Forestier 58-R-106*); Tsilaitry (*Gautier 3012*).

CONSERVATION STATUS. — *Stephanodaphne geminata* is widespread in the northern half of Madagascar, with an extent of occurrence of 190000 km² and an area of occupancy of 3800 km². It grows in at least 11 protected areas, and as such should be considered a species of Least Concern (LC).

Stephanodaphne geminata is distinguished from *S. humbertii*, the only other species in the genus with capitate inflorescences and glabrescent leaf blades, by its longer hypanthia and strongly reflexed sepals; the latter character is unique within the genus. The hypanthia of *S. geminata* are (1.3-)1.6-3.9(-4.1) cm long, whereas those of *S. humbertii* are only 0.7-1.1 cm long. Both species also have allopatric distributions; *S. geminata* occurs in northern, central, and western Madagascar (Fig. 12), and *S. humbertii*, is endemic to southeastern forests near Fort-Dauphin (Fig. 13).

Stephanodaphne geminata is morphologically variable, in particular with respect to leaf blade size and shape, leaf apex, leaf texture, number of flowers per inflorescence, peduncle length, and hypanthium length. Leaf morphology can vary considerably even between leaves on the same branch (Fig. 6). Leaf shape ranges from broadly to narrowly elliptic or obovate to ovate; leaf apices can be acute to acuminate and sometimes cuspidate; leaf texture varies from coriaceous to chartaceous. The inflorescence can be composed of (2-)3-9 (-12) flowers, and the length of the peduncle ranges from 3 to more than 10 mm.

LEANDRI (1947) described three species, *Stephanodaphne capitata*, *S. oblongifolia*, and *S. pulchra*, each based on a single collection, which I now place for the first time into synonymy with *S. geminata*. LEANDRI distinguished these three species by minor differences such as leaf shape and size, number of flowers per inflorescence, the way the inflorescence is held, and hypanthium length, all of which I have found to be highly variable characters within populations of *S. geminata*. *Stephanodaphne geminata* was distinguished on the basis of its longer hypanthia (LEANDRI 1930b, 1947), and while the hypanthia on the type collection of the species (*Perrier de la Bâthie 15241*) are slightly longer (3.4-4.1 cm) than those found on any other collection of the species (≤ 3.3 cm long), the small discontinuity in flower length is relatively insignificant when one takes into account how much flower length can vary within a population. The type was collected from the Tsaratanana massif in northern Madagascar, an area where a number of other individuals of *S. capitata* sensu LEANDRI (1947) (with shorter hypanthia) have been collected. LEANDRI (1947) distinguished *S. oblongifolia* on the basis of its c. 1 cm long pendent peduncles. The type (*Perrier de la Bâthie 16856*) has a few young flower buds, and was collected on the central escarpment, at a site located c. 100 km north of Antananarivo, Madagascar.

Stephanodaphne pulchra was distinguished from *S. geminata* sensu LEANDRI by its 3-4-flowered inflorescences, and by its numerous nearly inconspicuous secondary veins, however, the number of flowers per inflorescence and the degree to which the venation is raised have been

shown to be taxonomically unreliable characters in most species of *Stephanodaphne*. The type of *S. pulchra* (Leandri 834) has a few immature fruits, and was collected from the calcareous (“tsingy”) limestone near the Bemaraha Reserve in western Madagascar. LEANDRI himself appears to have questioned whether *S. pulchra* was distinct, as indicated by the phrase “spec. nova. interim.” written after the epithet in the original description, and by his comments about the incomplete condition of the type collection in his discussion of the species (LEANDRI 1947: 42). Thus, *Stephanodaphne pulchra* is invalid according to Art. 34.1b of the ICBN (GREUTER *et al.* 2000: 42), because his description was “provisionary”.

Although I consider LEANDRI’s three species, *S. capitata*, *S. oblongifolia*, and *S. pulchra*, to be synonyms of *S. geminata*, a few characters exhibit semi-consistent patterns of variation that can be roughly correlated with LEANDRI’s concept of *S. capitata* and *S. oblongifolia*. Populations occurring north of 15°S latitude, which LEANDRI would have treated as *S. capitata*, tend to have (3-) 4-9(-12) flowers per inflorescence, 2-10.2 cm long peduncles, and 1.9-3.3 cm long hypanthia. Populations located south of 17°S latitude and east of 47°E longitude, which LEANDRI would have regarded as *S. oblongifolia*, tend to have (2-) 3-4 flowers per inflorescence, 0.3-2.2(-4.1) cm long peduncles, and 1.3-1.7 cm long hypanthia. Plants growing in the outlying western population near Bemaraha Reserve (c. 44°50’E longitude), however which LEANDRI would have considered *S. pulchra*, can be morphologically similar to the northern populations (“*capitata*” and “*geminata*”), or the southern populations (“*oblongifolia*”), or can represent a form intermediate between the two. Morphological variation is clearly overlapping and continuous between populations of *S. geminata*.

An unfortunate consequence of the recircumscription of *S. geminata*, a species originally named for its geminate (i.e., 2-flowered) inflorescences, is that the species now includes plants with as many as 12 flowers per inflorescence.

A poorly preserved specimen collected from the Manongarivo Special Reserve in northern Madagascar (Gautier & Rakotomamonjy 3740)

has two open flowers loose in the envelope of the duplicate deposited at G, and a few immature fruits still attached to a 3-flowered inflorescence on the TEF duplicate. The glabrous leaf blades of this specimen are more ovate than usual for *S. geminata*, and the hypanthia are shorter (1.1 cm long) than those normally found in northern populations of this species. However, hypanthia of collections from southern populations may be as short as 1.3 cm long, and thus the length of the hypanthia of the Manongarivo collection almost falls within the range of the species, as circumscribed here. Two sterile collections in poor condition collected from the forest near the Marotandrano Reserve in northern Madagascar (*Service Forestier* 129-R-301 [TEF] and *Service Forestier* 130-R-301 [MO, P]), differ from typical *S. geminata* by having narrower leaf blades. Although all three of these somewhat anomalous collections probably represent *S. geminata*, they cannot be identified with absolute certainty, so they have been excluded from the description and specimen citations.

TIPIFICATION. — The sheet housed in the Paris herbarium (P-00253100!) is hereby selected as the lectotype of *Stephanodaphne geminata*, because it has the most complete label data, and it is also the sheet in the best condition.

ADDITIONAL MATERIAL EXAMINED. — MADAGASCAR, **Prov. Antananarivo:** *Perrier de la Bâthie* 16856; *Rogers et al.* 127, 129, 130, 131. **Prov. Antsiranana:** *Andrianantoanina & Solotiana* 71; *Birkinshaw et al.* 760; *Cours & Humbert* 5377; *Gautier* 3012, 3452; *Harder et al.* 1630; *Humbert* 22409, 32022, 32023; *Leeuwenberg et al.* 14328; *Malcomber et al.* 2254; *Morat* 3063; *Rabevohitra* 1365 (= *Service Forestier* 32595); *Rakotonasolo et al.* 591, 592, 593, 594, 600, 610, 611, 612, 612A, 613; *Rasoavimbahoaka et al.* 256, 600; *Ravelonarivo et al.* 223, 732, 1180; *Razafimandimbison* 105, 110; *Réserves Naturelles (Randriamahavita)* 9073; *Rogers et al.* 137, 138, 139, 140, 141, 143, 144, 145, 146, 151, 152, 153, 154; *Schatz* 3198; *Service Forestier* 9963, 22054, 27255, 32594 (= *Rabevohitra* 1365). **Prov. Mahajanga:** *Leandri* 834, 1988; *Réserves Naturelles (Razafindrakoto)* 4690; *Service Forestier (Capuron)* 6764 (= *Leandri* 1988?). **Prov. Toamasina:** *Homolle s.n.*; *Peltier* 975, 5680; *Rakotomalaza et al.* 978, 1171; *S. Randrianasolo et al.* 223; *Randrianjanaka et al.* 535, 616; *Ratovoson et al.* 682; *Service Forestier* 58-R-106, 22633, 22916, 23201.

