

A revision of the Malagasy endemic *Talinella* (Portulacaceae)

Wendy L. APPLEQUIST

Missouri Botanical Garden, P.O. Box 299, St Louis, MO 63166-0299 (USA)
wendy.applequist@mobot.org

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ABSTRACT

A revision is presented of the genus *Talinella* Baill. Twelve species are recognized, of which seven (*T. albidiflora*, *T. ankaranensis*, *T. bosseri*, *T. humbertii*, *T. latifolia*, *T. tsitondroinensis*, *T. xerophila*) are newly described. *Talinella grevei* Danguy is divided into four subspecies, of which two (subsp. *calcicola*, subsp. *hirsuta*) are newly described and one (subsp. *sarmentosa*) is newly recognized at that taxonomic level. All species are endemic to Madagascar, and most are vulnerable or endangered.

RÉSUMÉ

Révision du genre endémique malgache *Talinella* (Portulacaceae).

Une révision du genre *Talinella* Baill. est présentée. Douze espèces sont reconnues, dont sept sont nouvelles (*T. albidiflora*, *T. ankaranensis*, *T. bosseri*, *T. humbertii*, *T. latifolia*, *T. tsitondroinensis*, *T. xerophila*). *Talinella grevei* Danguy est divisée en quatre sous-espèces, dont deux sont nouvelles (subsp. *calcicola*, subsp. *hirsuta*) et une est nouvellement reconnue comme sous-espèce (subsp. *sarmentosa*). Toutes les espèces sont endémiques à Madagascar et la plupart sont menacées.

MOTS CLÉS

Portulacaceae,
Talinella,
Madagascar,
conservation,
endémisme,
nouvelles espèces.

INTRODUCTION

The Malagasy endemic genus *Talinella* Baill. differs from most Portulacaceae in being woody and usually dioecious with a usually fleshy fruit, a suite of characters that are positively associated and that occur with unusual frequency in plants endemic to island habitats (e.g., CARLQUIST 1974; BAWA 1980; LLOYD 1985) for reasons that, though much discussed, remain unclear (e.g., BAWA 1980; GIVNISH 1980; DONOGHUE 1989;

THOMSON & BRUNET 1990; SAKAI & WELLER 1999). *Talinella* is the only genus of Portulacaceae endemic to Madagascar (*Dendroportulaca* Eggl. being properly placed in Amaranthaceae and congeneric with *Deeringia* R.Br.; APPLEQUIST & PRATT in press). As described by BAILLON (1886) it contained only the type species, *T. boiviniana* Baill.; two more species were published by SCOTT ELLIOT (1891) and DANGUY (1915). LEANDRI (1962) described another as a new genus, *Sabouraea* Leandri,

which he tentatively referred to Flacourtiaceae; later (LEANDRI 1965), he recognized its synonymy with *Talinella* but failed to make the necessary transfer. *Talinella* was most recently revised by EGGLI (1997), who recognized five species.

Talinella was originally placed in Portulacaceae when described by BAILLON (1886). PAX & HOFFMAN (1934) considered this placement doubtful, as did MCNEILL (1974), and the genus was not included in CAROLIN's (1987, 1993) cladistic analysis and classifications of Portulacaceae. NYANANYO (1986, 1990) argued in favor of the placement of *Talinella* within Portulacaceae and eventually within the tribe Talineae Fenzl, whereas HERSHKOVITZ (1993) suggested a closer relationship to *Portulacaria* Jacq. and *Ceraria* Pearson & Stephens. NYANANYO's position is strongly supported by recent molecular data, which indicate that *Talinella* is embedded within a paraphyletic *Talinum* Adans. (HERSHKOVITZ & ZIMMER 1997; APPLEQUIST & WALLACE 2001).

Recent herbarium and field observations suggested that the subset of existing collections made available on loan to EGGLI were inadequate to portray the true range and distribution of variation within *Talinella*. As a result, four of the five species now recognized (EGGLI 1997) were rather broadly defined and most were apparently widespread, but included morphologically distinguishable disjunct populations that were individually of very limited range and thus of potential conservation concern. For this paper, as a contribution to a treatment of Portulacaceae of Madagascar and Comoros, the collections at P, MO, TAN and TEF were examined. Twelve species of *Talinella* are recognized herein, of which seven are described as new.

GEOGRAPHY AND CONSERVATION

Talinella can be roughly described as having a disjunct distribution, with one group of species confined to the extreme northern end of Madagascar and another concentrated in the arid southern region, from Toliara on the southwestern coast to Fort-Dauphin at the extreme southeast. Isolated specimens from central and northwestern localities, previously identified as outlying populations of existing species, represent

several previously unrecognized species and subspecies; this suggests that the current range of the genus may be the remnants of an original distribution spanning most of the drier portions of the country. *Talinella* is restricted to the more arid habitats, including dry forest, bush and transitional scrub; no species have been found in the eastern humid forest. Substrates include sand, calcite and granite; individual taxa are frequently restricted to a single substrate.

Specimen locality data for all species of *Talinella* have been analyzed to provide preliminary estimates of conservation status according to the IUCN Red List Categories and Criteria (IUCN 2001). Most species are of limited range, and several are known from only a single collection or a handful of sites. It is likely that most of these species are indeed uncommon. Some of the recorded localities are reasonably accessible, and collections would probably be more numerous if the species in the central part of the country were common. Moreover, most of these localities are not situated within Madagascar's network of protected areas; some collections have been made from degraded bush, and others from areas where further environmental damage has occurred since the time of collection. Based on estimates using specimen data alone, six of the 12 species recognized may be provisionally classified as vulnerable and one as critically endangered, while an eighth is lacking data but is likely to be vulnerable or endangered. Although *T. grevei* is widespread, two distinctive subspecies are known from a very limited number of collections and may also be of conservation concern.

MORPHOLOGY

Morphological variation in *Talinella* is complex; within groups of very similar and perhaps recently diverging species, there are few fixed character discontinuities, making delimitation of species boundaries difficult. In the most broadly distributed and best-collected species, *T. grevei* Danguy, infraspecific variability is as great as that usually seen among closely related species. However, where morphological differences are accompanied by significant discontinuity in geographic range, habitat, and/or substrate preference, recognition at the species level may be

considered appropriate even where material is limited. Geographical and substrate data may thus play a useful role in identification.

VEGETATIVE CHARACTERS

The habit of almost all species of *Talinella* is that of a shrub with lax, sarmentose or lianoid branches. *Talinella pachypoda* Eggl. may be erect with a single main stem and a swollen basal caudex; *T. grevei* may have a very short basal trunk of over 20 cm in diameter. Individuals of such species as *T. grevei* and *T. boiviniiana* Baill., especially where commingled with lianas or other plants, can present the appearance of a liana growing on another shrub. Label information may be misleading in this regard, as a complex habit is easily misinterpreted by collectors; several species that have been described as lianoid probably rarely if ever are in the technical sense.

Lenticels may be present or absent on older twigs, varying even within individuals. Some species (e.g., *T. boiviniiana*, *T. ankaranensis*) are consistently glabrous, but most species sometimes or usually bear papillae on the smaller twigs. Papillae may be entirely white and occasionally elongated into short cilia, as in *T. grevei* and related species, or they may be intermingled white and brown, as in *T. pachypoda*, *T. dauphinensis* and related species.

Leaf characters are often relatively consistent within a species, although overlap among species limits their taxonomic utility. Papillose or revolute margins, or papillae or short cilia on the blade, are seen in certain species; secondary venation may be visible or not. The leaves of many species are frequently bullate, usually inconspicuously; in *T. humbertii* Appleq., the shallow white glandular bumps are sometimes quite prominent.

INFLORESCENCES

Inflorescence characters were considered key to species identification by EGGLI (1997). Inflorescences may be mostly terminal or lateral and numerous, and may range from over 30 cm long with over a hundred flowers maturing simultaneously to a simple cyme with only two or three flowers. Most inflorescences are paniculate or rarely racemiform, but the ultimate branching is always dichasial; maturing flowers may be termi-

nal or lateral. The distalmost branches, which are usually subtended by small triangular bracts, are frequently reduced, so that the terminal branches are tipped and the flowers subtended by small clusters of empty bracts or (especially in *T. grevei* and its apparent relatives) by clusters of bracts and small buds. Variation in bud size may to some extent reflect sequential maturation, although in *T. grevei* a comparison of budding, flowering and fruiting inflorescences suggests that many of the smaller buds do not mature. A distinction may be made between species that have numerous flowers open simultaneously (e.g., *T. grevei*, *T. boiviniiana*) and species with few mature flowers, but inflorescence size is quite variable within some species and even within individuals of those species, thus species cannot be neatly separated by the number of flowers per inflorescence.

Coloration, size and number of the bracts vary among species. In some species, bud scales are sometimes seen in the axils of leaf scars at the base of the peduncle and the distal portion of the supporting twig. These scales are usually small, dark and inconspicuous, but in some of the species with white and brown twig papillae, especially *T. humbertii* Appleq., they may be over 1 mm long, recurved and multicolored with a pale apex, giving the appearance of being a type of bract. However, this character is variable within individuals and, as bud scales are not present in large numbers, it is not observable on every specimen.

FLOWERS

Most species of *Talinella* are dioecious as the normal condition; either the stamens or the gynoecium appear to be vestigial in every flower, and there is sometimes, although not always, pronounced sexual dimorphism in the corolla, with the male flowers being larger. A few taxa, particularly *T. grevei* and *T. microphylla*, appear to be morphologically gynodioecious, although the "hermaphroditic" flowers often have very tiny ovaries despite their well developed stigmas and style, and the paucity of hermaphroditic specimens with developing fruits suggests that they may be for the most part functionally male. Corolla size averages significantly larger in hermaphroditic than in female flowers, which has been observed to be almost universally the case in

gynodioecious angiosperms (e.g., DELPH 1996; ECKHART 1999).

Talinella is described as normally having either two or five petals, with the northern species *T. boiviniana* and *T. pachypoda* (which are otherwise not very similar) having five and the southern species usually having two. However, other petal numbers are common. A few of the southern and central or western taxa, including *T. dauphinensis* sensu stricto, usually have three to four petals, and five-petaled species frequently display varying levels of petal fusion within individuals, such that four or even three petals per flower may be observed. However, where two petals are the norm, infra-individual variation in petal number is rare.

Other useful taxonomic characters may be found in the size, evenness and thickness of the sepals; the size and number of the anthers; the extent of ciliation of the filaments; the presence or absence of a nectar disk; and the number (two or three), size and shape of stigmas and the presence or absence of a style.

FRUITS

The fruit of *Talinella* is often a globose or broadly ellipsoid berry, whereas the fruits of other Portulacaceae are capsular. Young ovaries of various species are 2-3-loculed or incompletely 4-loculed (BAILLON 1886), also unique within Portulacaceae, but the septae are broken down upon ripening (EGGLI 1997). The fruit of *T. pachypoda* has been described as a lemon-shaped berry, and is plump and bacciform during much of its development, but has been observed in one specimen to be a capsule, thin-walled at maturity and apically dehiscent by shallow valves. The developing ovaries of some other species are not very fleshy and, although they have been presumed to be berries, it is possible that they too are unripe globose capsules. The number of seeds per fruit may range from one to nine, with three to six being most common. The seeds are generally black, glossy, laterally compressed and broadly reniform to orbicular, but vary somewhat in size, shape, and the presence or absence of a ridge around the back; in *T. boiviniana*, the seeds are very dark gray to black and at least weakly papillate. The pedicel sometimes thickens conspicuously in fruit; rarely, the perianth may persist

during fruit development. For most taxa, little or no mature fruit has been collected; thus, though the fruits display several promising taxonomic characters, they remain of limited use.

SYSTEMATICS

TALINELLA Baill.

Bull. Mens. Soc. Linn. Paris 1 (72): 569 (1886). — Type species: *Talinella boiviniana* Baill.
Sabouraea Leandri, Adansonia, sér. 2, 2: 224 (1962). — Type species: *Sabouraea sarmentosa* Leandri.

Shrubs, or rarely erect, caudiciform small trees, frequently with sarmentose lianoid branches; dioecious or possibly sometimes gynodioecious; twigs often longitudinally ridged or wrinkled, with lenticels present or absent, the smallest twigs glabrous or papillose with white or white and brown papillae. Leaves alternate, sometimes clustered on short shoots, short-petioled, often fleshy, often inconspicuously bullate, rarely pubescent; apex variable, frequently asymmetrical; margins entire or rarely papillate or ciliate, sometimes deeply revolute; venation pinnate, secondary venation visible or not. Inflorescences terminal or lateral, sometimes numerous, usually paniculiform, the ultimate branching dichasial, small and few-flowered to large and many-flowered, open to compact; dichasial branches usually subtended by small triangular bracts. Sepals 2, convex, occasionally unequal or fleshy, glabrous or rarely pubescent; petals 2-5, often convex or irregularly fused, white to pale green or yellowish or deep pink to purple; stamens usually about 20 in 2 whorls, occasionally fewer, the outer filaments glabrous, the lower portion of inner filaments ciliate or irregularly broadened at least at the base, sometimes attached to a nectar disk; ovary 2-3(-4)-loculed; stigmas 2 to 3, elongated, terete or flattened, glabrous, papillose or barely ciliate, sessile or borne on a single style. Fruit a berry or apically dehiscent capsule; seeds 1-9 per fruit, black or rarely dark gray, glossy, laterally compressed, reniform to suborbicular.

Endemic to Madagascar, with centers of diversity in the southern and extreme northern portions of the country. Twelve species are known.

Key to the species of *Talinella*

1. All leaves < 6 mm long, or < 10 mm and strongly revolute; inflorescences lateral, few-flowered, with a filiform rachis and few bracts 2
- 1'. Largest leaves all or mostly > 10 mm long, or leafless in flower; inflorescences variable 3
2. Leaves strongly revolute; twigs glabrous; petals 2; stigmas borne on short style *T. microphylla*
- 2'. Leaves broadly obovate, mostly not strongly revolute; small twigs often papillose with white and brown papillae; petals 3-5; stigmas sessile *T. xerophila*
3. Twigs thick, glabrous, sometimes appearing waxy; leaves mostly elliptical or obovate, fleshy, the largest > 2 cm broad; larger inflorescences with dozens to hundreds of maturing flowers, often in dense clusters; peduncle and rachis sturdy, glabrous; petals (3-)5, white to greenish or yellow 4
- 3'. Twigs variable, not waxy; leaves thin when dried or < 2 cm broad, or inflorescences few-flowered, open, with slender peduncle and rachis, or petals 2 or pink to purple 5
4. Inflorescences mostly lateral, narrowly ovoid panicles borne to one side of stem; most bracts < 1.0 mm long; sepals 1.5-2.3 mm long, not thickened; petals of male flowers 4-5 mm long, stamens of inner whorl to 5 mm; habitat on limestone *T. ankaranensis*
- 4'. Larger inflorescences usually terminal; lateral inflorescences often small and irregularly spaced on all sides of stem; most bracts 0.7-2.0 mm long; sepals 2.0-2.5 mm long, usually thickened and sometimes bullate; petals of male flowers to 4 mm long, stamens to 4 mm; habitat on sand or very rarely limestone *T. boiviniiana*
5. Twigs subtending inflorescences glabrous or bearing white papillae; leaves oblong to elliptical or obovate, < 4(-5) cm long and 2 cm broad, without visible secondary venation, glabrous or pubescent, rarely strongly revolute; inflorescences dense, short-branched, often large, with clusters of buds or empty bracts, if few-flowered then mostly lateral with a single main axis and reduced side branches; petals deep pink to purple or white 6
- 5'. Twigs subtending inflorescences glabrous or bearing mixed brown and white papillae; leaves variable, never pubescent nor strongly revolute, without or with visible secondary venation; inflorescences few, loose, open, irregularly paniculiform or cymose with slender rachis, few flowers open simultaneously; petals white to greenish or pale pink 7
6. Flowers white to pale green or yellow; larger inflorescences often borne on almost leafless upward-curving lateral branches to > 30 cm long; stigmas usually terete, often with hooked apices; pedicels 1-5.5 mm long; substrate granite or sand *T. albidiflora*
- 6'. Flowers pink to red or purple; inflorescences variable, usually not on long leafless shoots; stigmas flattened with a darker streak and pale ragged edge; pedicels (0.2-)1-2.5(-4) mm long; substrate sand or limestone *T. grevei*
7. Leaves narrowly lanceolate to lanceolate, (2.5-)5.5-10.0 cm long, (0.8-)1.2-2.2 cm broad; leaf apices narrowly acute to acute, often gracefully asymmetrical; sepals equal; petals 2; stamens *c.* 20 *T. bosseri*
- 7'. Leaves variable, if lanceolate rarely > 7 cm long and then > 2 cm broad; apices variable, usually not narrowly acute and asymmetrical; sepals equal or unequal; petals 2 or 2-5; stamens *c.* 20 or reduced to 10-15 8
8. Shrub or small tree; flowering material often leafless; leaves elliptical; leaf apices often symmetrically apiculate; male flowers with ring-shaped nectar disk; immature fruit with a prominent apical nipple *T. pachypoda*
- 8'. Shrub, sometimes lianoid; flowering material usually retaining leaves; leaves variable, the apices often somewhat asymmetrical; nectar disk present or absent; fruit globose 9
9. Leaves mostly 2.5-5.0 cm long and < 2.0 cm broad; most leaf apices rounded; secondary leaf venation visible; staminodes to 4 mm long; stigmas 2-3, sometimes branched, rose, to 3 mm long; seeds possibly 1 per fruit; known habitat on basalt *T. tsitondroinensis*
- 9'. Larger leaves > 2 cm broad or if narrower, then with most apices not rounded and secondary venation inconspicuous or invisible; stamens < 3 mm long; stigmas 2 or 2-3, < 2 mm long; seeds usually > 1 per fruit; habitat variable 10
10. Leaves broadly elliptical, mostly > 2 cm broad; leaf apices variable, often mucronulate to apiculate; leaves succulent *in vivo*, thin-textured when dry, with secondary venation visible; inflorescence bracts broadly triangular; petals 4-5, pink; stamens *c.* 20; stigmas 2-3 *T. latifolia*
- 10'. Leaves variable; apices rarely mucronulate; leaves often thick when dried, secondary venation invisible or very inconspicuous; inflorescence bracts narrowly triangular; petals 2 or 2-4, whitish to pale green, yellow or rarely pink; stamens usually reduced to 10-15; stigmas 2 11
11. Leaves lanceolate to elliptical, usually < 2 cm broad; sepals equal or unequal; petals 2, variable in color, usually < 3.5 mm long; nectar disk inconspicuous or lacking; stigmas not or barely papillose; habitat on granite, sometimes at high altitudes *T. humbertii*
- 11'. Leaves broadly elliptical to broadly lanceolate or ovate, often > 2 cm broad; sepals unequal; petals 2-4, whitish, 3-4.5 mm long; filaments attached basally to nectar disk; stigmas papillose; habitat on sand near sea level *T. dauphinensis*

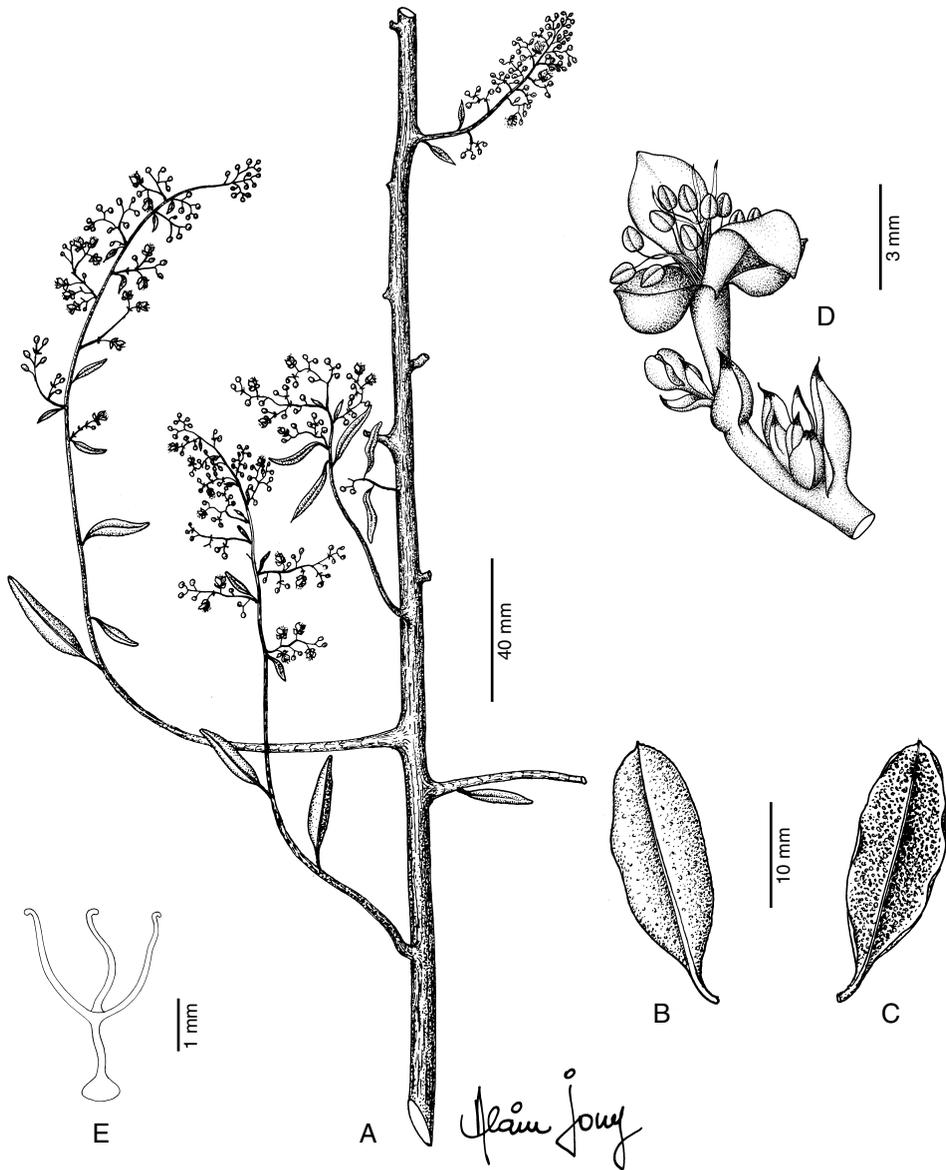


FIG. 1. — *Talinella albidiflora* Appleq.: **A**, habit; **B**, leaf (adaxial face); **C**, leaf (abaxial face); **D**, “hermaphroditic” flower; **E**, detail of gynoecium. A, D, E, *Phillipson 2700*; B, C, *Humbert 13402*.

1. *Talinella albidiflora* Appleq., sp. nov.

Haec species Talinellae grevei Danguy affinis, sed ab ea inflorescentiis lateralibus saepe 10-12 cm longis ramunculis elongatis pallidis glabris sursum curvatis por-

tatis, petalis albidis atque stigmatibus usque ad 4 mm longis apicibus teretibus saepe uncatis differt.

TYPUS. — *Humbert 12753*, Prov. Toliara, vallée de la Manambolo (bassin du Mandrare) au NW de Maroaomby (Betsioky), forêt sèche et bush xérophile,

300–400 m, 24°21'S, 046°34'E, fl., Dec. 1933 (holo-, P!; iso-, P!, MO!, K!, G!, WAG!).

Shrub with sarmentose branches, to 4 m high, frequently described as lianoid. Twigs more or less straight, with or without lenticels; bark reddish brown to dull brown; small twigs glabrous. Leaves mostly oblong to elliptical, 0.8–3 cm long, 3–10 mm broad, succulent, glabrous; apex usually rounded, sometimes slightly asymmetrical, often minutely apiculate. Inflorescences mostly lateral, often borne on long, curving shoots to 40 cm long, glabrous often with circumferential cracking; fertile portion usually open with well-developed dichasial branching, sometimes reduced; lowermost main branches of inflorescence frequently subtended by small leaves. Peduncle and rachis sturdy, white-papillate or glabrous. Pedicel 1.0–5.5 mm long, sometimes papillate. Sepals 1.8–3.6(–4.2) mm long. Petals 2(–3), 3.0–5.0(–6.1) mm long in hermaphroditic flowers, white to greenish, yellowish or pinkish white. Stamens 20+, 1.6–2.5(–3.8) mm long, only the basal portion of inner filaments slightly ciliate; anthers 0.4–0.6(–0.8) mm long. Stigma branches (2–)3, 1.6–4.0 mm long, the apices usually terete and often hooked, glabrous to papillate; style 0.7–1.1 mm long. Fruit a berry; seeds 2.0–2.5 mm long. — Fig. 1.

This species is segregated from *T. grevei*, with which it shares habit, leaf morphology, and a 2-petaled corolla. It is distinguished primarily by its whitish to yellowish or pale pink corolla color. The stigmas are well developed and usually have terete, uniformly colored, often hooked apices, rather than being flattened with a darker streak or pale ragged edge as in *T. grevei*; the larger lateral inflorescences are frequently borne on very long, slender, almost leafless shoots, and the perianth is quite variable in size but often larger than usual for *T. grevei*. *Talinella albidiflora* has a primary center of distribution east of 46°E longitude in the Mandrare River basin, frequently on granite at high elevations, a habitat never reported for *T. grevei*; collections from this area should be regarded as best representing the species. A second set of collections from the region of Ampanihy, at the western extreme, are in closer

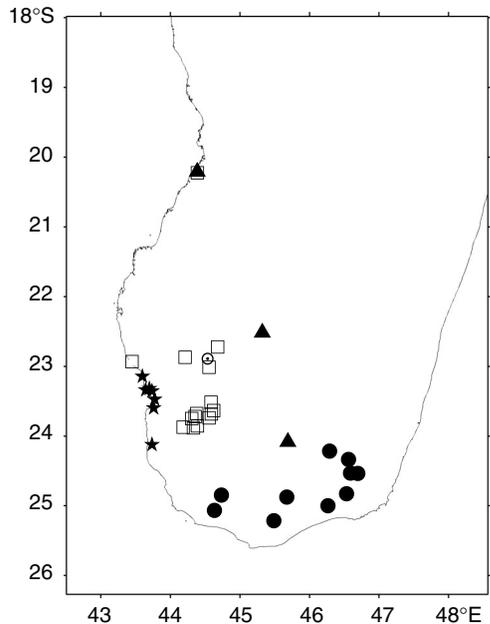


FIG. 2. — Distribution of *Talinella grevei* subsp. *calcicola* (★), subsp. *grevei* (□), subsp. *hirsuta* (▲), subsp. *sarmentosa* (◐), and segregate species *Talinella albidiflora* (●).

proximity to the range of *T. grevei* and are intermediate in appearance, more frequently having short inflorescences and, at least in some flowers, the flattened stigma typical of *T. grevei*.

DISTRIBUTION. — *Talinella albidiflora* is known from southern Madagascar (Fig. 2), from low altitudes to over 1000 m in elevation, sometimes on granite. In the southwest, its habitat is probably on sand and does not extend to the western limestone.

VERNACULAR NAME. — Sarondra (*Humbert 12873*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Least Concern (LC).

PARATYPES. — MADAGASCAR: Prov. Toliara: *Bosser 14226*, 20 km sud d'Ampanihy, fl., Mar. 1960 (P, MO, TAN); *Bosser 14390*, same locality, bush dégradé, fr., Mar. 1960 (P, TAN); *Bosser 15722*, Anadabolava, moyen Mandrare, roailles, 24°13'S, 046°19'E, fl., Feb. 1962 (P, MO); *Humbert 12461*, vallée moyenne du Mandrare près d'Anadabolava,

forêt sèche, 200-250 m, 24°13'S, 046°19'E, fl., ♀ fl., fr., Dec. 1933 (P, K, MO, G); *Humbert 12873*, vallée de la Manambolo, rive droite (bassin du Mandrare), aux environs d'Isomono (confluent de la Sakamalio), 400-900 m, 24°32'S, 046°38'E, fl., fr., Dec. 1933 (P, K, MO); *Humbert 13270*, same locality, Mont Morahariva, 1000-1400 m, 24°32'S, 046°38'E, fr., Dec. 1933 (P); *Humbert 13402*, vallée de la Sakamalio, affluent de la Manambolo (bassin du Mandrare), pentes rocailleuses gneissiques, 900-1100 m, 24°32'S, 046°41'E, fl., Dec. 1933 (P, MO); *Keraudren 907*, basse Menarandra, dans végétation xérophile près d'Ampotaka, 25°04'S, 044°40'E, fl., Mar. 1960 (P); *Keraudren 1475*, route Bevoalava à Ampanihy, ♀ fl., fr., Feb. 1962 (P); *Phillipson 2700*, Réserve d'Andohahela, near Hazofotsy, 24°50'S, 046°32'E, 100 m, fl., 21 Dec. 1987 (P, MO, TAN); *Phillipson & Rakotomalaza 5266*, 11 km N of Tsiombe along road to Antanimora, 25°13'01"S, 045°30'38"E, 125 m, 24 Jan. 2001 (MO); *Service Forestier 415*, Berenty (vallée du Mandrare), bush, 24°59'S, 046°17'E, fl., fr., 12 Feb. 1949 (P, TEF).

Incertae sedis: *Dorr et al. 3966*, road from Antanimora to Ambovombe, P.K. 54 (54 km NW of Ambovombe), Didiereaceae forest with *Alluaudiopsis*, fl., 15 Mar. 1985 (P, MO, TAN) is tentatively placed herein. This outlying specimen, collected near Antanimora, has apparently pale flowers, flattened stigmas, and 3-5 petals, which would represent unusual morphology for either *T. albidiflora* or *T. grevei* subsp. *grevei*. Further investigation of this population would be desirable.

2. *Talinella ankaranensis* Appelq., sp. nov.

Haec species Talinellae boiviniana Baill. *affinis, sed ab ea inflorescentiis lateralibus distantibus anguste ovoideis foliis paucioribus subtentis, bracteis plerumque minus quam 0.7 mm longis apice fuscato, sepalis 1.5-2.3 mm longis non incrassatis atque florum masculinorum petalis 4-5 mm longis filamentis interioribus 4-5 mm longis ac stylis usque ad 1.5 mm longis differt.*

TYPUS. — *Humbert 18940*, Madagascar, Prov. Antsiranana, Ankarana, forêt tropophile près d'Ambondrofe, 300 m, 12°53'S, 049°12'E, ♂ fl., Dec. 1937-Jan. 1938 (holo-, P!; iso-, P!, MO!).

Liana or lianoid shrub. Twigs straight, with few or no lenticels, glabrous, brown to grayish brown or yellowish or mottled black on old branches, occasionally with a peeling waxy outer layer. Leaves broadly elliptical rarely to lanceolate,

2.25-4.5(-6) cm long, (0.75-)1.5-2.5(-3.5) cm broad, often slightly asymmetrical, glabrous; apex rounded to short-apiculate or acute; base tapering at attachment to petiole, often slightly concave, otherwise rounded; margins entire to slightly undulate; blade thin to succulent; petiole and midrib reddish; midrib conspicuous beneath, secondary venation invisible or inconspicuous. Inflorescences lateral or rarely terminal, widely spaced, narrowly ovoid, 10-30 cm long with numerous flowers; peduncle and rachis sturdy, glabrous; bracts 0.3-0.7(-1.1) mm long, narrowly triangular to triangular, apex dark-tipped, possibly purplish *in vivo*. Dioecious. Pedicel 3-4(-5) mm long. Sepals 1.5-2.3 mm long, orbicular, sometimes asymmetrical, not strongly thickened; apex rounded. Petals 3-5, where less than 5 visibly derived from incomplete connation of 5 petals, 4-5 mm long in male flowers, 2.2-3.6 mm in female flowers, with distinct sexual dimorphism, greenish-yellow to nearly white; unfused petals oblong to obovate, frequently convex. Stamens numerous, attached to ring-shaped nectary disk; filaments of outer ring filiform, c. 2.5 mm long; filaments of inner ring 4.5-5 mm long, the lower two-thirds thickly ciliate, the upper portion filiform; anthers yellow, 0.35-0.4 mm long; pollen yellow. Female flowers with well developed staminodes, resembling inner ring of male filaments, except largely antherless; stigma branches 2, 1-1.1 mm long, sometimes on short style, nearly sessile at maturity; ovary reddish. Immature fruit bacciform, globose. — Fig. 3.