5. *Stephanodaphne humbertii* Leandri

Notul. Syst. (Paris) 13: 41 (1947), as "*Humberti*". — Type: *Humbert 13938*, Madagascar, Prov. Toliara, centre, bassin de réception de la Mananara, affluent du Mandrare, pentes occidentales des montagnes entre l'Andohahela et l'Elakelaka, à l'Aniampanga (rive gauche de la rivière Akaramy), en amont de Mahamavo, [24°45'30"S, 46°43'30"E], 900 m, Jan.-Feb. 1934, fl. (holo-, P-00253118!; iso-, P!).

Trees to 7 m tall; stems glabrescent, with internodes 0.4-1.5 cm long. Leaf blades oblong to elliptic, or rarely slightly obovate, (2.7-)3-10.8 × 1.2-2.6 cm, length/width ratio 2-6:1, chartaceous to coriaceous, glabrescent, apex acuminate, or rarely acute, acumen 0.4-1.8 cm long, margin flat, rarely slightly undulate, base cuneate to short attenuate, midrib raised and glabrescent abaxially, venation raised to inconspicuous on both surfaces, secondary veins (4-) 5-11 per side, 0.9-1.4 cm apart, angle of divergence from the midvein 45-65°, submarginal veins 2-3(-4) mm from margin; petioles (1-)2-5 mm long. Inflorescences capitate, erect in flower, pendent in fruit, borne 0-5 mm above leaf axil, 2-3(-4)-flowered, flowers opening simultaneously; peduncles 0.8-1.7(-2.2) cm long, sericeous to glabrescent; inflorescence bract 1, not seen in good condition. Flowers white; pedicel 0-0.1 mm long; hypanthium 0.7-1.1 cm × 1-1.5 mm, sericeous abaxially; sepals spreading, ovate or rarely obovate, 2-3.5 × 1.3-2.3 mm, glabrous to tomentose adaxially, sericeous to tomentose abaxially, apex acute to rounded; annulus white, (0.5-)0.8-1.1 mm tall; upper whorl of stamens adnate just below annulus, lower whorl adnate 0-0.4 mm below upper whorl, free portion of filaments 0.1-0.4 mm long, anthers 0.9-1.2 × 0.3-0.4 mm; ovary 1.8-2.4 × 1.2-1.5 mm, style 1.5-2.7 mm long, stigma 1.3-2.6 mm below lower whorl of stamens. Fruits probably white when mature, ovoid to subspherical, 1.1-1.2 cm × 8.5-9.6 mm, pericarp coriaceous, sericeous; beak 0.1-0.2 mm long, inconspicuous. Seeds dark brown, ovoid, 7.4-8.6 × 6.8-7 mm, beak 0.4-0.6 mm long, embryo not seen. — Fig. 7.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne humbertii* is known from only two collections in southeastern Madagascar (Fig. 13). The type was found growing on the drier western slopes of Andohahela National Park (Parcel 1) at 900 m elevation, while the second collection, *Rogers et al. 95*, was made c. 35 km southeast of Andohahela at 300 m elevation, in the coastal forest above Saint-Jacques, a village overlooking Fort-Dauphin. *Stephanodaphne humbertii* flowers and fruits in January to February.

CONSERVATION STATUS. — *Stephanodaphne humbertii* is known from just two localities, each one represented by a single collection. The type collection was made 70 years ago in what is now Andohahela National Park, but this population could not be relocated during a recent search at the type locality. The forest at the site is still in fairly good condition, so it is likely that populations have not been extirpated. The second collection of *S. humbertii*, made in 2003 in an unprotected degraded forest above Fort-Dauphin, was the only individual seen at the site. Since 2003, the forest at the site has almost entirely been cleared by local loggers (J. RABENANTOANORO pers. comm.). The area of occupancy for the species is 200 km², and the species should thus be considered Endangered (EN B1ab).

Stephanodaphne humbertii is distinguished from *S. geminata*, the only other species with capitate inflorescences and glabrous blades, by its shorter hypanthia that are 0.7-1.1 cm long, whereas those of *S. geminata* are (1.3-)1.6-4.1 cm long. The discontinuity in the morphological variation between the two species is also correlated with allopatric distributions. For example, *Stephanodaphne humbertii* is endemic to forests in the extreme southeast of the island around Fort-Dauphin; the southernmost populations of *S. geminata* grow more than 500 km to the north.

Also worthy of mention is that the leaves of *Rogers et al. 95* are shorter and more elliptic than those on the type, and its hypanthia are also slightly shorter (c. 7-8 mm vs 10-11 mm long).

ADDITIONAL MATERIAL EXAMINED. — MADAGASCAR, Prov. Toliara: *Rogers et al. 95*.

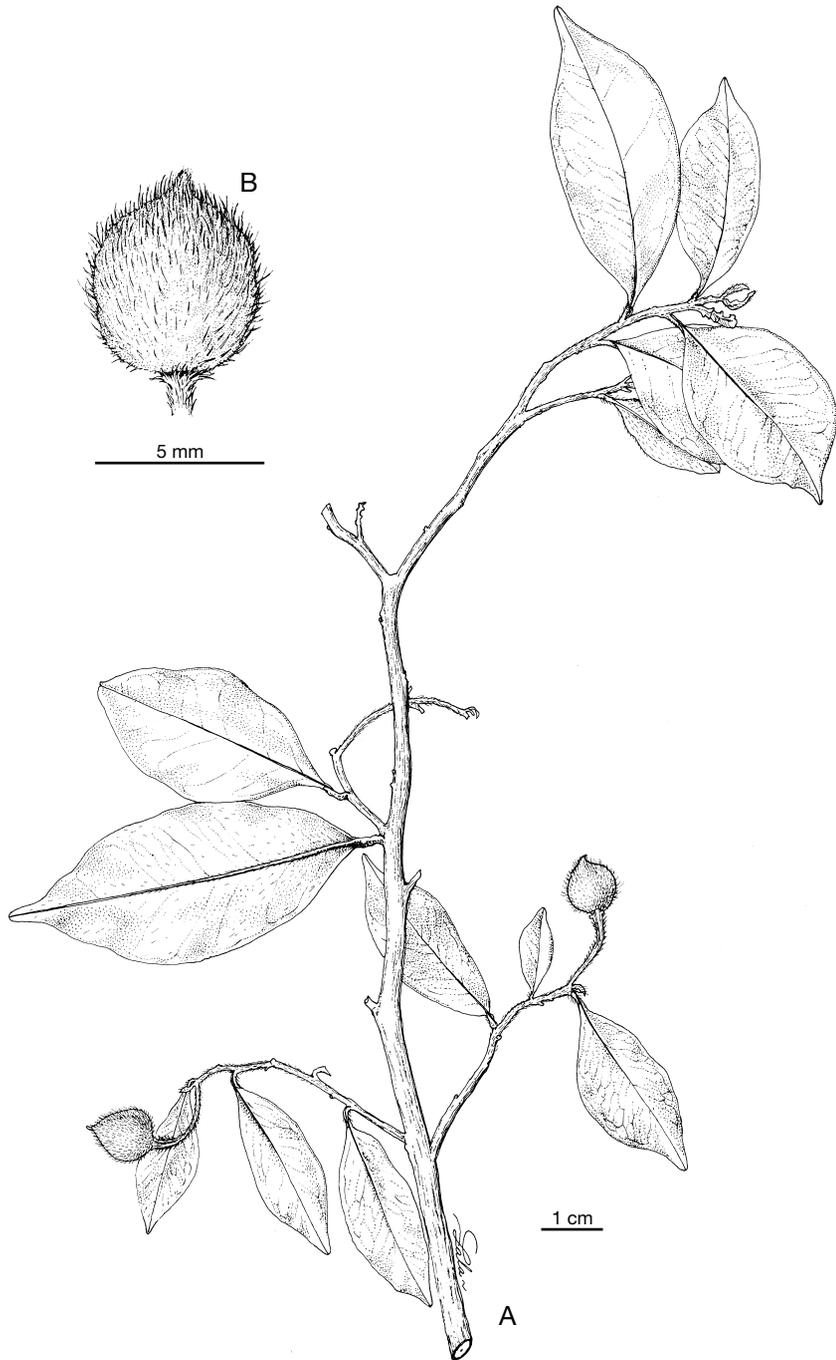


FIG. 7. — *Stephanodaphne humbertii* Leandri: A, habit; B, fruit. Rogers et al. 95.

6. *Stephanodaphne pedicellata* Z.S. Rogers, **sp. nov.**

Stephanodaphne pedicellata a *speciebus aliis in inflorescentiis umbellatis, floribus pedicellatis, et fructibus rostris robustis* 8-11 × 1.5-3 mm, *differt.*

TYPUS. — *Rasoavimbahoaka & Ravelonarivo* 187, Madagascar, Prov. Antsiranana, Marojejy, Réserve Naturelle Intégrale No. 12, Fivondronona Andapa, Firaisana Doany, Fokotany Antsahaberoka, nord d'Andapa, ligne de crête Analanohitsa vers Ambodimanga Antsahaberoka, forêt dense et humide, 14°22'10"S, 49°39'10"E, 488 m, 14 Mar. 1994, fr. (holo-, MO!; iso-, G!, MO!, P!, TAN).

Trees to 10 m tall; stems glabrescent, with internodes 0.4-1.9 cm long. Leaf blades elliptic to slightly obovate, 3.9-11.2 × 1.3-2.8 cm, length/width ratio 2.8-4.6:1, chartaceous to subcoriaceous, glabrescent, apex acute or slightly acuminate, margin flat or slightly undulate, base cuneate to short attenuate, midrib strongly raised and glabrescent abaxially, venation strongly raised to inconspicuous, secondary veins 5-8 per side, 0.9-1.7 cm apart, angle of divergence from the midvein 45-70°, submarginal veins 1-5 mm from margin; petioles 3-5 mm long. Inflorescences umbellate, borne 1-5(-8) mm above leaf axil, 4-flowered; peduncles 0.8-1.6 (-2.3) cm long, sericeous; inflorescence bract not seen. Flowers not seen; pedicels (in fruit) (3.3-) 3.7-5.3 mm long, densely strigose. Fruits white, orbicular to subspherical, (1.7-)2.2-2.5 × (0.8-) 1.1-1.4 cm, pericarp coriaceous, densely strigose, beak 8-11 × 1.5-3 mm, robust. Seeds dark brown, otherwise unknown. — Fig. 8.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne pedicellata* is known from the base of the northern side of the Marojejy massif at about 500 m elevation in Antsiranana province, Madagascar (Fig. 11). The species was collected in fruit in March.

CONSERVATION STATUS. — The only known collection of *S. pedicellata* was made in 1994 just outside of the boundary of Marojejy National Park, in a low-lying area near a village. A search at the type locality with one of the collectors of the type (RAVELONARIVO) failed to locate another individual of the species. The forest at the type

locality is degraded, which may explain why additional material could not be located. The area of occupancy is perhaps less than 10 km². Thus, *Stephanodaphne pedicellata* qualifies as Critically Endangered (CE B1ab).

Stephanodaphne pedicellata is easily distinguished from all other members of the genus by its distinctively pedicellate flowers, its umbellate inflorescences, and its longer, more robust fruit beaks (8-11 × 1.5-3 mm).

7. *Stephanodaphne perrieri* Leandri

Notul. Syst. (Paris) 13: 39 (1947). — Type: *Perrier de la Bathie* 4605, Madagascar, Prov. Antsiranana, Montagne du Sambirano, Massif du Manongarivo, 500 m, Apr. 1909, fl., fr. (holo-, P-00253120!; iso-, P!).

Trees to 7 m tall; stems glabrescent, with internodes 0.7-1.7(-2.2) cm long. Leaf blades broadly to narrowly elliptic (slightly obovate), (6.3-)7.3-20.3 × (1.9-)2.8-5.4 cm, length/width ratio (2.4-)2.8-4.8:1, chartaceous to subcoriaceous, glabrescent, apex acuminate, acumen (0.3-)0.5-1.8(-2) cm long, margin flat to slightly undulate, base cuneate, nearly clasping petiole, midrib raised and glabrescent abaxially, venation raised to nearly inconspicuous on both surfaces, secondary veins 8-13(-16) per side, 0.7-1.6 cm apart, angle of divergence from the midvein 55-80°, submarginal veins (2-)3-4(-5) mm from margin; petioles 2-4 mm long. Inflorescences spicate, probably erect, borne (0.6-) 1.0-2.5 (-3.2) mm above leaf axil, elongating with up to 35 flowers per spike, 1-3 flowers opening simultaneously; peduncles 4.8-11.7 cm long, sericeous to glabrescent, indument persistent near flowers, fertile portion to 5.1 cm long, one-third to one-half the length of peduncle; inflorescence bract not seen. Flowers white; pedicels 0-1 mm long; hypanthium 0.9-1.2(-1.9) cm × 0.7-1 mm, sericeous abaxially; sepals probably spreading, ovate to triangular, 2.3-3.2 × 1.5-2.8 mm, sericeous to tomentose adaxially, densely sericeous to tomentose abaxially, apex acute, base glabrescent; annulus 0.5-0.7 mm tall; upper whorl of stamens adnate 0.2-3 mm below mouth, lower whorl adnate 0.5-4.5 mm below upper whorl, free portion of filaments 0.2-0.7 mm long, anthers 1.1-1.3 ×



FIG. 8. — *Stephanodaphne pedicellata* Z.S. Rogers: **A**, habit; **B**, pedicellate fruit with robust fruit beak. *Rasoavimbahoaka & Ravelonarivo 187*.