Talinella ankaranensis is distinguished from *T. boiviniana*, from which it is herein segregated and to which it is certainly a sister species, by more pronounced sexual dimorphism and larger male floral parts (petals 4-5 mm long vs 3-4 mm, inner stamens to 5 mm long vs 4 mm), with the exception of the sepals, which are slightly smaller and are not conspicuously thickened. *Talinella ankaranensis* may have a somewhat greater tendency to petal fusion; the inflorescence bracts are fewer, smaller (usually < 1 mm long vs 0.7-2.0 mm in *T. boiviniana*) and more frequently dark-tipped. The inflorescences of *T. ankaranensis* are often long, narrow lateral panicles borne on one side of a rather lianoid stem, whereas

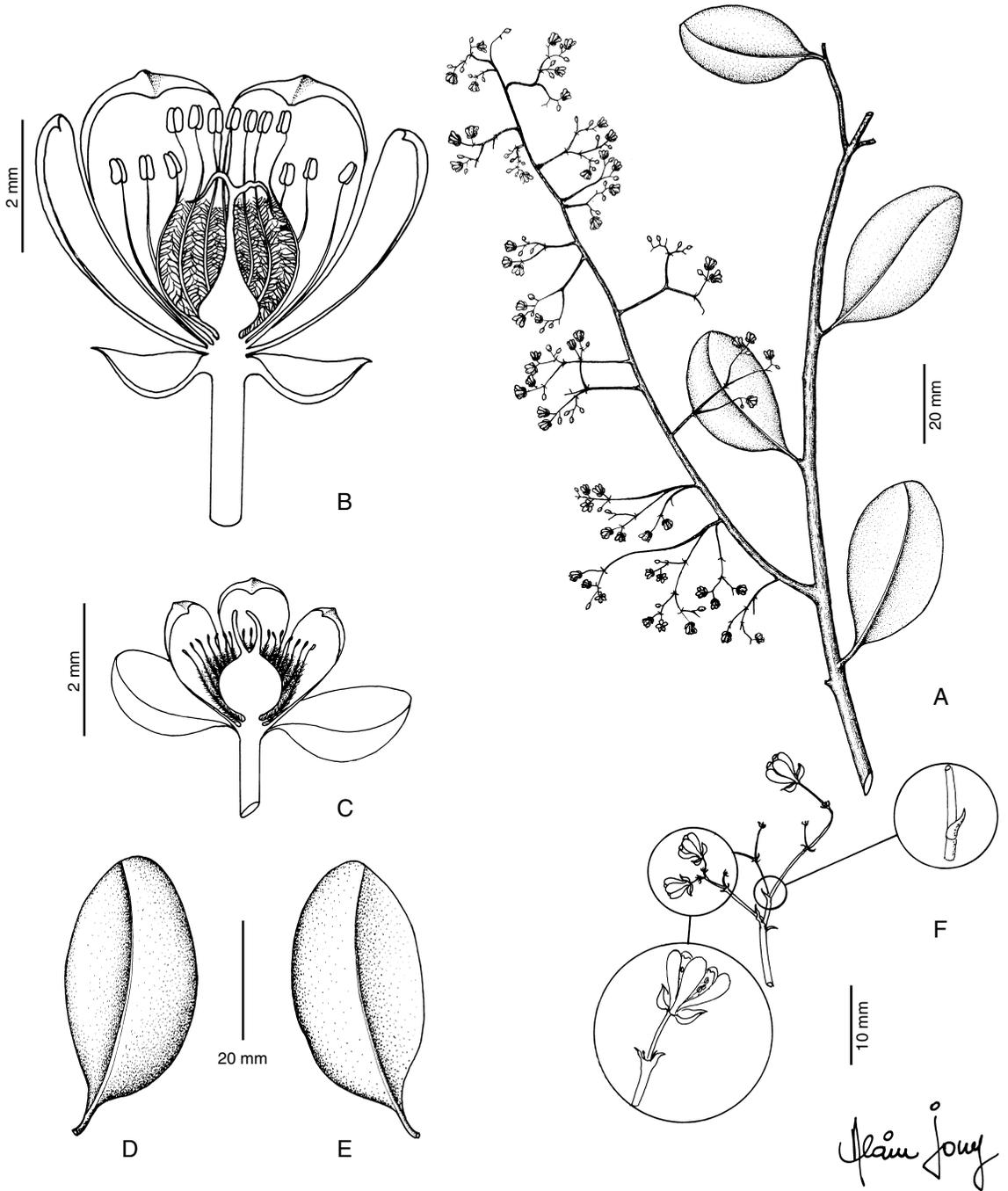


FIG. 3. — *Talinella ankaranensis* Appleg.: **A**, habit; **B**, male flower; **C**, female flower; **D**, leaf (adaxial surface); **E**, leaf (abaxial surface); **F**, detail of inflorescence. A-E, *Humbert 18940*; F, *Bardot-Vaucoulon 202*.

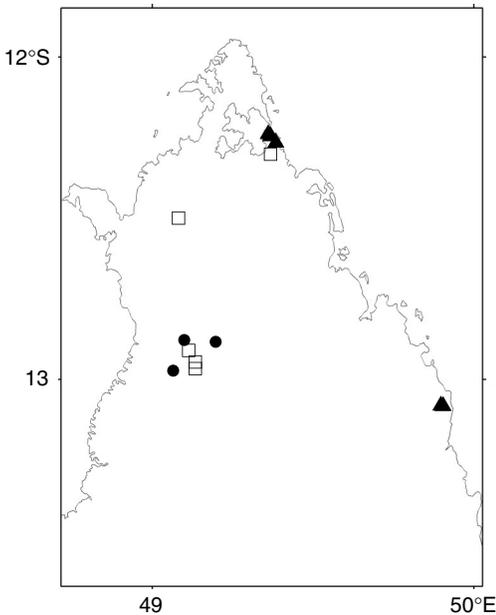


FIG. 4. — Distributions of *Talinella* species from the extreme north: *T. ankaranensis* (●), *T. boiviniana* (▲), *T. pachypoda* (□).

T. boiviniana frequently has terminal inflorescences, and its lateral panicles are often small and clustered or irregularly spaced on leafy shoots, usually not confined to one side of the stem. *Talinella ankaranensis* is said to be a liana on some labels, although this must be interpreted with caution as other highly sarmentose species have been inaccurately described by collectors. Its habitat is on limestone, especially tsingy; *T. boiviniana* has been reported on calcareous substrate at Orangéa, but probably occurs most often on quartz sand. BARDOT-VAUCOULON (1997) mentioned the presence of two unnamed species of *Talinella* at Ankarana, presumably referring to this species and to *T. pachypoda*, both of which she collected in the area.

DISTRIBUTION. — *Talinella ankaranensis* is known only from northern Madagascar in the vicinity of Ankarana (Fig. 4), on calcareous substrates, at 10-300 m elevation.

VERNACULAR NAME. — Vahiloko (*Humbert 18878*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). *Talinella ankaranensis* is known only from a single location, the reserve of Ankarana. Though label data of existing specimens are inadequate to determine distribution precisely, area of occupancy is likely to be small.

PARATYPES. — MADAGASCAR: Prov. Antsiranana: *Bardot-Vaucoulon 202*, tsingy du plateau, massif de l'Ankarana, ♀ fl., fr., 2 and 17 Nov. 1990 (P, MO); *Bardot-Vaucoulon & Andrianantoanina 986*, Ambilobe, Ankarabe, Réserve Spéciale d'Ankarana, Andavenoko, tsingy et éboulis, forêt sèche caducifoliée, sommet de tsingy, végétation en mosaïque, arbres rabougris et plantes xérophytes, sol squelettique dans les creux et les fissures sur calcaire du Jurassique moyen, 12°58'29"S, 049°04'04"E, 100 m, ♀ fl., 27 Nov. 1997 (MO); *Humbert 18878*, collines et plateaux calcaires de l'Ankarana, base de la falaise NW, 10-50 m, ♂ fl., Dec. 1937-Jan. 1938 (P, MO); *Morat 3088*, falaise calcaire de l'Ankarana, Jan. 1969 (TAN).

Incertae sedis: *Andrianantoanina & Bezara 999*, Fivondrana Antsiranana II, environ de Parc National de Montagne d'Ambre, à 91 km SW d'Antsiranana par rte secondaire vers Bobakilandy, 2 km NW du village de Bobakilandy, forêt sèche et humide, 12°37'43"S, 049°04'27"E, 507 m, ♂ fl., 29 Oct. 1996. This specimen is lianoid with a hollow stem and rather narrow leaves; most inflorescences are narrow and lateral on long flexuous shoots, and the bracts are dark-tipped and mostly < 1.2 mm long. However, its flowers rather resemble those of *T. boiviniana*, with small but thick and bullate sepals, petals 3.0-3.5 mm long, and filaments actually shorter than the normal range. The locality is closer to the known range of *T. ankaranensis*, but the substrate cannot be limestone (perhaps granite). On the other hand, *T. boiviniana* is found mostly on sand near sea level, never at high altitude. This collection may represent simply an atypical population of *T. ankaranensis*, or it might be a distinct subspecies or even species. Its apparent intermediacy is probably not due to recent hybridization, given the distance between the ranges of *T. ankaranensis* and *T. boiviniana*; it might reflect this locality's position in a perhaps historically broader distribution of the common ancestor of those two taxa. Lacking further material, formal description would be inappropriate.

3. *Talinella boiviniana* Baill.

Bull. Mens. Soc. Linn. Paris 1 (72): 569 (1886). — Type: *Boivin 2576*, Madagascar, Prov. Antsiranana, Baie de Diégo-Suarez, ♀ fl., Dec. 1848 (holo-, P!).

Shrub to 3 m high with sarmentose branches, sometimes appearing lianoid; bark greenish brown to gray, sometimes with prominent lenticels. Twigs straight to somewhat crooked, with few or no lenticels, glabrous, dark brown to ruddy or dull olive, often with peeling waxy outer layer. Leaves broadly elliptical or obovate to rarely suborbicular, 2.0–6.5 cm long, (1.5–)2.0–4.0(–5.0) cm broad, occasionally asymmetrical, glabrous; apex rounded to emarginate, acute or short-apiculate; base tapering, somewhat concave; margins entire or slightly undulate; midrib conspicuous, secondary venation not visible or barely visible. Inflorescences terminal or lateral, the largest at maturity up to 20(–30) cm long and 15 cm wide, usually broadly to narrowly ovoid to oblong, with numerous maturing flowers; peduncle and rachis sturdy, glabrous; bracts (0.5–)0.7–2.0(–2.5) mm long, linear to narrowly triangular or triangular in the smallest, apex brown-tipped or pale. Dioecious, rare flowers possibly hermaphroditic. Pedicel 2.0–4.5 mm long. Sepals 2–2.5 mm long, orbicular, usually thickened, sometimes bullate. Petals (3–)5, 2.2–4.0 mm long, whitish to cream, pale green or yellowish, with varying degrees of petal fusion; single petals oblong, often hooded, sometimes borne directly inside another petal; apices of lobes of fused petals sometimes acute; female flowers with smaller petals (2–3 mm). Stamens largely enclosed within petals, attached to ring-shaped nectary disk; inner filaments 3–4 mm long, the lower two-thirds heavily ciliate and cohering, the upper portion filiform and lax; anthers pale, *c.* 0.35–0.40 mm long; pollen yellow, released before anthesis. Male flowers with small deep pink ovary. Female flowers with sterile, purplish staminodes, green ovary; stigma branches at maturity (2–)3, *c.* 0.8–1.1 mm long, nearly sessile and rarely persisting; some female flowers with ovary enlarging in young buds, elliptical and rugose, the stigmas small (< 0.2 mm), appressed. Fruit bacciform, green, globose, 6–8 mm in diameter; remnants of calyx often per-

sisting on developing fruit; seeds (1–)3–4(–6), 2.4–2.8 mm long, broadly reniform to suborbicular, papillate.

Talinella boiviniana occurs in the extreme north of Madagascar, where it has been observed primarily in two areas, one from the Bay of Diégo Suarez to Orangéa and the other in the vicinity of Lac Sahaka, farther south along the eastern coast. Collections from the Ankarana reserve, previously identified as *T. boiviniana*, are segregated here as *T. ankaranensis* (see above). Collections from the region of Lac Sahaka are described as lianoid by label data; while this may not be technically accurate, the southeastern population appears to be more strongly sarmentose, and to have larger leaves and often longer, narrower lateral panicles. The sepals of *T. boiviniana* are usually thickened, and may present a lumpy or bullate appearance. Hand sectioning of a rehydrated thickened sepal sometimes releases globular clear, cohesive gelatinous blobs, indicating that the observed bumps are glands probably containing some mucilaginous substance of unknown function; this character has not been observed in any other species.

DISTRIBUTION. — *Talinella boiviniana* is known only from extreme northern Madagascar (Fig. 4). It is restricted to sites near sea level, usually on sand, once reportedly on calcareous substrate at a mostly sandy locality.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). Known collections come from only three locations, with most collections from the areas around Orangéa and Lac Sahaka; area of occupancy is estimated at 12 km². However, *T. boiviniana* is flourishing in both of these subpopulations, the latter of which was discovered only recently. More thorough field work along the northeastern coast might reveal a wider distribution.

MATERIAL EXAMINED. — MADAGASCAR: Prov. Antsiranana: *Applequist et al. 153*, forêt d'Orangéa, along path, sandy soil, 12°14'05"S, 049°21'38"E, 30 m, ♂ fl., 17 Jan. 2003 (MO, P, TAN); *Applequist et al. 154*, same locality, ♀ fl., 17 Jan. 2003 (MO, P, TAN); *Applequist et al. 160*, same locality, ♂ fl., 17 Jan. 2003 (MO, P, TAN); *Applequist et al. 167*,

same locality, ♂ fl., 17 Jan. 2003 (MO, P, TAN); *Appelquist et al.* 170, same locality, fr., 17 Jan. 2003 (MO, P, TAN); *Boivin* 2576, Baie de Diégo-Suarez, ♀ fl., Dec. 1848 (P); *Cours & Humbert* 5428, District de Diégo-Suarez, Orangéa, roches calcaires, 12°15'S, 049°23'E, ♂ fl., 22 Jan. 1960 (P); *Humbert & Cours* 32237, environs de Diégo-Suarez, forêt d'Orangéa, forêt tropophile sur calcaire et sable, 1-100 m, 12°15'S, 049°23'E, ♂ fl., 22 Jan. 1960 (P, K, MO, G); *McPherson et al.* 18856, 40 km N of Vohémar, near N end of Lac Sakaha, Firaïana: Nosibe, Fokontany: Anjiabe, littoral forest on sand, 13°04'45"S, 049°54'17"E, 20 m, ♂ fl., 3 Nov. 2002 (MO); *Rabenantandro et al.* 1311, Fivondronana: Vohémar, Firaïana: Nosibe, Fokontany: Anjiabe, village le plus proche: Anaborano près du lac Sahaka, forêt littorale sur sable d'Anaborano (Analabe), 13°04'43"S, 049°54'04"E, 10 m, fr., 23 Feb. 2003 (MO); *Rabenantandro et al.* 1330, Fivondronana: Vohémar, Firaïana: Nosibe, Fokontany: Anjiabe, forêt littorale sur sables d'Analabe (Anaborano) près du lac Sahaka, 5 m, 13°04'53"S, 049°54'03"E, ♀ fl., 25 Feb. 2003 (MO); *Rabevohitra et al.* 4501, Fivondronana: Vohémar, Commune rurale: Nosibe, forêt sublittorale d'Analabe sur sables blancs, 13°04'45"S, 049°54'17"E, fr., 22 Feb. 2003 (MO, TAN); *Rogers et al.* 158, Orangéa, c. 1.5 km NE of military camp on sandy road along trail to ocean, 12°14'18"S, 049°21'49"E, 20-75 m, ♀ fl., 15 Feb. 2003 (MO); *Rogers et al.* 159, Orangéa, same locality, fr., 15 Feb. 2003 (MO); *Service Forestier (Capuron) s.n.*, district de Diégo-Suarez, Orangéa, 12°15'S, 049°23'E, ♂ fl., s. date (TEF).

4. *Talinella bosseri* Appelq., sp. nov.

Haec species Talinellae humberitii Appelq. *affinis, sed ab ea foliis* (2.5-)5.0-10.0 cm longis anguste lanceolatis vel lanceolatis glabris nervis secundariis bene manifestis apice saepissime asymmetricis, inflorescentiis majoribus, squamis gemmae foliaris inconspicuis fuscatis deltoideis, sepalis (2.5-)3.0-3.6 mm longis atque florum masculinorum petalis 3.5-5.0 mm longis bene convexis ac filamentis 2.5-3.0 mm longis differt.

TYPUS. — *Bosser 17406bis*, Prov. Fianarantsoa, route de Ranotsara, district d'Ihoso, vestige de forêt tropophile, c. 22°38'S, 046°30'E, ♂ fl., Feb. 1963 (holo-, P!).

Subshrub to 1 m high. Twigs straight, tan mottled with brown, papillose; papillae white and brown. Leaves narrowly lanceolate to lanceolate, (2.5-)5.5-10.0 cm long, (0.8-)1.2-2.2 cm broad; apex narrowly acute, usually asymmetrical; base

tapering, often somewhat rounded; margins entire; midrib fairly prominent, secondary venation visible but inconspicuous; both surfaces glabrous. Inflorescence terminal, loose, paniculiform; peduncle and rachis slender, glabrate; bud scales on subtending twigs few, deltoid, < 1 mm long, mottled, usually not recurved; bracts 0.3-0.8(-1.4) mm long, narrowly triangular, red-brownish with or without pale margin, or pale with mottled brown. Probably dioecious. Pedicel 3-6 mm long. Sepals (2.5-)3.0-3.6 mm long, broadly elliptical to broadly ovate, pale; apex obtuse. Petals 2, 3.5-5 mm long, obovate, strongly hooded. Stamens up to 20; filaments pink, 2.5-3 mm long, the lower 40% of those of the inner whorl flattened-ciliate; anthers yellow, 0.35-0.6 mm long; pollen yellow, released before flower is open. Female flowers and fruits unknown. — Fig. 5.