0.2-0.3 mm; ovary 2.9-4.1 × 1.2-1.8 mm, style 3.1-5.2 mm long, stigma at height of upper whorl of stamens to 4 mm below lower whorl. Fruits white, ovoid, 1.1-1.5 × 0.5-0.8 cm, pericarp coriaceous, sericeous, beak 2-5 mm long, slender. Seeds dark brown, ovoid, 8.4 × 5.1 mm, beak 0.2-0.4 mm long; embryo not seen in good condition.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne perrieri* is known from the humid forests of the Manongarivo massif (500-800 m elevation) in northern Madagascar, Antsiranana province (Fig. 11). It flowers and fruits from April to August.

VERNACULAR NAME. — Tsilaitribe (*Derleth 126*).

CONSERVATION STATUS. — This species is known from two populations, at least one of which is located in the Manongarivo Special Reserve. The extent of occurrence for the species is estimated to be less than 350 km², whereas the area of occupancy is 200 km². The species is assigned a preliminary status of Endangered (EN B1ab).

Stephanodaphne perrieri is distinguished from *S. cremostachya*, the only other species in the genus with spicate inflorescences, by its larger leaves (reaching 20.3 cm vs 10.1 cm long), by its longer hypanthia (1-1.9 cm vs *c.* 0.6 cm long), and by its longer fruits (1.1-1.5 cm vs ≤ 1.1 cm long). For an illustration of the species see LEANDRI (1950: 9, fig. 2). The ranges of the two species are separated by more than 1200 km; *S. perrieri* occurs in the north of the island, whereas *S. cremostachya* grows in the extreme southeast.

Derleth 126 has noticeably longer hypanthia (1.9 cm long) when compared to those on the type collection (0.9-1.2 cm long).

ADDITIONAL MATERIAL EXAMINED. — MADAGASCAR, Prov. Antsiranana: *Derleth 126*.

8. *Stephanodaphne pilosa* Z.S. Rogers, sp. nov.

Stephanodaphne pilosa a speciebus aliis in foliis apicibus decurvatis marginibus undulatis et paginis inferi-

oribus indumento aureo dense piloso praeditis, differt.

TYPUS. — *Rogers & Razakamalala 48*, Madagascar, Prov. Toamasina, Mantadia National Park, *c.* 11 km N of Andasibe village, along eastern trail to small waterfall, 18°49'47"S, 48°25'56"E, 939 m, 10 Jan. 2003, fl., fr. (holo-, MO!; iso-, G!, K!, MO!, P!, TAN!, WAG!).

Trees to 14 m tall; stems densely pilose, with internodes (0.3-)0.6-2.6(-3) cm long. Leaf blades obovate to elliptic, rarely ovate, 4-19.8 × 1-5.6 cm, length/width ratio 1.8-5.4(-6.1):1, chartaceous, abaxial surface covered with dense soft pilose indument, apex acute to acuminate, often cuspidate, decurved, acumen to 1.8 cm long, margin strongly undulate, outlined with dense sericeous golden trichomes, base cuneate to short attenuate, midrib strongly raised and densely pilose abaxially, venation raised to nearly inconspicuous on both surfaces, secondary veins 6-16 per side, 0.9-1.4 cm apart, angle of divergence from the midvein 45-65°, submarginal veins (2-) 3-7(-8) mm from margin; petioles (1-)2-6 mm long. Inflorescences capitate, pendent or erect in flower and fruit, borne 0-1.4(-2.1) cm above leaf axil, 5-13-flowered; peduncles 2.2-13.1(-15.7) cm long, densely pilose; inflorescence bract 1, persistent into flower, linear to narrowly ovate, 0.5-2.1(-3.5) cm × 0.8-2.2 mm, densely pilose abaxially, apex acuminate, base attenuate. Flowers green to green-yellow; pedicels 0-0.1 mm long; hypanthium 1.1-1.6(-2.4) cm × 0.9-1.2(-1.8) mm, densely pilose and sericeous abaxially; sepals spreading, triangular to ovate, (1.6-)2.1-2.8 × 1.1-2.2(-2.8) mm, glabrescent adaxially, pilose and sericeous abaxially, apex acute to rounded, margin tomentose; annulus white, 0.7-1.1 mm tall; upper whorl of stamens adnate 0.1-0.4(-0.9) mm below mouth, lower whorl adnate 0.5-1.8(-3.1) mm below upper whorl, free portion of filaments 0.2-0.8(-1.1) mm long, anthers 1-1.2 × 0.3-0.5 mm; ovary 1.6-2.3 × 1.1-1.4 mm, style 2.4-5.6 mm long, stigma 0-2.4(-8.1) mm below lower whorl of stamens. Fruits white to yellow, ovoid, 0.9-1.4 × 0.8-1.3 cm, pericarp coriaceous, pilose and sericeous, erect trichomes to 1.3 mm long, beak 0.2-2.1 mm long, slender. Seeds dark to light brown, ovoid to subspherical, 7.1-9.7 × 4.8-7.2 mm, beak 0.1-0.8 mm long; embryo (3.9-)5.5-7.2 × 3.8-5.2 mm, radicle 0.2-0.8 mm long. — Fig. 9.

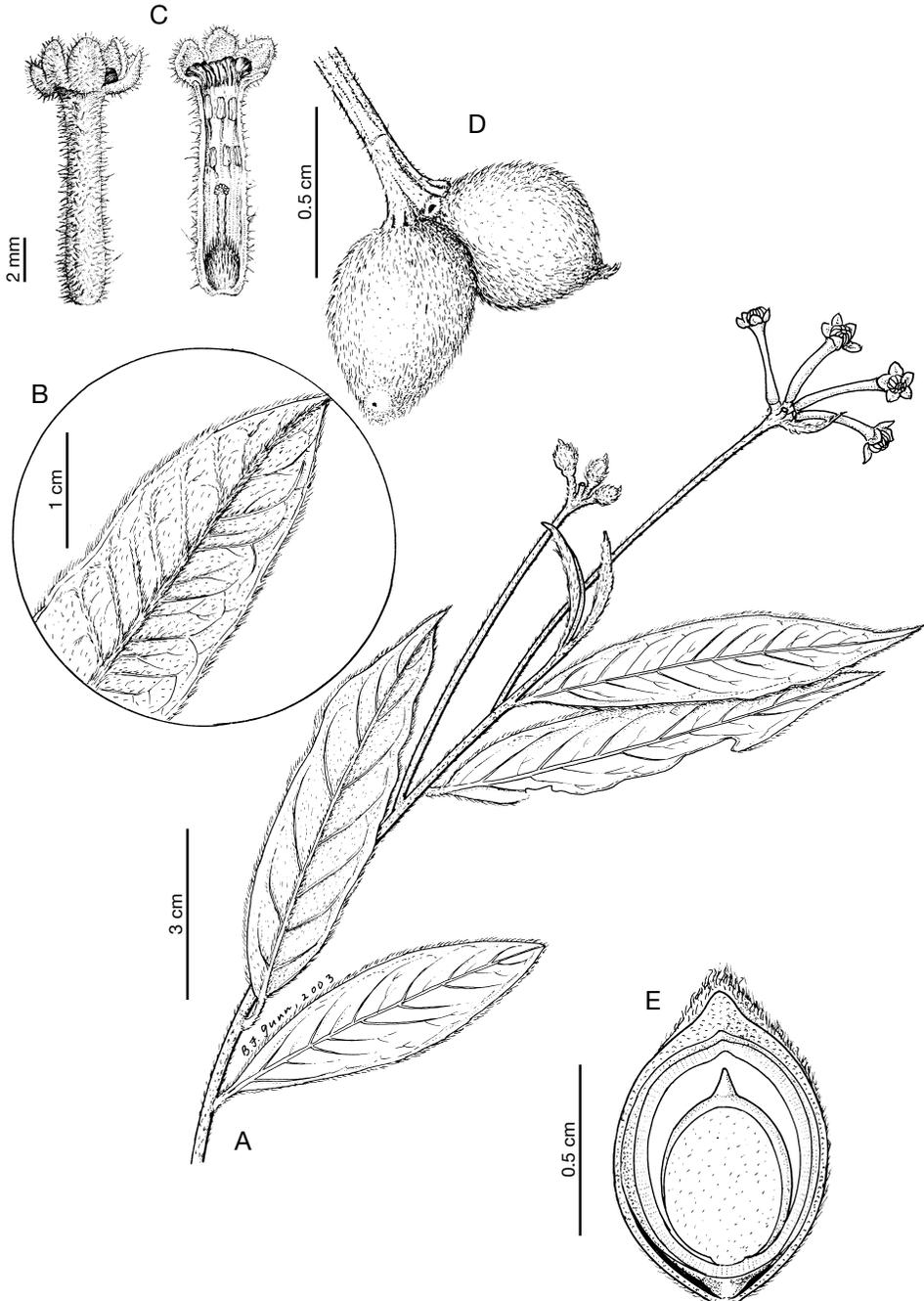


FIG. 9. — *Stephanodaphne pilosa* Z.S. Rogers: **A**, habit; **B**, abaxial leaf surface; **C**, flower; **D**, infructescence (after bract dissociates); **E**, longitudinal section of fruit and seed. A, C, D, Rogers & Razakamalala 48; B, Rogers et al. 115; E, Ratovoson et al. 682.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne pilosa* is a widespread Malagasy species that occurs from 50-1100 m elevation, and from the Masoala peninsula south to the forests near Fort-Dauphin (Fig. 11). Coastal and subcoastal populations of *S. pilosa* are located on the eastern slopes of Andohahela National Park (Parcel 1), and the forests above Saint-Jacques village, Analalava (west of Foulpointe), and the northern side of Masoala. One or two populations grow about 75 km inland at Mantadia National Park and Analamazoatra Special Reserve.

Stephanodaphne pilosa grows in fully shaded areas of dense humid forest on lateritic soils. It has been collected in flower from October through March and fruit from October to July, but the species probably flowers and fruits year round.

VERNACULAR NAMES. — Havoia (*Humbert 20600bis*); Fotsivolomanokana (*Service Forestier 1092-R-100*).

LOCAL USE. — The strong cortical fibers of *S. pilosa* have been used to make textiles (*Humbert 20600bis*).

CONSERVATION STATUS. — This species has been collected from eight or nine localities, four of which are located within protected areas. The species appears to be quite common in some of these areas (e.g., Andohahela National Park, Analamazoatra Special Reserve, Mantadia National Park). The extent of occurrence for the species is 50000 km², and the area of occupancy is 900 km². *Stephanodaphne pilosa* is assigned a conservation status of Least Concern (LC).

Stephanodaphne pilosa is easily distinguished from all other species in the genus by its dense indument composed of golden erect trichomes that cover the young stems, leaf blades, midribs, margins and hypanthia, and by the decurved leaf apices with strongly undulate margins. The dense pilose indumentum gives the blades of *S. pilosa* their soft texture. The only other species with dense indument, *S. cuspidata*, is easily distinguished from *S. pilosa* by its adpressed indument and scabrous abaxial leaf surfaces. When comparing fresh material of *S. pilosa* with *S. cuspidata*, leaf blades of the former are darker green and more chartaceous, and the hypanthia of the latter are broader and more yellow than green.

Populations of *Stephanodaphne pilosa* growing in forests near Mantadia and Analamazoatra (c. 1000-1100 m elevation) typically have smaller leaves with longer acumen than those occurring in subcoastal or low elevation forests (c. 50-600 m elevation). Subcoastal populations also tend to have more obovate leaves with more cuspidate apices.

PARATYPES. — MADAGASCAR, **Prov. Toamasina**: *Descoings 160*, Perinet, [18°56'S, 48°26'E], Dec. 1954, fl. (MO [2 sheets], TAN); *Lowry & Schatz 4285*, Andasibe (Perinet), on road to Col de la Mantadia, [18°53'S, 48°27'E], 1000-1050 m, 2 Apr. 1987, fr. (MO, TAN); *McPherson & van der Werff 16475*, Mantadia PN, 18°55'S, 48°25'E, 900 m, 2 Nov. 1994, fl. (MO [2 sheets], P, TAN); *Perrier de la Bâthie 4468*, Analamazoatra RS, [18°56'S, 48°26'E], 800 m, Feb. 1912, fr. (P); *Rogers & Razakamalala 34*, same locality, 18°56'08"S, 48°25'08"E, 940-960 m, 8 Jan. 2003, fl. (MO, P, TAN); *Rogers & Razakamalala 35, 36, 37*, same locality, fl., fr. (MO); *Rogers & Razakamalala 38*, same locality, y.fl. (MO); *Rogers & Razakamalala 39*, same locality, 9 Jan. 2003, fl., y.fr. (MO, TAN); *Rogers & Razakamalala 47, 50*, Mantadia PN, 18°49'47"S, 48°25'56"E, 939 m, 10 Jan. 2003, fl., y.fr. (MO, P, TAN); *Rogers & Randrianaivo 168*, Analamazoatra RS, 18°56'02"S, 48°25'38"E, 1020 m, 26 Feb. 2003, fl., fr. (MO); *Rogers & Randrianaivo 172, 173*, Mantadia PN, 18°49'47"S, 48°25'56"E, 939 m, 26 Feb. 2003, fr. (MO, P, TAN); *Rogers & Randrianaivo 174*, same locality, st. (MO); *Schatz et al. 3716*, Analamazoatra RS, 18°56'S, 48°26'E, 1000 m, 29 Nov. 1996, fl. (MO [3 sheets], P, TEF); *Service Forestier (Écoles Forestières) 1092-R-100*, Série C Perinet II, [18°56'S, 48°26'E], 21 Dec. 1953, fl. (TEF); *Service Forestier (Capuron) 22799*, Forêt d'Analalava, à l'ouest de Foulpointe, [17°42'34"S, 49°26'50"E], [50 m], 30 Oct. 1963, y.fl. (MO, P, TEF); *Service Forestier (Capuron) 23851*, same locality, 20 Nov. 1964, fl. (MO, P, TEF); *Sweeney 1338*, Masoala peninsula, peak near Andranobe, 15°40'12"S, 49°58'40"E, 620 m, 3 July 2003, fr. (MO). **Prov. Toliara**: *Dumetz 715*, Andohahela RNI (Parcel #1), [24°48'S, 46°50'E], 160 m, 22 Apr. 1989, fr. (MO, TAN, TEF, WAG); *Du Puy et al. MB531*, same locality, [24°46'S, 46°50'E], 500 m, 7 Dec. 1989, fl., fr. (MO, TAN); *Humbert 20600bis*, Ampasimena, vallée de la Manampanihy, [24°22'S, 47°10'E], 20-100 m, 18-23 Mar. 1947, st. (P); *Humbert & Capuron 29045*, Ranofotsy, Mont Ankazovandamena, près de la Baie des Galions (Ranofotsy), [25°09'S, 46°43'E], 100-450 m, 21 Feb. 1955, fl., fr. (P); *Leeuwenberg et al. 13984*, Andohahely RNI (Parcel #1), [24°45'S, 46°51'E], 500 m, 26 Apr. 1988, fr. (MO, P, TAN, WAG [2 sheets]); *Phillipson 2972*, same locality, [24°46'S, 46°51'E], 200 m, 24 Dec. 1988, fl. (G, MO, TAN, WAG); *Randriamampionona 231*, same locality,