Bosser 17406bis, the type of *Talinella bosseri*, collected southeast of Ihoso, was included within *T. dauphinensis* by EGGLI (1997), but it differs both by its unusual long, narrowly lanceolate leaves, often with an asymmetrical, narrowly acute apex, and by its flowers with two petals, equal sepals and stamens not reduced in number. It seems likely that this material is more closely related to *T. humberitii*, which also has two petals and frequently equal sepals. *T. humberitii* has smaller flowers with fewer stamens; its leaves are usually smaller and, if large, are not shaped like those of *T. bosseri*.

DISTRIBUTION. — *Talinella bosseri* is known only from a single locality in south-central Madagascar (Fig. 6); the type was collected from a patch of forest on sand to the north of Ranotsara (BOSSER pers. comm.).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Critically Endangered (CR B1ab(iii)+2ab(iii)). The area around Ranotsara and Ihoso is wholly unprotected and has suffered serious ecological degradation, so that only small patches of natural vegetation remain; a decline in area or quality of habitat has certainly occurred in the past and may be expected to continue in future. Efforts to relocate *T. bosseri* in the field were unsuccessful, although its vegetative appearance is distinctive.

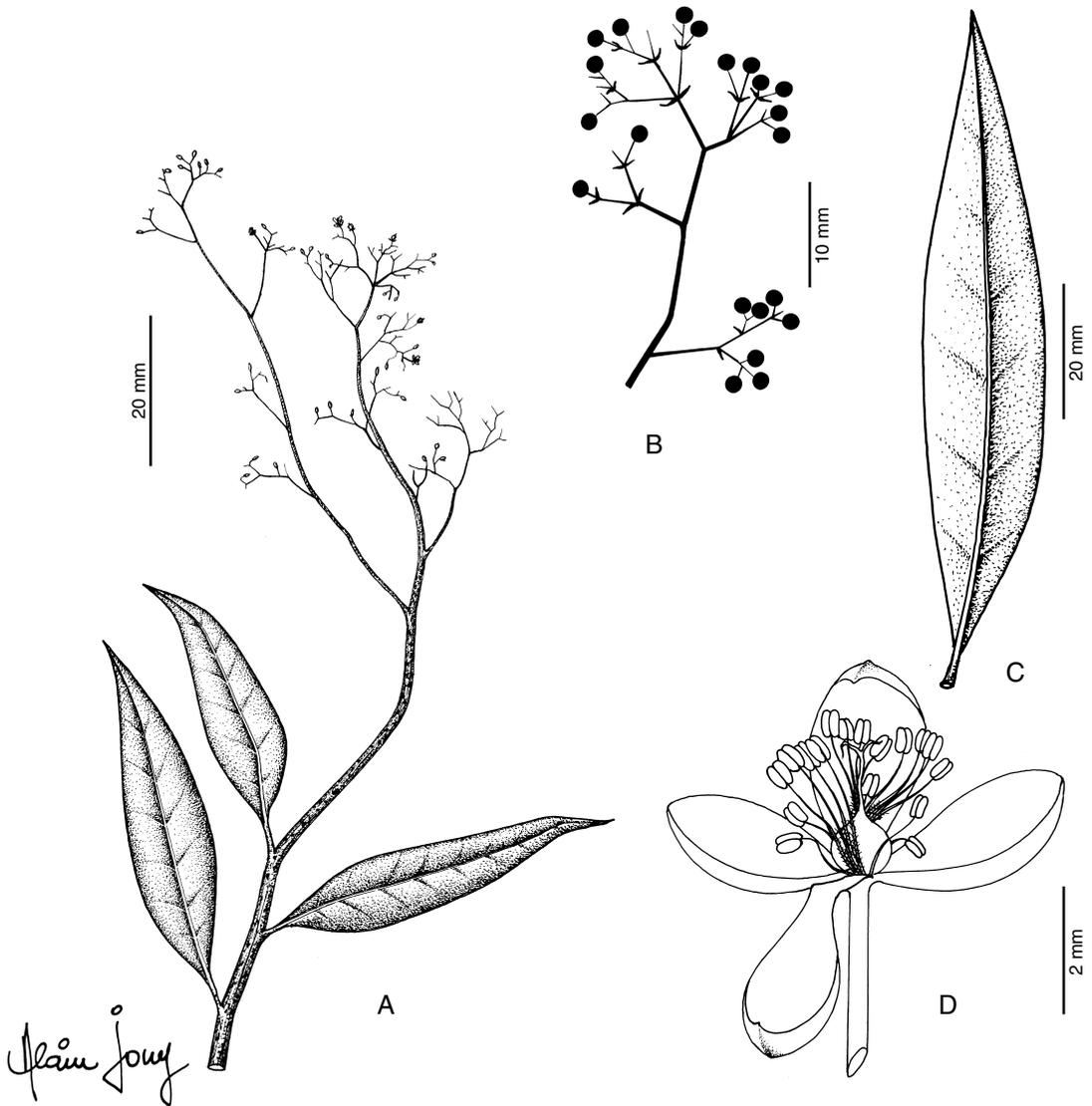


FIG. 5. — *Talinella bosseri* Appleg.: **A**, habit; **B**, diagram of inflorescence; **C**, leaf (abaxial surface); **D**, male flower. *Bosser 17406bis*.

5. *Talinella dauphinensis* Scott-Elliot

J. Linn. Soc. Bot. 29: 4 (1891). — Type: *Scott-Elliot 2717*, Madagascar, Prov. Toliara, Fort Dauphin, thickets on sandy soil, 25°03'S, 047°00'E, ♂ fl., May (s. year) (neo-, K [photo seen]; isoneo-, Pl, here designated).

Small shrub or liana, to 2 m high with sarmentose branches. Twigs straight to crooked, dark

reddish to pale brown, usually with plentiful pale elliptical to fusiform lenticels, glabrous or occasionally papillate with white and brown papillae. Leaves broadly elliptical or ovate to narrowly ovate, rarely obovate or broadly lanceolate, 2.50–7.75 cm long, (1.0–)1.3–3.3 cm broad, glabrous or visibly bullate, sometimes moderately coriaceous on drying; apex short-apiculate to acute or

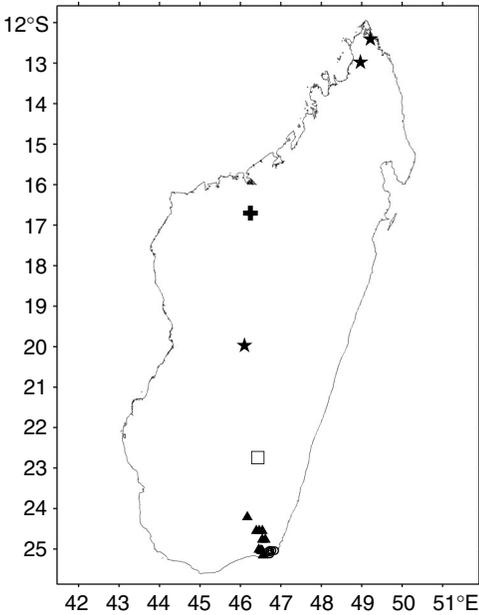


Fig. 6. — Distributions of *Talinella dauphinensis* and segregate species: *T. bosseri* (□), *T. dauphinensis* (○), *T. humbertii* (▲), *T. latifolia* (★), *T. tsitondroinensis* (⊕).

rarely rounded, frequently asymmetrically apiculate; base rounded-tapering; midrib conspicuous at least beneath, secondary venation not visible. Inflorescences terminal, loose, with up to 2-3 dozen buds, few mature flowers, clustered empty bracts; peduncle and rachis filiform, glabrous or occasionally white-papillose; bud scales below inflorescences infrequent, usually small and dark, sometimes recurved, 0.3-1.1 mm; bracts 0.5-0.9-1.3(-3.0) mm long, narrowly triangular, apical portion or whole bract brown, sometimes with pale tip. Dioecious or possibly gynodioecious, female flowers with antherless staminodes but “male” flowers sometimes with well developed ovaries and stigmas. Pedicel 2-9(-18) mm long. Sepals 1.0-2.3 mm long, pale green, orbicular, usually unequal, apex rounded. Petals 2-4, 3.0-4.5 mm long, white to greenish white, often unequal or partly fused, single petals often oblong, convex. Stamens usually reduced to 10-15, attached to ring-shaped nectary disk; filaments 2.0-2.3 mm long, pale pink, the lower third or fourth ciliate; anthers yellow, *c.* 0.7-

0.8 mm long. Stigma branches 2, 1.1-1.8 mm long, terete, irregular at apex, papillose, sessile or on short style especially in “male” flowers. Immature fruit globose.

Talinella dauphinensis has previously been quite broadly defined; most included collections were from the extreme southeastern portion of Madagascar near Fort-Dauphin, ranging from Petriky (on sand at sea level) to the Mandrare River basin (on granite at over 1000 m), with scattered disjunct collections far to the north and northwest of Fort-Dauphin. These specimens share several features, including few-flowered, slender, open inflorescences, twigs often with white and brown papillae, and small whitish or pink flowers; however, when they are separated according to geography and habitat (Fig. 6), correlated morphological differences can be observed. Several segregate species, including *T. bosseri*, *T. humbertii* Appelq., *T. latifolia* Appelq., and *T. tsitondroinensis* Appelq., are herein described; other species that share the features mentioned and appear to fall into the same group include *T. xerophila* Appelq. and *T. pachypoda* Eggl. With the recognition of these taxa as distinct, *T. dauphinensis* is more narrowly circumscribed here to include plants from sandy soils at low elevations around Fort-Dauphin. It may be distinguished from related species by its broad leaves (often over 5 cm long) with a frequently asymmetrical tip and without visible venation; large inflorescence bracts; small, unequal orbicular sepals; petals whitish and varying from two to four in number; stamens usually reduced in number and attached to a nectar disk; and stigma branches two, terete and often papillose.

EGGLI (1997) did not select a lectotype from among the four indicated syntypes of *T. dauphinensis* (*Scott-Elliot* 2972a, 2716, 2551 and 2679). He suggested that the only SCOTT-ELLIOT collection at P, *Scott-Elliot* 2717, was probably one of the syntypes and that there had been a typographical error in the protologue. However, at the time of writing EGGLI had not seen the material at K, and most of SCOTT-ELLIOT's types were deposited at K or BM (STAFLEU & COWAN 1985). A second duplicate of *Scott-Elliot* 2717 is one of two SCOTT-ELLIOT specimens at K, the other being *Scott-Elliot*

2821, and enquiries at BM have not located a specimen numbered 2616, so EGGLI's assumption was probably correct. As *Scott-Elliott 2717* is the only located probable syntype collection, yet cannot be indisputably proven to be the specimen referred to by SCOTT-ELLIOT (1891), it is here conservatively designated as a neotype rather than a lectotype, a designation that can be overridden should any other syntypes be located.

DISTRIBUTION. — *Talinella dauphinensis* is known from southeastern Madagascar in the vicinity of Fort-Dauphin (Fig. 6), around Petriky and Vinany Be, in sublittoral or littoral forests or thickets on sand from sea level to < 100 m.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). Fewer than five locations are known, and all are within a restricted area (estimated extent of occurrence 30 km²) near the coast, so that a single environmental threat such as a major storm could affect all populations simultaneously.

MATERIAL EXAMINED. — MADAGASCAR: Prov. Toliara: *Dumetz & McPherson 1110*, Petriky, 25°05'S, 046°52'E, 0-10 m, ♂ fl., 5 Dec. 1989 (MO, TAN); *Gereau et al. 3209*, Préfecture de Tôlanaro (Fort-Dauphin), Canton de Manambaro, Petriky Forest c. 15 km WSW of Tôlanaro (Fort-Dauphin) on stabilized dune sand, 25°04'S, 046°51'E, 0-10 m, ♂ fl., 9 Mar. 1989 (MO, TAN, TEF); *Humbert 20758*, forêt de Vinanibe près Fort-Dauphin, forêt ombrophile littorale sur sable siliceux, 5-50 m, 25°03'S, 046°56'E, ♀ fl., 2 Apr. 1947 (P, MO); *Humbert 20785*, same locality, fl., ♀ fl., 2 Apr. 1947 (P); *Lowry et al. 5021*, Petriky, WSW of Fort-Dauphin along main QMM road, 25°04'25"S, 046°50'15"E, 5 m, ♀ fl., 13 Mar 1998 (P, MO); *Rabevohitra 2112*, Préfecture de Tôlanaro (Fort Dauphin), Petriky, 25°04'S, 046°52'E, 10 m, ♂ fl., 12 Jan. 1990 (TEF); *Scott-Elliott 2717*, thickets on sandy soil, Fort Dauphin, 25°03'S, 046°52'E, fl., May (s. year) (P, K [photo seen]); *Scott-Elliott 2821*, Fort Dauphin, thickets etc. on white sand, 25°03'S, 046°52'E, June (s. year) (K [photo seen]); *Service Forestier 11755*, forêt sublittorale, sur sables, près du Vinany Be, au SW de Fort-Dauphin, 25°03'S, 046°56'E, fl., Feb. 1955 (P, K, G, MO, WAG).

6. *Talinella grevei* Danguy

Shrub or small tree with sarmentose to lianoid branches, 2-4(-5) m high. Twigs straight to contorted;

bark reddish brown to tan or dark brown; lenticels present or absent, usually pale, rarely dark and prominently raised; small twigs glabrous, white-papillate or rarely white-pubescent. Leaves variable, oblong to elliptical or obovate, often irregularly shaped, 0.5-4.0(-5.0) cm long, 1.5-14.0(-22.0) mm broad, thick or succulent, often clustered on short shoots; apex variable, acute to rounded, minutely apiculate, mucronulate or emarginate, often dark-tipped, sometimes truncate or asymmetrical; base tapering; margins entire or laterally revolute, occasionally papillose or ciliate; midrib conspicuous beneath, sometimes papillose, secondary venation invisible; petiole and leaf blade glabrous or rarely white-papillose or pubescent. Inflorescences often numerous, lateral on short or long shoots or terminal, occasionally forming a large compound panicle; fertile portion (1-)3-6(-16) cm long; shape variable, usually narrowly paniculiform; branches frequently compressed, with dense clusters of small buds or empty bracts; at the extreme, main branches reduced to single fertile flowers with few bracts, giving a racemose appearance. Peduncle and rachis sturdy, densely white-papillate to glabrous; bracts 0.3-1.6(-2.5) mm long, pale with dark tip, rarely papillate. Gynodioecious or perhaps functionally dioecious; female flowers with antherless stamino-odes, ovary enlarged in bud. Pedicel (0.2-)1.0-2.5(-5.5) mm long, rarely pubescent. Sepals 2 (very rarely 3), (1.4-)1.8-2.6(-3.4) mm long, reddish, glabrous or rarely papillate. Petals 2 or (2-)3-4, (1.8-)2.5-5.0(-6.1) mm long, deep pink to reddish purple, obovate to oblong, if > 2 sometimes unequal; female flowers smaller and less showy, with petals usually < 3 mm long. Fertile stamens c. 20, rarely more or fewer; filaments (1.0-)1.8-3.3(-3.8) mm long, the basal portion of inner whorl usually slightly flattened and short-ciliate, sometimes densely ciliate; anthers yellow, (0.40-)0.50-0.75(-1.10) mm long, broadly elliptical to oblong. Stigma branches (2-)3(-4), (0.75-)1.50-4.00(-4.30) mm long, usually with darker central streak and pale ragged edges, the apex flattened, rarely branching; style (0.0-)0.5-1.0(-2.0) mm long. Fruit a berry, globose, (3.5-)4.5-7 mm in diam., green, containing 2-6 seeds; seeds 1.6-2.5 mm long, broadly reniform to sub-orbicular or reniform, up to 1 mm thick, with no ridge or inconspicuous shallow obtuse or rounded ridge around outer edge.

Talinella grevei is a widespread species in southern Madagascar (Fig. 2), and is exceptionally diverse in characters ranging from inflorescence and floral structure to leaf characters. It is the only species that has petals and sepals of vivid deep pink to red color; it is further distinguished by its leaves, which are usually < 4 cm long, oblong to elliptical, thick, without visible secondary venation and of a dull, dark to grayish green color. Twig papillae, if present, are all white, whereas most papillose species have white and brown papillae; leaves and inflorescences are sometimes white-papillose as well. The inflorescences are extremely variable but as a rule are sturdy, often dense, with many maturing flowers. Small inflorescences in *T. grevei* are mostly lateral, often numerous, with a single main axis and short branches, whereas most species with few-flowered inflorescences have more open, slender, irregularly shaped and often terminal inflorescences. Observations made of individuals in a roadside population indicated considerable variation in leaf and inflorescence size, perhaps in response to local factors of water availability, as those in low-lying wet spots were better developed than those only a few yards away that received less water; there can be a great range of variation even within one individual.