[24°48'S, 46°52'E], 100-500 m, 16-24 Mar. 1993, fl., fr. (MO, P, TAN); *Réserves Naturelles (Rakotoson) 10041*, same locality, 19 Jan. 1958, fl., fr. (P); *Rogers et al. 96, 97, 98, 99, 100, 104*, 3 km NW of Saint-Jacques, forest Ambatomitikitra, 24°58'56"S, 46°57'30"E, 200-300 m, 25 Jan. 2003, fl., fr. (MO, P, TAN); *Rogers et al. 112, 113, 114, 115*, Manantantely Forest, 10 km W of Fort-Dauphin, 24°59'15"S, 46°55'33"E, 120-220 m, 30 Jan. 2003, fl., fr. (MO, P, TAN); *Schatz & Nicoll 1245*, same locality, [24°47'S, 46°52'E], 150-700 m, 15 Mar. 1987, fl., fr. (MO, TAN, WAG); *Service Forestier (Capuron) 11824*, Massif du Lavasoa (= Grand Lavasoa), au nord de la Baie des Galions, [25°05'S, 46°44'30"E], 450 m, 24-25 Jan. 1955, fr. (P).

9. *Stephanodaphne schatzii* Z.S. Rogers, sp. nov.

Stephanodaphne schatzii a speciebus aliis in laminis linearibus 5.4-21.4-plo longioribus quam latioribus basi-bus rotundatis et marginibus planis, et floribus annulis flavis, differt.

TYPUS. — *Rogers, Razakamalala & Ludovic 52*, Madagascar, Prov. Fianarantsoa, Ranomafana National Park, along trail to Riana waterfall, piste F, 21°15'39"S, 47°25'10"E, 1000-1160 m, 15 Jan. 2003, fl., fr. (holo-, MO!; iso-, G!, Kl, MO!, P!, TAN!, WAG!).

Trees to 3 m tall; stems strigose, with internodes 0.3-2.6 cm long. Leaf blades linear, 3.9-18.8 × 0.4-1.7(-2) cm, length/width ratio 5.2-21.4:1, chartaceous, rigid, scabrous or smooth abaxially, abaxial surface covered with dense adpressed or subadpressed strigose indument, apex acute, margin flat, often sericeous, base rounded, midrib strongly raised and strigose, venation slightly raised to inconspicuous on both surfaces, secondary veins (4-)-5-8(-9) per side, 0.9-3.1 cm apart, angle of divergence from the midvein 20-50°(-55°), submarginal veins 1-2(-3) mm from margin; petioles 1-2(-3) mm long. Inflorescences capitate, pendent or erect in flower and fruit, borne 1.0-5.4 (-7.6) mm above leaf axil, (2-)3(-4)-flowered; peduncles 2.2-5.8(-7.9) cm long, strigose; inflorescence bract 1, linear to ovate, (1.8-)3.2-6.1 × 0.3-0.6 mm, sericeous to glabrescent abaxially, apex acute, base attenuate. Flowers white-green; pedicels 0-0.3 (-0.5) mm long; hypanthium (1.1)1.2-1.4(-1.6) cm × 0.8-1.1 mm, sericeous abaxially; sepals spreading, subtriangular to ovate, 1.7-2.4 × 0.8-1.5 mm,

tomentose adaxially, sericeous abaxially, apex acute, margin tomentose, base glabrescent; annulus yellow, 0.6-0.9 mm tall; upper whorl of stamens adnate 0-0.4 mm below mouth, lower whorl adnate 0.3-0.5 mm below upper whorl, free portion of filaments 0.2-0.5 mm long, anthers 0.8-1.2 × 0.2-0.3 mm; ovary 2.5-2.7 × 0.5-1.1 mm, style 1.8-4.1 mm long, glabrous near stigma, stigma 2.9-4.1 mm below lower whorl of stamens. Fruits white, ovoid, 1.1-1.3 × 0.6-0.8 cm, pericarp coriaceous, sericeous, beak 1.2-2.8 mm long, slender. Seeds dark brown, ovoid, 6.4-7.8 × 4.8-6.9 mm, beak 0.3-0.4 mm long; embryo 3.9-5.5 × 3.8-4.5 mm, radicle 0.4-0.5 mm long. — Fig. 10.

DISTRIBUTION AND PHENOLOGY. — *Stephanodaphne schatzii* grows in mid-elevation (1000-1350 m) humid forest at Ranomafana National Park and Ivohibe Réserve Spéciale in Fianarantsoa province, Madagascar (Fig. 12). The species flowers from October to March and fruits from January to March.

VERNACULAR NAME. — Ambozy (*Turk et al. 756*).

CONSERVATION STATUS. — *Stephanodaphne schatzii* is known from two protected areas separated by c. 150 km. Habitat between the two populations is fragmented and degraded and may no longer be able to support the species, although it appears to be relatively common at Ranomafana. The species has an estimated 300 km² extent of occurrence, and a 400 km² area of occupancy. It is assigned a preliminary conservation status of Endangered (EN B1ab).

Stephanodaphne schatzii is easily recognizable by its linear leaf blades with rounded bases; typical length/width ratios of the longest blades are 8:1-15:1, while those of some leaves exceed 21:1. The margins of the leaf blades are always flat, with no undulation whatsoever. *Stephanodaphne schatzii* is the only species of *Stephanodaphne* with a pale yellow annulus in the flower; all others have white annuli.

Rakotovao et al. 860, collected at Ivohibe Réserve Spéciale, differs from the populations growing at Ranomafana National Park by the presence of subadpressed or erect indument. A specimen of uncertain identity, *Rogers et al. 54*

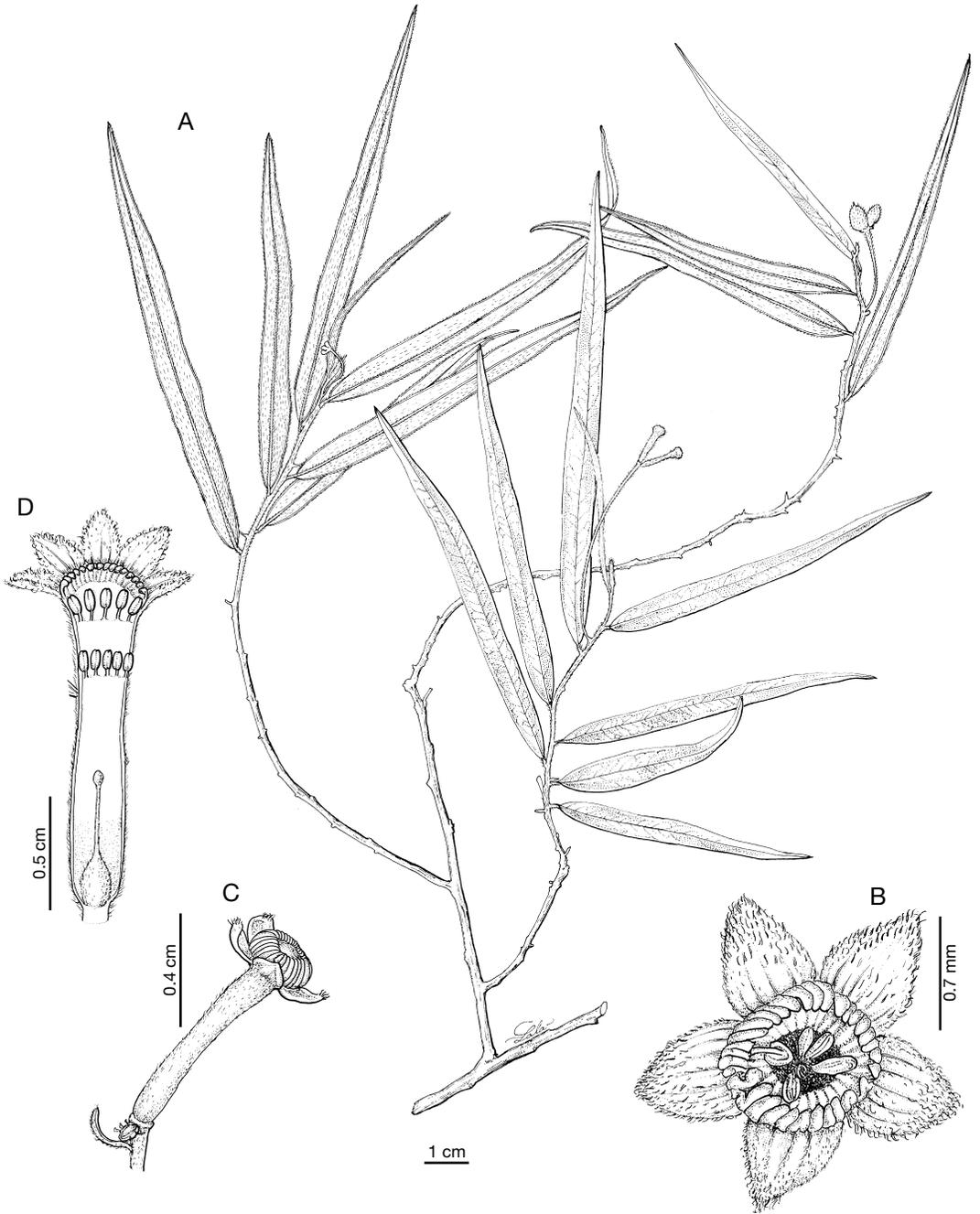
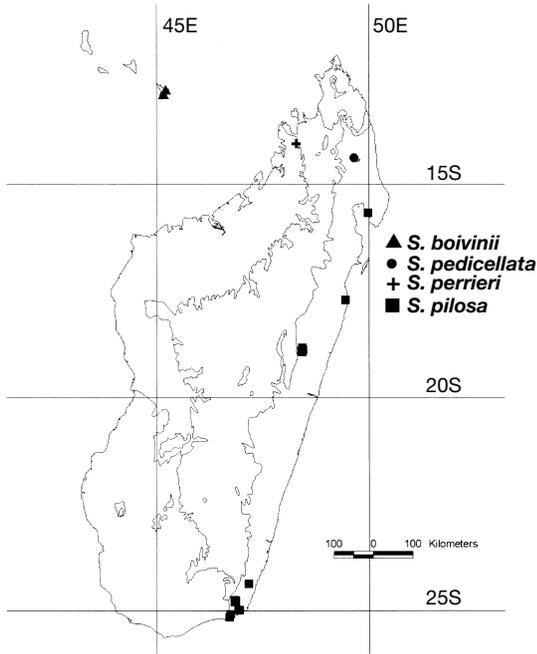
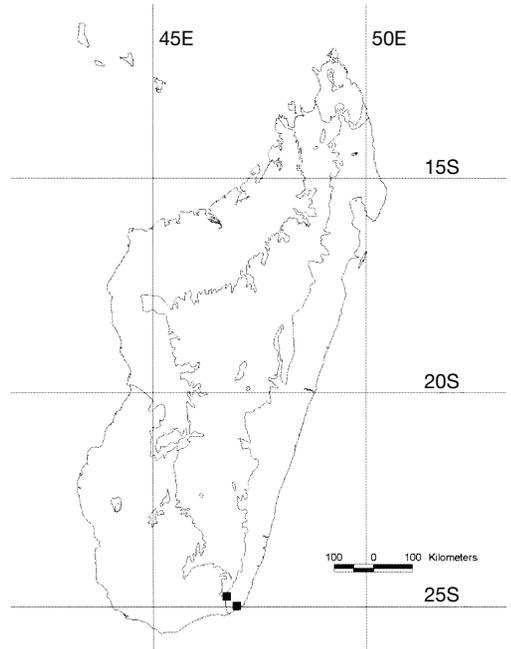
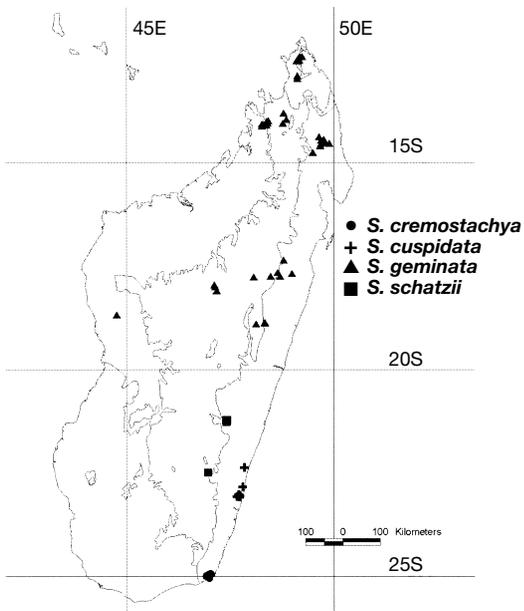


FIG. 10. — *Stephanodaphne schatzii* Z.S. Rogers, **sp. nov.**: A, habit; B-D, flower. Rogers et al. 52.

FIG. 11. — Distribution of *Stephanodaphne* species.FIG. 13. — Distribution of *Stephanodaphne humbertii* Leandri.FIG. 12. — Distribution of *Stephanodaphne* species.

(MO), lacking both open flowers and mature fruits, was collected along a trail where *S. schatzii* was also found, but it differs from that species by its more broadly elliptic leaves this specimen has been excluded from the description and paratype-citation, and may represent a different species.

Stephanodaphne schatzii is named in honor of Dr. George E. Schatz, the first person to collect the species, and a botanist whose research has greatly contributed to our knowledge of the Malagasy flora.