Four subspecies of *T. grevei* are herein recognized, of which two are newly described. Intraspecific variation in qualitative as well as quantitative characters, ranging from petal number to floral size, leaf size and pubescence, may be

as great as the variation commonly seen among closely related species of *Talinella*. However, although the broad pattern of interpopulational morphological variation is correlated with geographic origin and habitat, the ranges of different subspecies may be adjacent or overlapping. Useful taxonomic characters do not vary in concert, intermediate specimens are frequent, and few specimens exist of some morphologically distinctive groups. It is not clear that these groups are reproductively isolated; therefore, it is more conservative to recognize them at the subspecific level pending further study. The white-flowered *T. albidiflora*, for which more collections exist, is herein segregated from *T. grevei*.

Talinella grevei is believed to be gynodioecious, one of the few exceptions to the dioecious condition of most species of *Talinella*. A minority of flowering specimens are female-only, with sterile staminodes and rapidly developing ovaries, while the majority have apparently hermaphroditic flowers with well-developed stigmas and styles, often exceeding those of the female flowers in size. However, the ovaries of hermaphroditic flowers are quite small at anthesis, and specimens bearing both flowers near anthesis and developing fruit are usually identifiable as female, so it may be surmised that “hermaphrodites” are for the most part functionally male.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Least Concern (LC).

Key to subspecies of *Talinella grevei*

1. Peduncle and rachis glabrous or glabrate; most leaves 0.5-2.0 cm long, sometimes with lateral margins revolute; midrib and petiole glabrous; substrate limestone or sand subsp. *calicicola*
- 1'. Peduncle and rachis white-papillose to pubescent; mature leaves mostly > 2.0 cm long, or < 2.0 cm and strongly revolute; midrib and petiole glabrous to pubescent; substrate usually sand 2
2. Leaves mostly < 2.0 cm long, strongly revolute; inflorescences numerous, lateral, the main axis < 3(-5) cm long with 1-2 fertile flowers per branch, few empty bracts or undeveloped buds; style of hermaphroditic flowers c. 1.5-2.0 mm long, stigmas c. 2.5-4.5 mm long subsp. *sarmentosa*
- 2'. Leaves mostly > 2.0 cm long, seldom revolute; inflorescences variable, frequently with empty bracts or undeveloped buds; style < 1.0 mm long, stigmas < 3.0 mm long 3
3. Petals 2; bracts 0.4-1.3(-1.6) mm long, glabrous or papillose; sepals 2, glabrous or papillose; leaf blade glabrous or weakly papillose even if midrib and margins are pubescent; large twigs glabrous, small twigs glabrous to short-pubescent subsp. *grevei*
- 3'. Petals 3-4; bracts (0.4-)1.1-2.5 mm long, pubescent; sepals 2(3), pubescent; leaf blade densely papillose or pubescent; large twigs often papillose, small twigs pubescent subsp. *hirsuta*

6a. *Talinella grevei* subsp. *grevei*

Not. Syst. (Paris) 3: 159 (1915, dated 1914). — Type: *Grevé 262*, Madagascar, Prov. Toliara, Morondava, Be-Kapake, fl., s. date (holo-, P!; iso-, P!, MO!, K!, TAN!).

Leaves (1.0-)1.5-3.5(-5.0) cm long; margins entire or rarely deeply revolute, glabrous or short-ciliate; midrib sometimes papillose; petiole sometimes white-papillose to shortly pubescent. Peduncle and rachis more or less white-papillose on at least some inflorescences; bracts 0.4-1.3(-1.6) mm long, pale with dark tip, rarely papillate. Pedicel (0.2-)1.0-2.5(-4.0) mm long, rarely pubescent. Sepals (1.4-)1.8-2.6(-3.1) mm long, reddish, glabrous or rarely papillate. Petals 2 (very rarely 3), (2.8-)3.2-4.5(-6.1) mm long in hermaphroditic flowers, 1.8-3.0 mm long in female flowers, deep pink to reddish purple. Filaments (1.5-)1.8-3.2(3.8) mm long; anthers (0.4-)0.5-0.7(-0.9) mm long. Stigma branches (2-)3(-4), (0.75-)2.00-3.00 mm long; style (0.0-)0.5-1.0 mm long. Berry (3.5-)4.5-7.0 mm in diameter, green; seeds 1.6-2.2 mm long, broadly reniform to suborbicular or reniform, up to 1 mm thick.

T. grevei subsp. *grevei* is distinguished from other subspecies by having white papillae on the peduncle and rachis; petals almost never exceeding two in number; and leaves that are mostly over 15 mm long, rarely strongly revolute, and with mostly glabrous blades. There is an apparent gradient of pubescence from north and east to southwest within subsp. *grevei*: plants ranging from Morondava to around Sakaraha have often densely papillose inflorescences with elongated papillae, and sometimes leaves with papillose petioles, margins and midribs, whereas plants from Beza Mahafaly and Betioky, near Tuléar, are only sparsely papillose on portions of the inflorescences; very rare specimens (e.g., *Appelquist et al. 182*) are glabrous. Populations from the western coast around Tuléar, herein segregated as subsp. *calicola*, have glabrous inflorescences and leaves that are mostly < 1.5 cm long and more frequently revolute. This transition coincides with a difference in substrate: subsp. *calicola* is most often found on limestone, whereas the range of

subsp. *grevei* begins just to the east of the limestone region, so it is usually found on sand.

The berries of *Talinella grevei* are reported to be used as food (*Sussman 121*).

DISTRIBUTION. — *Talinella grevei* subsp. *grevei* is known from southwestern Madagascar, from the Sakaraha region to Tsiarimpioky and to Beza Mahafaly and south of Betioky, with a disjunct population to the north near Morondava (Fig. 2). The habitat of *T. grevei* subsp. *grevei* is rather diverse, usually in bush or open forest on sand, rarely in riverine forest or tropophile forest on schist, perhaps very rarely on calcareous substrates; it is generally found at elevations under 300 m. It is often a locally dominant plant and common on roadsides.

VERNACULAR NAMES. — Dango (*Sussman 121*), Dango porotsy (*Phillipson 1653*), Dongo porotsy (*Appelquist et al. 181*, *Phillipson 1665*), Soron-dra (*Grevé 262*), Tangohazo (*Service Forestier 4113*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Least Concern (LC).

MATERIAL EXAMINED. — MADAGASCAR: Prov. Toliara: *Appelquist et al. 181*, junction of road S from Betioky and road to Behilka, open forest on quartz sand, 23°52'28"S, 044°21'27"E, 117 m, fr., 30 Jan. 2003 (MO, P, TAN); *Appelquist et al. 182*, junction of road S from Betioky and road to Behilka, open forest on quartz sand, 23°52'28"S, 044°21'27"E, fl., 30 Jan. 2003 (MO, P, TAN); *Appelquist et al. 183*, same locality, ♀ fl., fr., 30 Jan. 2003 (MO, P, TAN); *Appelquist et al. 184*, same locality, fl., 30 Jan. 2003 (MO, P, TAN); *Bosser 15673*, Lambomakandro, 22°42'S, 044°42'E, ♀ fl., Feb. 1952 (P, TAN); *Decary 18694*, Manombo (SW), sables, fr., 22 Feb. 1943 (P); *Descoings 1344*, same locality, Jan. 1956 (TAN); *Descoings 2419*, route de Manombo au N de Tuléar, fl., 9 Feb. 1957 (TAN); *Dorr et al. 4097*, road from Ejeda to Betioky 19.3 km S of Betioky, Didiereaceae forest on volcanic soil, fl., 21 Mar. 1985 (P, MO, TAN); *Du Puy et al. MB606*, c. 18 km on route from Betioky to RS of Beza Mahafaly, gallery forest on pale sand over sandstone substrate, 23°45'S, 044°20'E, c. 120 m, fl., 4 Feb. 1990 (P, TAN); *Grevé 262*, Morondava, Be-Kapake, fl., s. date (P, TAN); *Humbert 19616*, forêt d'Analamarina, vallée de l'Hazoroa (affluent de la Taheza, bassin de l'Onilahy) au sud de Sakaraha, forêt tropophile sur sol siliceux grésosableux, c. 300 m, 23°00'S, 044°34'E, fl., 6-9 Dec. 1946 (P, K, MO); *Humbert 20300*, environs de Betioky (pays Mahafaly), bush xérophile sur sol

siliceux rocailleux, *c.* 300 m, 23°44'S, 044°22'E, fl., 17-19 Feb. 1942 (P, MO); *Humbert 29404*, d'Ampanihy à Betioky, fl., 13 Mar. 1955 (P, K, MO); *Humbert & Capuron 29420*, de la vallée de la Sakamena à la vallée de la Sakoa (bassin de l'Onilahy) à l'est de Betioky, restes de forêts tropophiles sur schistes, *c.* 300 m, 23°45'S, 044°33'E, fr., 16 Mar. 1955 (P); *Humbert & Capuron 29461*, Plateau Mahafaly à l'W de Betioky, forêt tropophile sur calcaire et sable roux, plateau calcaire, 100-300 m, fl., 18 Mar. 1955 (P, MO); *Jongkind & Andriantiana 3651*, dry forest N of Morondave, on sandy soil, 50 m, 20°13'S, 044°24'E, fr., 5 Jan. 1996 (MO); *Keraudren 1306*, forêt de Lambomakandro près de Sakaraha, 22°42'S, 044°42'E, ♀ fl., 26 Jan. 1962 (P, MO); *Keraudren 1430*, restes de végétation xérophile près d'Ambatry, route Ampanihy à Betioky, 23°50'S, 044°25'E, fl., Feb. 1962 (P); *Liede et al. 2735*, Beza Mahafaly Special Reserve, parcelle 2 along road to Betioky, 23°41'S, 044°36'E, 150 m, ♀ fl., 13 Feb. 1990 (MO); *Morat 720*, gorges de Betioky, fr., Mar. 1964 (P, MO, TAN); *Morat 2541*, Betioky, 23°42'S, 044°23'E, ♀ fl., Feb. 1967 (P, TAN); *Phillipson 1653*, Beza Mahafaly Reserve near Betioky, Parcelle #1, riverine forest adjacent to Sakamena River, 23°39'S, 044°38'E, 130 m, fr., 17 Apr. 1987 (P, MO, TAN); *Phillipson 1665*, Beza Mahafaly Reserve near Betioky, Parcelle #2, xerophyte woodland dominated by *Alluaudia procera*, 23°31'S, 044°36'E, 150 m, fl., 18 Apr. 1987 (P, MO, TAN); *Phillipson 2779*, Beza Mahafaly Reserve near Betioky, between Parcelle 1 and 2, 23°39'S, 044°37'E, 150 m, fl., 5 Jan 1988 (P, TAN); *Phillipson & Rabesihanaka 3130*, Itambono Corridor, 15 km W of junction with Route Nationale 10, 23°53'S, 044°12'E, 250 m, fl., 10 Jan 1989 (P, MO, TAN); *Service Forestier 4113*, Ambatovory-Beroraha-Sakaraha, 22°52'S, 044°14'E, ♀ fl., 16 Nov. 1951 (P, TEF); *Service Forestier 11880*, bassin de l'Onilahy, environs Nord-Est de Betioky, fl., Mar. 1955 (P, K, MO, G); *Sussman 121*, Southern Domain, 40 km NE of Betioky, near Analafaly, on path SE of Analafaly to Andreharata, dry woodland forest, 23°39'S, 044°38'E, 18 May 1987 (MO); *Sussman 330*, Southern Domain, Beza Mahafaly Reserve, 40 km NE of Betioky, Parcel 1, near Analafaly & Anteramena, riverine forest 23°39'S, 044°38'E, 11 Oct. 1987 (MO).

6b. *Talinella grevei* subsp. *callicola* Appleq., subsp. nov.

Ramunculi glabri. Folia glabra 0.5-1.2 cm longa margine revoluta.

TYPUS. — *Bosser 10426*, Prov. Toliara, Miary, bush à *Didierea* sur sable, 23°18'S, 043°44'E, fl., Nov. 1956 (holo-, P!; iso-, P!, MO!, TAN!).

Sarmentose or much-branched shrub, to 2.5 m high; twigs glabrous. Leaves narrowly oblong or elliptical to obovate or broadly elliptical, 0.5-2.0(-2.8) cm long, glabrous; margins sometimes revolute or strongly inrolled. Inflorescences usually lateral, the supporting branches short and sometimes pale, small and few-flowered with reduced side branches, sometimes branching from the base or terminal and of larger size. Peduncle and rachis glabrous; bracts sometimes with only inconspicuous dark tip. Petals 2(-4), < 4(-4.5) mm long in hermaphroditic flowers, pink to red or purple. Stigmas 1.1-2.0(-4.0) mm long. — Fig. 7.

This is the only subspecies of *T. grevei* that is normally found on the calcareous substrates close to the western coast, although it is also collected frequently on sand. It is distinguished from subsp. *grevei* by having glabrous or glabrate inflorescences throughout, with the exception of occasional weakly and sparsely papillose individuals (e.g., *Applequist 185*); the leaves sometimes have strongly revolute or rolled lateral margins, and are usually < 1.5 cm long, whereas mature leaves of subsp. *grevei* are mostly > 1.5 cm long. The flowers may be on average a little smaller as well, with a tendency to have > 2 petals in some individuals, and the maximal size of the plant may be reduced. It extends as far south as the region of Lac Tsimanampetsotsa, to which *T. microphylla* is endemic. *Talinella microphylla* shares the glabrous habit and reduced inflorescences of *T. grevei* subsp. *callicola*, but the latter has leaves that are over 10 mm long and often flat rather than strongly revolute, whereas leaves of *T. microphylla* are always rolled up and seldom approach 10 mm long. The inflorescence of subsp. *callicola*, though small, has a sturdy rachis and clusters of bracts on the side branches, whereas that of *T. microphylla* is more reduced, rarely exceeding half a dozen flowers and few bracts on a rachis that is filiform and occasionally papillate. The flowers of subsp. *callicola* are pink to purple rather than whitish, and the pedicels are usually 0.5-2.5 mm long vs 1-7 mm in *T. microphylla*.

DISTRIBUTION. — *Talinella grevei* subsp. *callicola* is known from southwestern Madagascar in the vicinity of Toliara (Fig. 2), near the coast at low elevations, on limestone or sand.

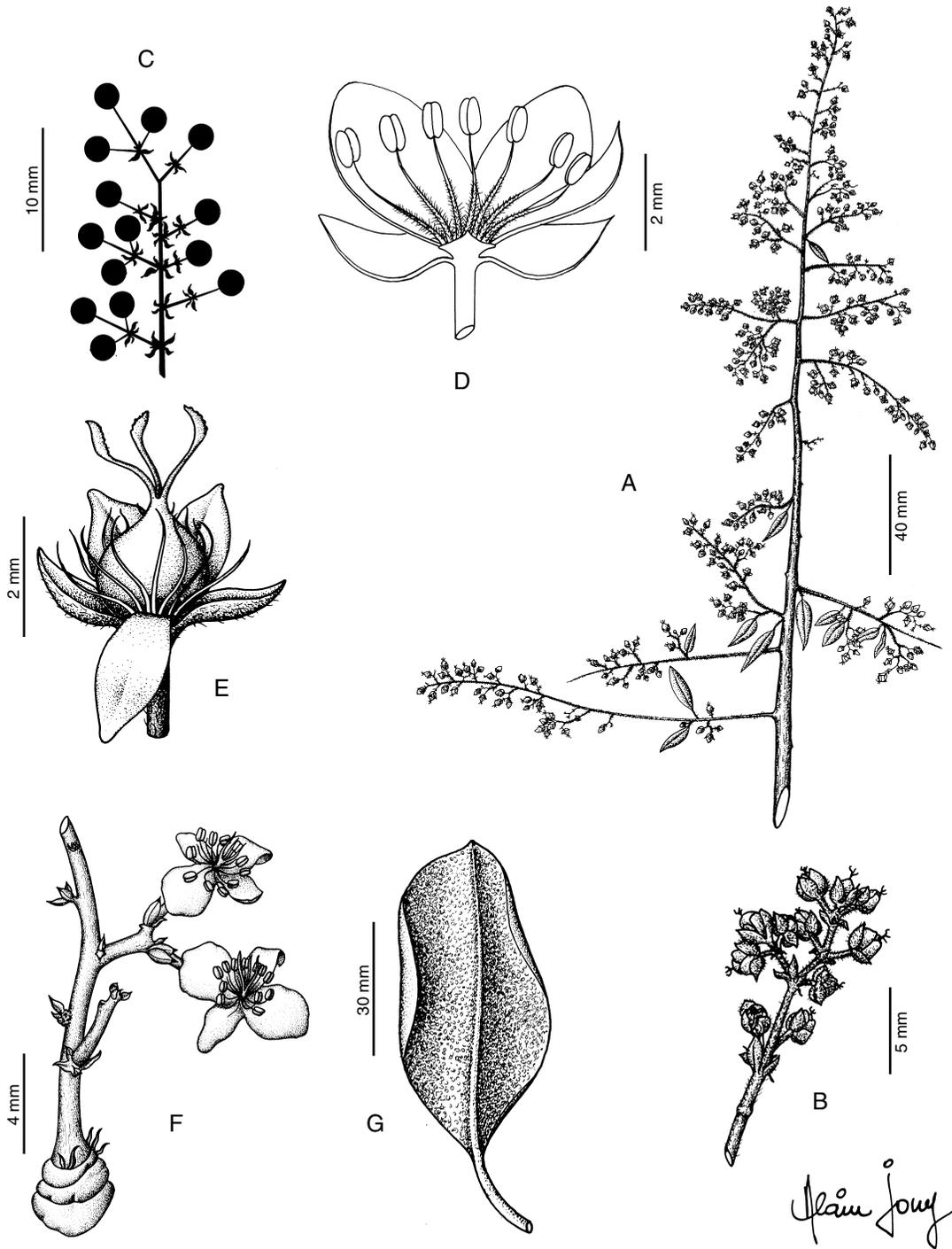


FIG. 7. — A-E, *Talinella grevei* subsp. *hirsuta* Appleg.: A, habit; B, inflorescence detail; C, inflorescence diagram; D, male or "hermaphroditic" flower; E, female flower; F, G, *Talinella grevei* subsp. *calcicola*: F, detail of inflorescence; G, leaf (abaxial surface). A, C, E, *Herbier du Jardin Botanique de Tananarive* 6067; B, D, *Humbert* 2804; F, G, *Bosser* 10426.

VERNACULAR NAME. — Sarodra (*Geay 3321*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: possible Near Threatened (NT). Although the population around Tuléar appears to be thriving, this subspecies is confined to a strip near the western coast (estimated at 625 km² extent of occurrence) which is not protected, so that both human and natural threats, such as major storms, are potentially of concern.

PARATYPES. — MADAGASCAR: Prov. Toliara: *Applequist et al. 186*, along road S from Tuléar to St Augustine, scrub on calcareous soil, 23°28'56"S, 043°46'01"E, fl., fr., 31 Jan. 2003 (MO, P, TAN); *Chauvet 288*, route de Tuléar à Sarodrano, ♀ fl., fr., 25 Feb. 1962 (P, K, G, MO, WAG, TEF); *Geay 3321*, bas Fiherena, collines calcaires, fr., s. date (P); *Geay 3356*, bas Fiherena, fr., s. date (P); *Geay 5292*, bas Fiherena, collines calcaires, fl., s. date (P, MO); *Homolle 1568*, Tuléar, fl., s. date (P); *Keraudren 684*, environs de Tuléar, dunes à *Didierea* de l'embouchure du Fiherenana, fl., Mar. 1960 (P, MO); *Leandri & Ratoto Jean de Dieu 3720*, environs de Tuléar, chemin au sud vers Saint-Augustin, assez près de la mer, bush à Euphorbes, 0-200 m, 23°33'S, 043°45'E, fl., 6 Nov. 1960 (P, MO); *Perrier de la Bâthie 19026*, dunes près de Tuléar, 23°20'S, 043°40'E, fl., fr., Apr. 1933 (P, MO); *Perrier de la Bâthie 19043*, Manampetsa (= Tsimanampetsotsa), calcaires, fr., Apr. 1933 (P, MO); *Poisson 711*, Befanamy, 23°18'S, 043°42'E, fl., 25 Dec. 1923 (P); *Randrianaivo et al. 220*, Fiv. Tuléar, commune rurale d'Ifaty à 30 km au Nord de Tuléar, brousse épineuse à *Didierea* sur sable fin, route Tuléar-Ifaty, nord du Village d'Ifaty, 23°08'44"S, 043°37'24"E, 14 m, fr., 28 Apr. 1998 (P, MO).

SPECIMENS INTERMEDIATE BETWEEN SUBSP. *CALCICOLA* AND SUBSP. *GREVEI*. — *Applequist et al. 185*, along road S from Tuléar to St Augustine, scrub on calcareous soil, 23°28'56"S, 043°46'01"E, 30 m, fl., 31 Jan. 2003 (MO, P, TAN); *Basse s.n.*, entre Arivoroa et Tsirimpioky, Flanc Est de la Chaîne de Tsirimpioky, 150-400 m, fl., 15 Oct. 1931 (P, MO); *Petit s.n.*, bas de la falaise de Miary (Tuléar), 23°18'S, 043°43'E, ♀ fl., Jan. 1922[?] (P); *Poisson 350*, Itafarky sur l'Onilahy, fl., 30 Nov. 1921 (P). These specimens have small, sometimes revolute leaves typical of subsp. *calcicola*, but thickly papillose inflorescences more consistent with those of subsp. *grevei*.

6c. *Talinella grevei* subsp. *hirsuta* Appleq., subsp. nov.

Ramunculi papilloso vel pubescentes lenticellis prominentibus ornati. Folia petiolo laminaque pubescentibus.

Inflorescentiae pubescentes; bracteis (0.6-)1.1-2.5 mm longis sicut pedicellis pubescentibus. Flos sepalis 2 (vel 3) pubescentibus; petalis 3 vel 4; stigmatibus 1.2-1.6 mm longis.

TYPUS. — *Herbier du Jardin Botanique de Tananarive 6067*, Prov. Toliara, Ampandrandava, 24°05'S, 045°42'E, ♀ fl., 1943 (holo-, P!; iso-, TAN?).

Large twigs often sparsely white-papillate, small twigs white-pubescent; lenticels prominently raised, sometimes darker than bark. Leaves more or less oblong, 1-3 cm long, 3-9 mm broad; margins ciliate, shallowly wavy or sometimes deeply revolute; both surfaces and petiole densely white-papillose to short-pubescent. Inflorescences numerous, lateral, closely spaced, narrowly paniculiform, (3-)6-16 cm long, usually with clusters of empty bracts or small buds; supporting twig, peduncle and rachis white-pubescent. Bracts (0.4-)1.1-2.5 mm, narrowly triangular, pale except for dark acute tip, prominent, pubescent. Pedicel (0.5-)1.4-2.5 mm long, pubescent. Sepals 2(-3), 1.8-2.6 mm long, pubescent, orbicular, sometimes obtuse or short-apiculate. Petals 3-4, sometimes unequal, 2.4-3.2 mm long. Filaments 1.0-2.3 mm long, the lower third of the inner whorl densely ciliate; anthers (0.6-)0.7-0.9(-1.1) mm long, from elliptical to narrow and oblong. Stigmas (2-)3, irregular, on short flattened style or subsessile, 1.2-1.6 mm long. Maturing ovary globose to broadly ovoid; fruits not seen. — Fig. 7.

This subspecies is separated from the remainder of *T. grevei* most noticeably by the dense pubescence that extends from the leaves, twigs, and inflorescences to the bracts, pedicels and sepals, whereas the leaf blades, bracts and sepals in all other subspecies are glabrous or at most weakly papillose. It may also be distinguished by the exceptionally large bracts, especially on the type; the petals numbering 3-4 rather than usually 2; and in the type specimen, the pale bark with raised dark lenticels and white papillae even on large twigs. The stigmas appear to be short and sessile, whereas they are usually borne on a style in other subspecies; however, both of the available female specimens are past anthesis, and the first expansion of the ovary may obscure the style, so the value of this character is uncertain.

The two best specimens are from widely separated localities but well inland, to the east of subsp. *grevei*. The third specimen tentatively included herein, *Grevé 20*, was collected from the vicinity of Morondava, as was *Grevé 262*, the type of *T. grevei*. Although *Grevé 262* is one of the most pubescent collections of subsp. *grevei*, *Grevé 20* differs from *Grevé 262* in having sparse pubescence on the bracts and sepals, > 2 petals per flower, and larger bracts. It is noted under the discussion of subsp. *grevei* that the more pubescent collections of that subspecies tend to be those from the eastern and northern portion of its range; one might speculate that there is a gradient of variation involving the very pubescent subsp. *hirsuta* at the eastern side as well as the glabrous subsp. *calcicola* to the west. Morondava is well outside the otherwise known range for *T. grevei*, and the occurrence of two distinct subspecies at this isolated locality is unexpected; however, botanical collections between Morondava and Tuléar are not plentiful enough to define *T. grevei*'s actual range. Although subsp. *hirsuta* might otherwise appear distinctive enough to be segregated at the specific level, the variation of pubescence in subsp. *grevei*, coupled with the uncertain but apparently overlapping ranges of the two subspecies, creates considerable doubt as to whether the two are reproductively isolated. Recognition at the subspecific level is therefore preferable.

DISTRIBUTION. — *Talinella grevei* subsp. *hirsuta* is found in the central portion of southern Madagascar (Fig. 2). Insufficient collections exist to determine its full range and habitat; it probably grows primarily on sand, and may be found at elevations of over 400 m.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Data Deficient (DD). *Talinella grevei* subsp. *hirsuta* is known from three widely separated localities, one of which is protected. Small patches of potentially suitable habitat exist between these localities, and should be investigated for the presence of this taxon.

PARATYPES. — MADAGASCAR: Prov. Toliara: *Grevé 20*, Mouroundava (= Morondava), ♀ fl., s. date (P); *Humbert 2804*, plateaux et vallées de l'Isalo, grès et sables siliceux, 400-1000 m, fl., 16-25 Oct. 1924 (P, MO).

6d. *Talinella grevei* subsp. *sarmentosa* (Leandri) Appleg., **comb. nov., stat. nov.**

Sabouraea sarmentosa Leandri, Adansonia, sér. 2, 2: 226 (1962). — Type: *Leandri & Ratoto Jean de Dieu 3558*, Prov. Toliara, forêt de Zombitsy, au NE de Sakaraha (150 km NE de Tuléar), forêt à feuilles caduques et passage au bush à xérophytes, 600-800 m, 22°54'S, 044°32'E, fl., 1 Nov. 1960 (holo-, P!; iso-, P!, MO!).

Leaves and inflorescences borne in small clusters on short shoots. Leaves oblong to elliptical, 5-20 mm long, thick or succulent, inconspicuously glandular; lateral margins usually deeply revolute so that the blade appears to be linear or very narrowly obtriangular, usually papillose; base tapering; midrib conspicuous beneath, somewhat papillose; petiole short-pubescent. Inflorescences lateral, numerous, with a single main axis < 3(-5) cm long, with leaves borne on lower portion; each main branch a small cyme with 1-2 fertile flowers and few excess bracts or no bracts, with very few undeveloping buds; peduncle and rachis slender, white-papillose or short-pubescent; bracts 0.3-0.7(-1.1) mm long, dark-tipped. Pedicel 2-4 mm long, sparsely papillate to glabrate. Sepals 2.6-3.4 mm long. Petals (2-)3-4, (3.0-)3.6-5.2 mm long, pink. Filaments 2.6-3.3 mm long; anthers 0.70-0.95 mm long. Stigma branches 3, 2.6-4.3 mm long; style *c.* (1.5-)2.0 mm long.

The type specimen of *S. sarmentosa*, collected from Zombitsy (to the west of Isalo) and included in *T. grevei* by EGGI (1997), has small tightly revolute leaves and reduced inflorescences with very few bracts, yet relatively large flowers. Geographically, Zombitsy is not far from the known range of subsp. *grevei*, and the pubescence of this specimen is similar to those of the Sakaraha collections of subsp. *grevei*. However, the specimen has several other distinctive features: the petals are usually 3-4 in number and the flowers are of unusually large size for subsp. *grevei* (pedicels 2-4 mm long vs usually < 2.5 mm, sepals 2.6-3.4 mm long vs usually < 3 mm, style 1.5-2 mm long vs < 1 mm, and stigmas 2.6-4.3 mm long vs < 3 mm). Examined specimens of *T. grevei* subsp. *hirsuta*, which also tends to have 3-4 petals, are pubescent on the leaf blades, bracts and sepals and have a short pedicel, a small

perianth and a much smaller gynoecium. This specimen therefore appears to represent the single known collection of a distinct taxon, possibly of very limited range. Since it was collected within the range of *T. grevei* as presently defined, and no other specimens from the vicinity are available to demonstrate morphological consistency or the lack of intermediates, it may conservatively be retained within *T. grevei* at the subspecific level. However, further investigation of this population is certainly warranted, as it may in the future prove to be an endemic species.

DISTRIBUTION. — Southern Madagascar, known only from Zombitsy Parc National (Fig. 2).

CONSERVATION STATUS. — IUCN Provisional Red List Category: Data Deficient (DD). *T. grevei* subsp. *sarmentosa* is known only from the type locality, which is protected.

7. *Talinella humbertii* Appelq., sp. nov.

Haec species a Talinella dauphinensis Scott-Elliot *foliis minoribus lanceolatis, ramunculis plerumque papillosis papillis albis et bruneis, squamis gemmae foliaris pluries usque ad 1 mm longis apice recurvato pallido, sepalis aequalibus, petalis 2 2.0-2.5 mm longis atque stigmatibus non papillosis differt.*

TYPUS. — *Humbert 13403*, Prov. Toliara, vallée de la Sakamalio, affluent de la Manambolo (bassin du Mandrare), pentes rocailleuses (gneiss), 900-1100 m, 24°32'S, 046°41'E, ♀ fl., Dec. 1933 (holo-, P!; iso-, P!).

Shrub, sarmentose to lianoid, 6-10 dm high. Twigs straight to contorted, slender, reddish brown to dull brown, often with plentiful pale, round to elliptical lenticels; small twigs papillose with white and brown papillae or glabrous. Leaves lanceolate to elliptical or ovate, 1.2-7.0(-9.0) cm long, 0.4-2.0(-3.5) cm broad, sometimes slightly asymmetrical, membranous to thick and coriaceous when dried, often bullate; apex acute, asymmetrically short-apiculate, or occasionally rounded, sometimes minutely emarginate or mucronulate; base rounded-tapering to rounded; midrib conspicuous beneath, secondary venation invisible or inconspicuous. Inflorescences terminal, open, small with few maturing

flowers; peduncle and rachis filiform, white-papillate or glabrous; bud scales near base of peduncle sometimes 0.6-1.0(-1.6) mm long, acuminate, recurved, with pale apex, otherwise dark, triangular; bracts 0.3-0.9(-1.3) mm long, narrowly triangular or reduced to scales, pale, brownish or pale with brownish or reddish base or spot near apex. Usually dioecious, with rare possible instances of monoecy or hermaphroditism. Pedicel 2-7 mm long. Sepals 1.3-2.4 (-2.7) mm long, pale green, orbicular, equal or unequal; apex rounded, occasionally apiculate. Petals 2 (very rarely 3), (1.8-)2.0-3.5(-4.6) mm long, white to greenish or yellowish white, pale reddish green or rarely pink, obovate-oblong, the apex rounded. Stamens 10-15(-20); filaments *c.* 1.1-2.0(-2.3) mm long, pink to purple, the lower third flattened with weakly ciliate margins; anthers yellowish or cream, (0.3-)0.5-0.8 mm long. Stigma branches 2, 0.7-1.0(-1.5) mm long, not or barely papillose, somewhat flattened or rarely terete, yellowish, usually contorted, sessile or on very short style; ovary pale pink, sometimes somewhat triangular. At fruiting, non-maturing branches of inflorescence possibly lost so that infructescence is reduced to one or a few fruits; pedicels thicken and may persist after fruit dehiscence. Fruit a berry, 4-8 mm in diameter, subglobose, reddish, glabrous or sparsely white-papillose, 2-8-seeded; seeds 2.5-3.0 mm long, reniform to broadly reniform, usually with a ridge around the back. — Fig. 8.