PARATYPES. — MADAGASCAR, **Prov. Fianarantsoa**: *Rakotovo* *et al.* 860, Ivohibe Réserve Spéciale, 22°29'00"S, 46°58'06"E, 1350 m, 15-22 Oct. 1997, fl. (MO, P); *Rogers et al.* 51, 52, 53, 55, 56, 57, 58, 59, Ranomafana National Park, Trail F to Riana waterfall, 21°15'39"S, 47°25'10"E, 1000-1160 m, 15 Jan. 2003, fl., fr. (MO, P, TAN); *Rogers et al.* 62, Ranomafana National Park, *Pandanus* swamp forest of Antanifotsy, 21°13'22"S, 47°25'51"E, 1000-1150 m, 16 Jan. 2003, fl., y.fr. (MO, P, TAN); *Schatz* 2578, 7 km W of Ranomafana, on slopes above Namorona River, 21°16'S, 47°25'E, 1000 m, 12-13 Feb. 1989, fr. (MO, TAN); *Turk et al.* 756, Ranomafana National Park, for-

est near Amboditanimena and Ampasina wetland, [21°13'S, 47°24'E], 1200 m, 11 Mar. 1995, fl., fr., (MO, TAN).

COLLECTION OF UNCERTAIN AFFINITY

Service Forestier 101-R-104 (MO, TEF) has a distinctive morphology that does not resemble that of any other specimens examined in this study. Its vegetative organs are covered with the longest and most dense indument of erect trichomes of any other collection. The inflorescences are long and spicate, which clearly distinguishes it from *S. pilosa*, the other species of *Stephanodaphne* with dense erect indument. Unfortunately, the collection is incomplete, with only two immature fruits loose in the envelope. It was collected in 1951 from a forest near Fort Carnot, Fianarantsoa province, Madagascar. The condition of the vegetation at present is unknown. The collection may represent a new species, but additional material will be required before its taxonomic status can be determined.

Acknowledgements

The research conducted for this study was undertaken for a Masters of Science degree at the University of Missouri-St. Louis, Missouri, USA. I would like to acknowledge the three members of my thesis committee: P.C. HOCH, G.E. SCHATZ, and P.F. STEVENS. I also would like to thank G. DAVIDSE, S. FUENTES, R. GEREAU, R. KEATING, E. KELLOGG, M. MERELLO, J. MILLER, L. NEVLING, M. VAN DER BANK, the Missouri Botanical Garden staff stationed in Madagascar, and the curators of: BM, BR, K, G, GH, MO, NY, P, TAN, TEF, US, WAG. B. GUNN and L. Roger ANDRIAMIARISOA kindly provided the illustrations. The field work portion of my study was partially supported by the 2003 John Denver Memorial Scholarship awarded through the International Center for Tropical Ecology at the University of Missouri-St. Louis. The Missouri Botanical Garden provided additional financial support towards my field work and supplies, through several other grants administered by P.P. LOWRY II and P.M. RICHARDSON.

REFERENCES

BAILLON H. 1875. — D'observations botaniques. *Adansonia* 11: 302-304.

- BAYER C., FAY M.F., DE BRUIJN A.Y., SAVOLAINEN V., MORTON C.M., KUBITZKI K., ALVERSON W.S. & CHASE M.W. 1999. — Support for an expanded family concept of Malvaceae within a recircumscribed order Malvales: a combined analysis of plastid *atpB* and *rbcl* DNA sequences. *Bot. J. Linn. Soc.* 129: 267-303.
- BROWN R.W. 1956. — *Composition of Scientific Words*. Reese Press, Baltimore.
- CORNET A. 1974. — Essai de cartographie bioclimatique à Madagascar. *Notic. Explic. ORSTOM* No. 55.
- DAVIS P.H. & HEYWOOD V.H. 1963. — *Principles of Angiosperm Taxonomy*. Oliver and Boyd, Edinburgh.
- DE JUSSIEU A.-L. 1789. — *Genera plantarum: secundum ordines naturales disposita...* Herissant et Barrois, Paris.
- DE QUEIROZ K. 1998. — The general lineage concept of species, species criteria, and the process of speciation: 57-75, in HOWARD D.J. & BERLOCHER S.H. (eds), *Endless Forms: Species and Speciation*. Oxford University Press, New York.
- DORR L.J. 1997. — *Plant Collectors in Madagascar and the Comoro Islands*. Royal Botanic Gardens, Kew.
- GREUTER W., MCNEILL J., BARRIE F.R., BURDET H.M., DEMOULIN V., FILGUEIRAS T.S., NICOLSON D.H., SILVA P.C., SKOG J.E., TREHANE P., TURLAND N.J. & HAWKSWORTH D.L. (eds) 2000. — *International Code of Botanical Nomenclature (St. Louis Code)*. Regnum Vegetabile 138. Koeltz Scientific Books, Königstein.
- HERBER B.E. 2002. — Thymelaeaceae: 373-396, in KUBITZKI K. (ed.), *The Families and Genera of Vascular Plants. IV. Flowering Plants. Dicotyledons. Malvales, Capparales and Non-betalain Caryophyllales*. Springer, Berlin.
- HOLMGREN P.K., HOLMGREN N.H. & BARNETT L.C. (eds) 1990. — *Index Herbariorum*, ed. 8. New York Botanical Garden, New York.
- IUCN 2001. — *IUCN Red List Categories and Criteria: Version 3.1*. IUCN, Gland, Switzerland and Cambridge, UK, IUCN Species Survival Commission.
- LEANDRI J. 1930a. — Nouvelles Thyméléacées de Madagascar. *Bull. Soc. Bot. France* 77: 32-35.
- LEANDRI J. 1930b. — Révision des Thyméléacées de Madagascar. *Bull. Mus. Natl. Hist. Nat.*, sér. 2, 2: 668-676.
- LEANDRI J. 1947. — Nouvelles observations sur les Thyméléacées de Madagascar. *Notul. Syst. (Paris)* 13: 38-55.
- LEANDRI J. 1950. — Thyméléacées: 1-40, in HUMBERT H. (ed.), *Flore de Madagascar et des Comores (plantes vasculaires)*. Firmin-Didot, Paris.
- MABBERLEY D.J. 1997. — *The Plant Book*, ed. 2. Cambridge University Press, Cambridge.
- ROGERS Z.S. 2003. — *A taxonomic revision of Stephanodaphne Baill. (Thymelaeaceae: Thymelaeoi-*

- deae*). University of Missouri-St. Louis, USA, unpubl. M.S. thesis.
- SCHATZ G.E. 2000. — Endemism in the Malagasy tree flora: 1-9, in LOURENÇO W.R. & GOODMAN S.M. (eds), *Diversity and Endemism in Madagascar*. Mém. Soc. Biogéogr., Paris.
- SCHATZ G.E. & LESCOT M. 2003. — Gazetteer to Malagasy Botanical Collecting Localities. Missouri Botanical Garden website (<http://www.mobot.org/MOBOT/Research/madagascar/gazetteer/>).
- STEARNS W.T. 1992. — *Botanical Latin*, ed. 4. Timber Press, Portland.
- VAN DER BANK M., FAY M.F. & CHASE M.W. 2002. — Molecular phylogenetics of Thymelaeaceae with particular reference to African and Australian genera. *Taxon* 51: 329-339.
- WURDACK K.J. & HORN J.W. 2001. — A reevaluation of the affinities of the Tepuianthaceae: molecular and morphological evidence for placement in the Malvales: 151, in *Botany 2001: Plants and People*, Abstracts [Albuquerque].

*Submitted on 10 February 2004;
accepted on 23 March 2004.*