The material here assigned to *T. humbertii* was included by EGGLE (1997) in his concept of *T. dauphinensis*; these and several other species (*T. bosseri*, *T. latifolia*, *T. pachypoda*, *T. tsitondroinensis* and *T. xerophila*) share small open inflorescences, pale flowers, and white and brown papillae on the smaller twigs. Both *T. dauphinensis* and *T. humbertii* occur in the same area of southeastern Madagascar; however, the former grows only on sand at low elevations in coastal regions around Fort-Dauphin, whereas the latter is found on granite farther from the coast and extending to much higher altitudes. *Talinella humbertii*, unlike *T. dauphinensis*, has only two petals and lacks a well developed nectar disk or strongly papillose stigmas; the leaves of typical

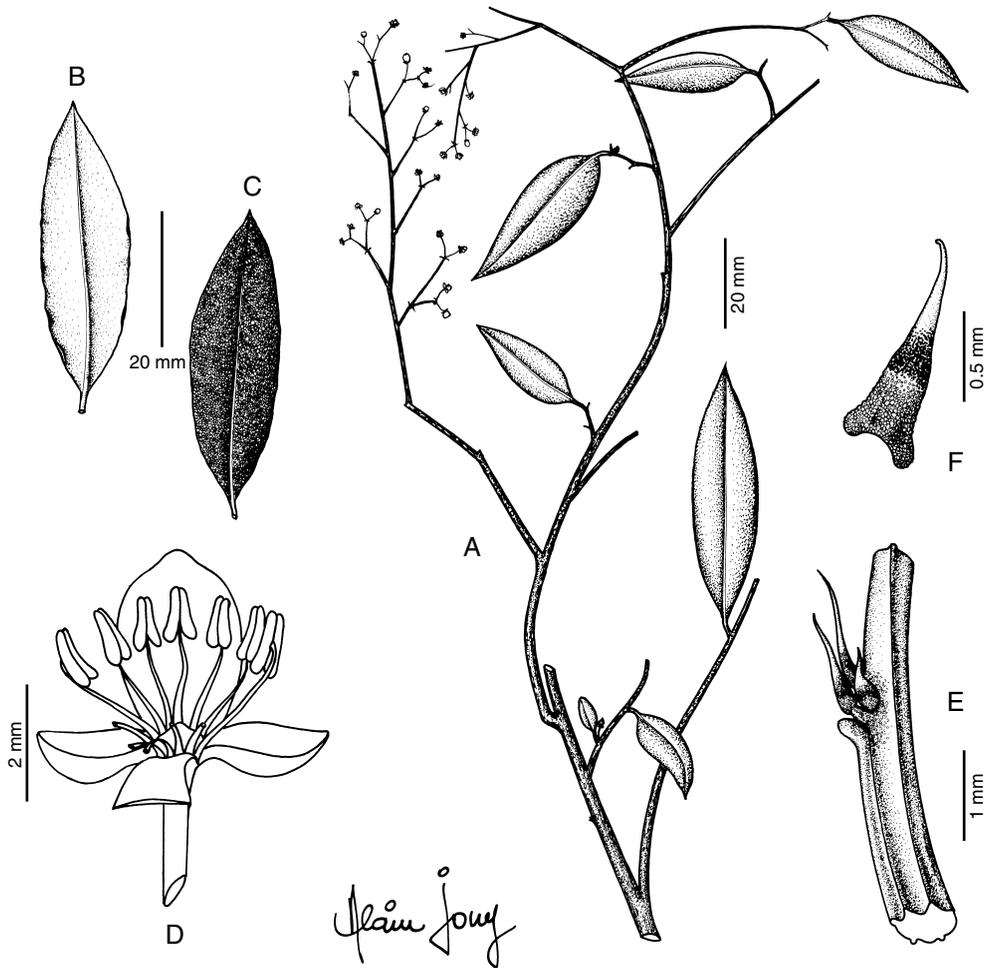


FIG. 8. — *Talinella humbertii* Appleg.: A, habit; B, leaf (abaxial face); C, leaf (adaxial face); D, male flower; E, section of young twig; F, bud scale. *Humbert 12804*.

T. humbertii are smaller and narrower than those of *T. dauphinensis*, lanceolate to elliptical (almost always < 2 cm broad) rather than broadly elliptical to broadly lanceolate or ovate, and the flowers are usually smaller (petals 2-3.5 mm long vs 3-4.5 mm). The sepals are frequently equal in *T. humbertii*, whereas those of *T. dauphinensis* are unequal; the twigs are more commonly papillose, and the bud scales more commonly recurved with pale apices.

A portion of the collections referable to *T. humbertii* share some characters typical of

T. dauphinensis, notably unequal sepals and rounded, asymmetrically short-apiculate leaf apices; these collections all tend to have small, coriaceous, conspicuously bullate, often elliptical leaves. This suite of features is more common in the more southerly collections and at lower altitudes, closer to the present range of *T. dauphinensis*.

Two specimens included herein, *Humbert 12448* and *Humbert 13115*, have exceptionally large, broadly lanceolate leaves and large flowers (Fig. 8); the latter was collected from the same

locality as typical *T. humbertii*, but has leaves to 9 cm long and 3 cm broad and flowers with petals 3.3-4.6 mm long. *Humbert 12448* was noted to have pink flowers, which is also atypical for *T. humbertii*. These specimens have more numerous anthers than other specimens, 2 petals and more or less equal sepals, indicating that they are not referable to *T. dauphinensis*, which sometimes has similar leaves. There is also one fragment of *Humbert 13115* that appears to bear both male and fertile female flowers, although this could be an aberrant individual. As the inclusion of these specimens within *T. humbertii* greatly increases the heterogeneity of this species, their placement should be regarded as tentative.

DISTRIBUTION. — *Talinella humbertii* is known from southeastern Madagascar (Fig. 6), primarily on granite, in dry or transitional forests, and from low altitudes to over 1000 m (possibly to 1400 m).

CONSERVATION STATUS. — Provisional IUCN Red List Category: possible Near Threatened (NT). The extent of occurrence is estimated at 1720 km² and the area of occupancy at 44 km², with collections from several distinct areas. However, the southernmost of these are in a region where considerable human-mediated ecological degradation has occurred, creating reason for concern.

PARATYPES. — MADAGASCAR: Prov. Toliara: *Croat 31953*, along Route #10, 16 km W of Manambaro, 25°02'S, 046°39'E, 110 m, ♂ fl., 21 Feb 1975 (P, MO); *Eboroke 808*, Andohahela RNI, Fort-Dauphin, Ranopiso, Mahamavo, forêt sèche sur un bord de rivière, 24°45'S, 046°45'E, 100 m, fr., 10-20 May 1994 (P, MO); *Humbert 12448*, vallée moyenne du Mandrare près d'Anadabolava, forêt sèche, 200-250 m, 24°12'S, 046°19'E, Dec. 1933 (P); *Humbert 12804*, vallée de la Manambolo, rive gauche (bassin du Mandrare) aux environs d'Isomonony (confluent de la Sakamalio), monts Kotriha et Isomonobe, bush xérophile, 400-600 m, 24°32'S, 046°34'E, ♂ fl., Dec. 1933-Jan. 1934 (P, MO, K); *Humbert 13115*, vallée de la Manambolo, rive droite (bassin du Mandrare) aux environs d'Isomono [= Esomony] (confluent de la Sakamalio), mont Morahariva, 900-1200 m, 24°32'S, 046°38'E, fl., fr., Dec. 1933 (P, MO, K, G); *Humbert 13269*, same locality, rocailles gneissiques, 1000-1400 m, 24°32'S, 046°38'E, fr., Dec. 1933 (P, MO); *Humbert 13737*, bassin de réception de la Mananara, affluent du Mandrare, pentes occidentales des mon-

tagnes entre l'Andohahela et l'Elakelaka, entre Ampahiso et Mahamavo (gneiss), 500-700 m, 24°45'S, 046°43'E, ♂ fl., Jan.-Feb. 1934 (P, MO); *Humbert 13847*, same locality, mont Apiky au-dessus de Mahamavo, transition du bush xérophile à la forêt basse sclérophylle, c. 700 m, 24°45'S, 046°43'E, ♂ fl., Jan.-Feb. 1934 (P, MO, G, K); *Humbert & Capuron 29017*, Baie des Galions (Ranofotsy) au SW de Fort-Dauphin, bush xérophile, 1-100 m, 25°09'S, 046°43'E, fl., 18-21 Feb. 1955 (P); *Humbert & Capuron 29150*, mont Vohitsandriana au sud de Ranopiso, sud-ouest de Fort-Dauphin, forêt de transition sur granite, 200-500 m, 25°03'S, 046°41'E, ♂ fl., 27 Feb. 1955 (P); *Phillipson & Milijaona 3522*, Andohahela RN, 100 m, 25°02'S, 046°40'E, ♂ fl., 17 Feb. 1990 (MO, TAN); *Réserves Naturelles (Rakotoson) 10784*, District Fort-Dauphin, Canton Ambavatary, ♂ fl., 30 Mar. 1960 (P, TEF); *Service Forestier 22397*, formations de transition entre le bush xérophile et la forêt tropophylle, au P. K. 448 de la route Amboasary-Fort-Dauphin (aux environs Est de Bevilany), 25°01'S, 046°36'E, ♂ fl., 13 Jan 1963 (P, TEF).

The collection *Rogers & Rakotonasolo 632*, Prov. Fianarantsoa, N of RN 10, 5 km W of Ihoay along road and slopes to summit, 725 m, 22°13'47"S, 046°21'0"E, fr., 24 May 2004 (MO, P, TAN) may also be referable to *T. humbertii*, which would greatly extend the range of that species. Its seeds lack a ridge; its leaves are consistent with *T. humbertii* and do not resemble those of other *Talinella* collections from the region of Ihoay (two unclassified BOSSER specimens, discussed below).

8. *Talinella latifolia* Appleg., sp. nov.

Haec species Talinellae tsitondroinensis Appleg. *affinis, sed ab ea foliis late ellipticis (2.3-)*3.5-6.5 cm longis glandulari-maculatis apices plerumque mucronulatis, squamis gemmae foliaris saepe curvatis apicis pallidis, floribus maturiscentibus plerumque terminalibus, bracteis late deltoideis vel absentibus, pedicellis 5-9 mm longis, sepalis 2.5-3.0 mm longis, petalis 4 vel 5 roseis 3.0-4.5(-5.5) mm longis atque stigmatibus 1.4-1.6 mm longis plus minusve papillosis stylo brevi insidentibus distinguitur.

TYPUS. — *Perrier de la Bâthie 12533*, Bassin de la Mania, granite, rocailles, 700 m, ♀ fl., Mar. 1919 (holo-, P!).

Shrub. Twigs straight to slightly crooked, light brown, sometimes with small pale circular

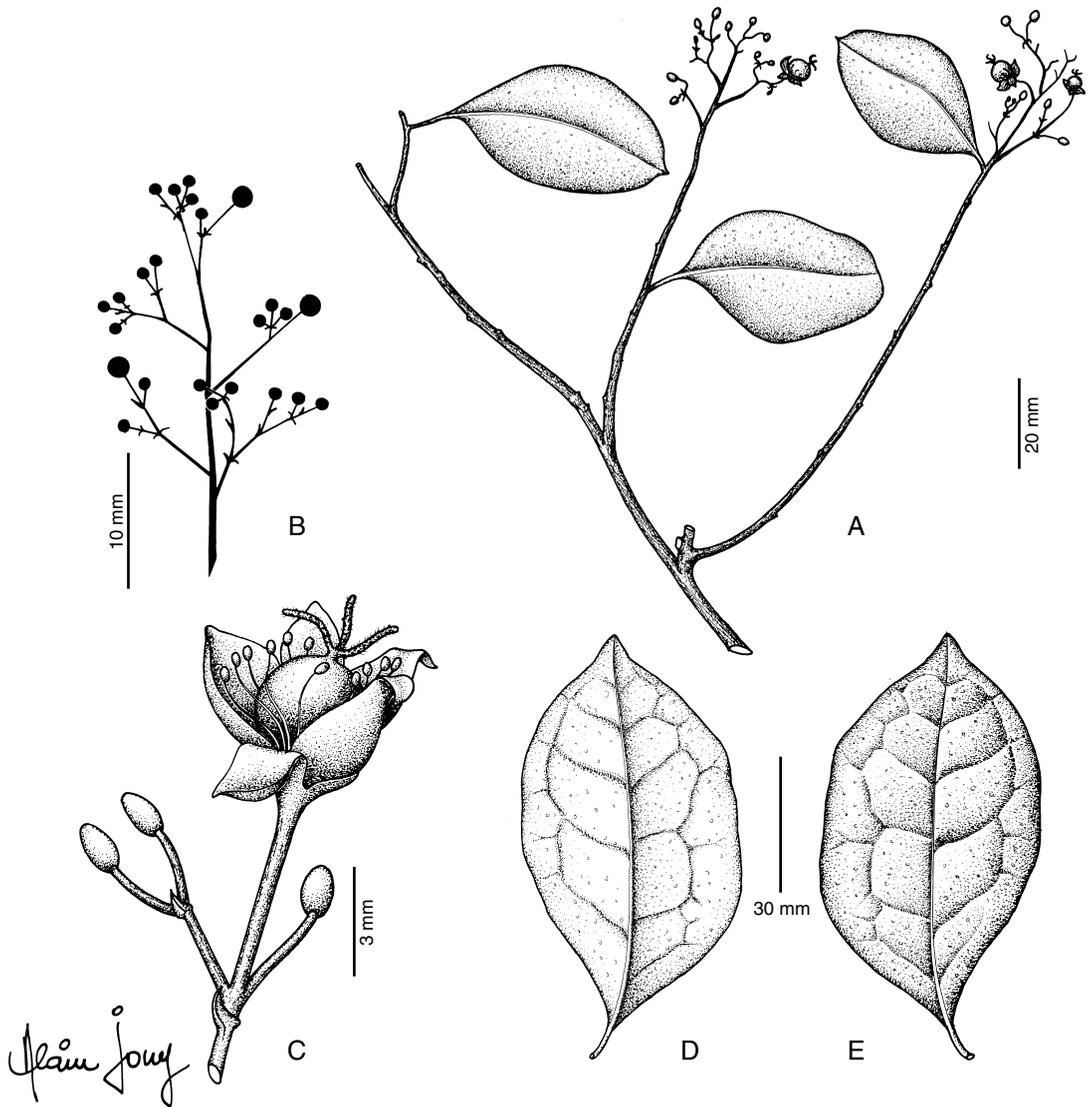


FIG. 9. — *Talinella latifolia* Appleq.: A, habit; B, diagram of entire inflorescence; C, female flower; D, leaf (abaxial surface); E, leaf (adaxial surface). Perrier de la Bâthie 12533.

lenticels; the smallest twigs papillose with white and brown papillae. Leaves broadly elliptical to suborbicular, (2.2-)3.5-6.5 cm long, (1.0-)2.0-3.5(-4.3) cm broad, often somewhat asymmetrical; apex usually mucronulate to apiculate, rarely acute or rounded or emarginate and sometimes with mucron; base tapering; texture crassulescent *in vivo*, papery when dry; surface dark-spotted

and somewhat translucent; midrib conspicuous, higher order venation visible beneath. Probably dioecious. Inflorescences terminal or lateral, open, the fertile portion 2.0-4.5 cm long; peduncle and rachis slender, white-papillate; bud scales below inflorescences 0.4-0.9 mm long, sometimes inward-curving or recurved and with pale apex; bracts 0.3-0.8 mm long, sometimes absent

or reduced to small ridge, broadly triangular with the base prominently curved in a semicircle around the rachis, apical portion or whole bract somewhat darkened. Pedicel 5-9 mm long. Sepals 2.3-3.0 mm long, broadly oblong, apex rounded to apiculate. Petals 4-5, 3.0-4.5(-5.5) mm long, pink or white, frequently unequal, often narrowly oblong, sometimes with an acute apex. Filaments *c.* 2.5-3.0 mm long, flattened and slightly ciliate below; anthers *c.* 0.5 mm long; staminodes of female flowers bearing occasional anthers 0.2-0.5 mm long. Stigma branches 2-3, 1.4-1.6 mm long, somewhat flattened at apex, sometimes irregularly short-ciliate and developing a warty appearance; style < 0.5 mm long; ovary round. Immature fruit globose, to 5 mm in diameter, with remnants of perianth and staminodes persisting; mature fruit not known. — Fig. 9.

The type of *T. latifolia* was placed by EGGLI (1997) within the southeastern *T. dauphinensis*, which differs in having leaves without dark spots, visible secondary venation, or mucronulate apices; smaller and unequal sepals; and petals that are whitish rather than pink. *Talinella latifolia* also closely resembles the northern species *T. pachypoda*, with which it may share unusual pink corollas, and *T. tsitondroinensis*, but may be distinguished from these by leaf morphology. The leaves of *T. pachypoda* are usually symmetrical and slightly narrower than those of *T. latifolia*; the margins are often minutely papillate, the upper surface is not dark-spotted, and the apex is less variable, frequently apiculate but not mucronulate. The petals of *T. pachypoda* are < 3.5 mm long, and the bracts are sometimes > 1 mm long and narrowly triangular; the immature fruit has an apical beak, and the mature fruit may dehisce apically. *Talinella tsitondroinensis* has narrower leaves than *T. latifolia*, usually with rounded apices; narrower bracts (which in both species are sometimes reduced to scales or ridges); and larger stigma branches (up to 3 mm, sometimes branching). Petal number varies within a single individual in both species (4-5 in *T. latifolia* and (2-)5 in *T. tsitondroinensis*). These two species are otherwise quite similar. The holotype of *T. latifolia* has small anthers on a few staminodes, but is probably functionally female; related

species (*T. pachypoda*, *T. dauphinensis*) are apparently dioecious.

DISTRIBUTION. — *Talinella latifolia* is known from three collections in two widely separated areas (Fig. 6). The type was collected in central Madagascar, near the Mania River on granite at about 700 m. If the label data are accurate, the location of the collection would be limited to the portion of the Mania east of the juncture with the Ankotrofotsy or Tsiribihina River, but west of about 046°30'E, as the elevation of the river basin farther east exceeds 700 m. RAZAFIMANDIMBISON & ANDRIANANTOANINA collected material of both *T. pachypoda* and *T. latifolia* under the same number at Ankarana, indicating that these species sometimes share similar habitats and that the potential habitat of *T. latifolia* may be rather diverse, since this collection was probably on limestone rather than granite. A photograph of another specimen from the extreme north (*Ramananjanahary et al.* 9) also appears to represent *T. latifolia*; the petals are reported to be white rather than pink.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). As only three collections of *T. latifolia* have been seen, population data are inadequate to draw firm conclusions. The original range may have been large, given the considerable distance between the Mania River and the northern habitat, but much of the original vegetation between these locations has been destroyed. Remaining vegetation patches around central population centers have long been accessible to collectors, so the absence of other collections suggests that the species may be sparsely distributed. *Talinella latifolia* also seems to be a rare plant within its northern range: RATOVOSON (pers. comm.) reports seeing only two individuals in 11 days of collection near Montagne des Français.

PARATYPES. — MADAGASCAR: Prov. Antsiranana: *Ramananjanahary et al.* 9, Ampitiliantsambo, sur rochers, 12°23'01"S, 049°23'09"E, 289 m, fl, 13 June 2004 (TAN [photo seen]); *Razafimandimbison & Andrianantoanina* 97b, District d'Ambilobe, Canton de Mahamasina, N de Mahamasina, Réserve Spéciale d'Ankarana, route de la Grotte des chauves-souris, 12°58'S, 049°08'E, 50 m, ♂ fl., 15 June 1995 (MO).

9. *Talinella microphylla* Eggl

Adansonia sér. 3, 19: 56 (1997). — Type: *Humbert 20221*, Madagascar, Prov. Toliara, environs du lac Tsimanampetsotsa (côte SW), bush xérophile des côteaux et plateaux calcaires rocailleux, 2-200 m, fl., fr., 14 Feb. 1947 (holo-, P!; iso-, P!, MO!, K!, G!).

Shrub with sarmentose to lianoid branches, to 2 m high, sometimes appearing lianoid. Twigs straight to contorted; bark on larger twigs sometimes cracked or peeling, pale grayish or dull brown, glabrous; lenticels absent or small; leaves and inflorescences often borne in small clusters on short shoots. Leaves oblong to obovate, the lateral margins deeply revolute so that the blade appears to be narrowly oblong, < 10 mm long, appearing < 2 mm broad, to twice that width when unrolled, thick or succulent, sometimes purple-tinged; apex truncate to minutely mucronulate or emarginate or rounded; base tapering; midrib conspicuous beneath. Inflorescences usually lateral on short shoots, small and few-branched, each branch cymose with 1-2(-3) fertile flowers and few bracts; peduncle and rachis filiform, weakly white-papillose to glabrate; bracts 0.3-0.7(-1.5) mm long, pale with dark tip. Possibly gynodioecious. Pedicel 1-7 mm long, sparsely papillate to glabrate. Sepals 1.7-2.3 mm long, greenish to greenish-white. Petals 2, in hermaphroditic flowers 2.5-3.2(-4.0) mm long, white to greenish white. Stamens white; filaments 2.2-2.5 mm long, the base of the inner whorl papillose or short-ciliate; anthers (0.4-)-0.5-0.7 mm long, broadly elliptical. Stigma branches 2-3, 1.4-2.5 mm long, slightly flattened, slightly papillose, dull pink; style 0.8-1.2 mm long; ovary green, globose. Immature fruit globose, to 4.5 mm in diameter, with remnants of calyx and staminodes persisting for some time; mature fruits not known.

Talinella microphylla as originally circumscribed was a rather heterogeneous assemblage of small-leaved, often gnarled plants from the most arid habitats at the western and southern edge of the range of *T. grevei*; the available specimens can be divided morphologically into those from Lac Tsimanampetsotsa, south of Tuléar, and those from further to the south and east, which are described herein as *T. xerophila* Appleg. *Talinella*

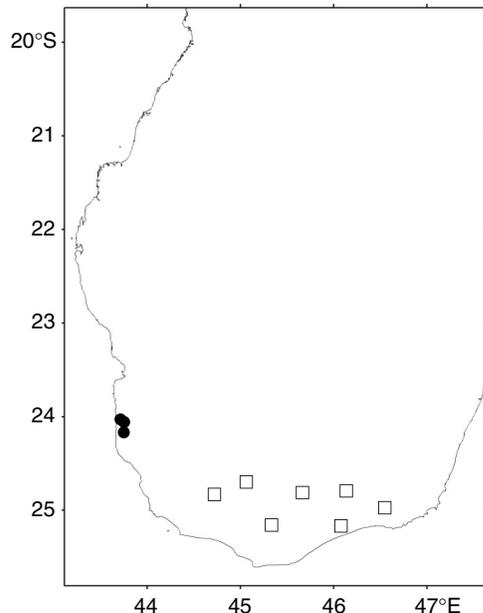


FIG. 10. — Distribution of *Talinella microphylla* (●) and *T. xerophila* (□).

microphylla sensu stricto can be distinguished by its very small, strongly revolute leaves, glabrous twigs, and whitish flowers with two petals. Like *T. grevei*, to which it is probably most closely related, *T. microphylla* appears to be gynodioecious. *Talinella grevei* subsp. *calcicola* has been collected near Tsimanampetsotsa (*Perrier de la Bâthie 19043*), where, despite being rather underdeveloped, it can be distinguished from *T. microphylla* by its larger leaves and sturdier inflorescences. Furthermore, *T. microphylla* has pale petals, whereas *T. grevei* has deep pink petals.

DISTRIBUTION. — *Talinella microphylla* is known only from the vicinity of Lac Tsimanampetsotsa in southwestern Madagascar (Fig. 10), on limestone substrates at low altitudes (< 200 m).

VERNACULAR NAMES. — Drakydraky (in Mahafaly; *Humbert 20229*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). *Talinella microphylla* occurs in only one known location, around Lac Tsimanampetsotsa;

although this area is protected, it remains vulnerable to natural threats.

MATERIAL EXAMINED. — MADAGASCAR: Prov. Toliara: *Bosser 15737*, plateau calcaire, RN 10, Lac Tsimanampetsotsa, fr., Feb. 1962 (P, TAN, MO, K); *Humbert 20221*, environs du lac Tsimanampetsotsa (côte SW), bush xérophile des côteaux et plateaux calcaires rocaillieux, 2-200 m, fl., fr., 14 Feb. 1947 (P, K, MO, G); *Humbert 20229*, same locality, fl., fr., 14 Feb. 1947 (P, MO); *Keraudren 1405*, sur les calcaires de la RN 10 au-dessus du Lac Tsimanampetsotsa, fr., Feb. 1962 (P); *Phillipson 2737*, Tsimanampetsotsa Reserve S of Tuléar, N edge of reserve, 24°04'S, 043°45'E, 80 m, fl., 28 Dec. 1987 (P, MO, TAN).

10. *Talinella pachypoda* Eggl

Adansonia, sér. 3, 19: 57 (1997). — Type: *Rössli & Rechberger s.n.*, Madagascar, Diégo Suarez, Montagne des Français, SE flank, 7-8 km from Diégo Suarez (c. 12°19.5'S, 049°20'E), 1989 (holo-, ZSS).

Shrub to 3 m, usually with arching branches, sometimes with short thick trunk or basal caudex; rarely described as a small tree. Twigs straight to contorted, brown to reddish brown; lenticels on large twigs pale, elliptical to round, occasionally absent; smallest twigs frequently papillose with brown and white papillae. Leaves elliptical, 2.5-7.0 cm long, 1.00-2.75 cm broad; apex apiculate, occasionally acute or emarginate, usually symmetrical; base tapering; margins entire, slightly wavy, minutely papillose; blade membranous or papery when dried, sometimes possibly paler around midrib and secondary veins above; under surface sometimes reddish tinged; midrib conspicuous at least on lower surface, higher-order venation observable. Often leafless at time of flowering. Inflorescences unisexual, plants probably dioecious. Inflorescences lateral or terminal, with up to a dozen fertile flowers; peduncle and rachis white-papillate; bracts c. (0.3-)-0.5-1.6 mm long, narrowly to broadly triangular, reddish to brown, often with a pale apex. Pedicel 1.5-5 mm long. Sepals (1.7-)-2.0-3.0 mm long, orbicular, sometimes unequal. Petals (3-)-5, (2.0-)-2.5-3.5 mm long, pink-tinged white to rose, sometimes irregularly shaped or orbicular due to fusion of 2 petals, otherwise oblong to elliptical. Filaments connate at base and attached to ring-

shaped nectary disk, 1.5-2.5 mm long, white or pinkish, the bases barely ciliate; anthers yellow, 0.40-0.60(-0.85) mm long. Stigma branches 2-3, white, 1.0-1.5 mm long, flattened, with papillose or ciliate edges, sessile in developing fruit, sometimes on very short broad style; ovary green, ovoid. Fruit ovoid to pyriform or oblong, with a pronounced apical beak, sometimes a capsule apically dehiscent by 2-3 shallow valves, to 8 mm long, up to 6-seeded; sepals and frequently petals persistent; pedicel sometimes thickening slightly in fruit; immature seeds elliptical to orbicular, possibly with a shallow ridge around edge.

Few fruiting specimens of *Talinella pachypoda* exist. The fruits, which are ovoid with a prominent apical nipple for most of their development, have been described as berries (EGGLI 1997). However, one specimen (*Jongkind & Rapanarivo 969*, MO) has mature fruits that are clearly capsular, apically dehiscent with thin dry walls. An error could easily have been made if only unripe fruits were available; for example, CAVACO (1952) described the globose circumscissile capsules of three Malagasy species of *Deeringia* as berries (APPLEQUIST & PRATT in press). If mature fleshy berries have indeed been observed, then "*T. pachypoda*" as presently defined must include a second unrecognized species. This observation suggests that *T. pachypoda* may occupy a basally branching position within *Talinella*, retaining both the usual petal number (five) and the dry fruit type of the genus' nearest relatives in *Talinum*.

DISTRIBUTION. — *Talinella pachypoda* occurs in northern Madagascar, from Ankarana to the vicinity of Antsiranana (Fig. 4), on calcareous substrates including tsingy.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Vulnerable (VU D2). No more than five clearly separate locations are known and the area of occupancy is estimated at 20 km². Moreover, the number of mature individuals of *Talinella pachypoda* in the wild may be < 1000, as the plant seems to be scarce in at least some of the known localities.

MATERIAL EXAMINED. — MADAGASCAR: Prov. Antsiranana: *Bardot Vaucoulon 481*, calcaires lapiazés,

massif de l'Ankarana, fl., fr., leaf, 15 Jan. 1991 (P); *Decary 14555*, massif de l'Ankara, roches calcaires, ♂ fl., 25 Jul. 1939 (P); *Gentry 11943*, road along coast from Diégo-Suarez to Ramenz [= Ramena], rocky hills overlooking sea, near sea level, 23 May 1974 (P); *Jongkind & Rapanarivo 969*, Ankarana Reserve near Campement des Anglais, open forest on calcareous plateau with many small succulent Euphorbias, c. 4 km S of Campement des Anglais, 12°54'42"S, 049°06'43"E, 240-260 m, ♀ fl., fr., leaf, 22 May 1993 (P, MO); *Phillipson 1993*, Ankarana, along RN6 30 km N of Ambilobe, 12°57'S, 049°08'E, 120 m, ♂ fl., 30 Jun. 1987 (P, MO, TAN); *Razafimandim-bison & Andrianantoanina 97a*, District d'Ambilobe, Canton de Mahamasina, N de Mahamasina, Réserve Spéciale d'Ankarana, route de la Grotte des chauves-souris, 12°58'S, 049°08'E, 50 m, ♂ fl., leaf, 15 Jun. 1995 (MO); *Service Forestier 22678*, Plateau calcaire de l'Ankarana, à l'W de Mahamasina (Antanatsimanja), 12°57'S, 049°08' E, fl., 23 Apr. 1963 (TEF).

11. *Talinella tsitondroinensis* Appleg., sp. nov.

Haec species Talinellae pachypodae Egglis affinis, sed ab ea habitu minore laxiore sine caudice, foliorum apicibus saepe asymmetricis rotundatis vel breviter acuminatis vel leviter emarginatis, squamis gemmae foliaris acuminatis apicibus fuscatis, inflorescentiis breviter paniculiformibus, bracteis 0.4-0.6(-1.2) mm longis vel sursum ad squamas reductis, floribus maturis lateralibus vel terminalibus, pedicellis 3-7 mm longis, sepalis late ovatis aequalibus, petalis (2 ad) 5 albidis (3.0-)3.6-4.0 mm longis, florum femineorum staminodiis usque ad 4 mm longis roseis interdum antheras gerentis ac stigmatibus 2 vel 3 usque ad 3 mm longis interdum semel ramosis atque fructu globoso semen solitarium usque ad 3 mm longum continente distinguitur.

TYPUS. — *Perrier de la Bathie 1385*, Prov. Mahajanga, rochers basaltiques [de la cime du] Mt Tsitondroina, 16°44'S, 046°24'E, ♀ fl., fr., Jan. 1900 (holo-, P!; iso-, P!).

Shrub to 0.5 m with lax, possibly sarmentose branches. Twigs straight, reddish brown; lenticels on large twigs pale, large and elliptical to small and round; smallest twigs usually papillose with brown and white papillae. Leaves elliptical to oblong, ovate or obovate, (1.5-)2.5-5.0 cm long, (0.9-)1.2-1.8(-2.0) cm broad, sometimes somewhat asymmetrical; apex rounded to rounded-acute, occasionally short-apiculate or shallowly emarginate; base tapering, usually somewhat concave; margins frequently slightly revolute,

sometimes barely papillose; blade crassulescent, rather thin when dried; midrib conspicuous at least on lower surface, higher-order venation observable beneath. Inflorescences short-paniculiform, borne on short or long lateral twigs, < 3 cm long with few fertile flowers; peduncle and rachis slender, glabrous or white-papillate; bud scales below inflorescence (0.6-)0.8-1.0 mm long, dark, acuminate, the base of the lower ones sometimes mottled and papillose like the twig; bracts c. 0.4-0.6(-1.2) mm long or reduced to scales distally, narrowly triangular, usually with inconspicuous darker tip or streak down the midline. Pedicel 3-7 mm long. Sepals 2.0-2.6 mm long, broadly ovate; apex rounded or obtuse. Petals (2-)5, (3.0-)3.6-4.0 mm long, white, oblong to narrowly obovate; fused petals sometimes suborbicular, convex. Staminodes of female flowers filiform, with lower portion ciliate, to 4 mm long, rose, with occasional anthers 0.4-0.9 mm long. Stigma branches 2-3, sometimes once-branched, rose, to 3 mm long at maturity, sessile, flattened, ragged-edged. Immature fruit globose, up to 5.8 mm in diameter; perianth and staminode remains frequently persistent; seeds 1 per fruit, broadly elliptical to suborbicular, to 3 mm long, with a shallow ridge around edge. — Fig. 11.

The single known collection of *Talinella tsitondroinensis* is from northwestern Madagascar, well outside the known range of any other member of the genus. It is a delicate shrub with few-flowered inflorescences and twigs bearing brown and white papillae, and thus belongs to the group of species including *T. dauphinensis* and *T. pachypoda*; the type was included within EGGLI's (1997) concept of *T. dauphinensis*, but is probably more closely related to *T. pachypoda*, to which it has the closest geographic proximity, or to *T. latifolia*, which it most closely resembles (see discussion under that species). It is distinguished from *T. dauphinensis* by its narrower leaves with visible secondary venation and frequently rounded apices; slightly larger (2.0-2.6 mm vs 1.0-2.3 mm) and equal sepals; stamens > 2.5 mm long and probably c. 20 in number; and stigmas that are > 2 mm long, pink and flattened (rather than whitish and terete). It is distinguished from *T. pachypoda* by

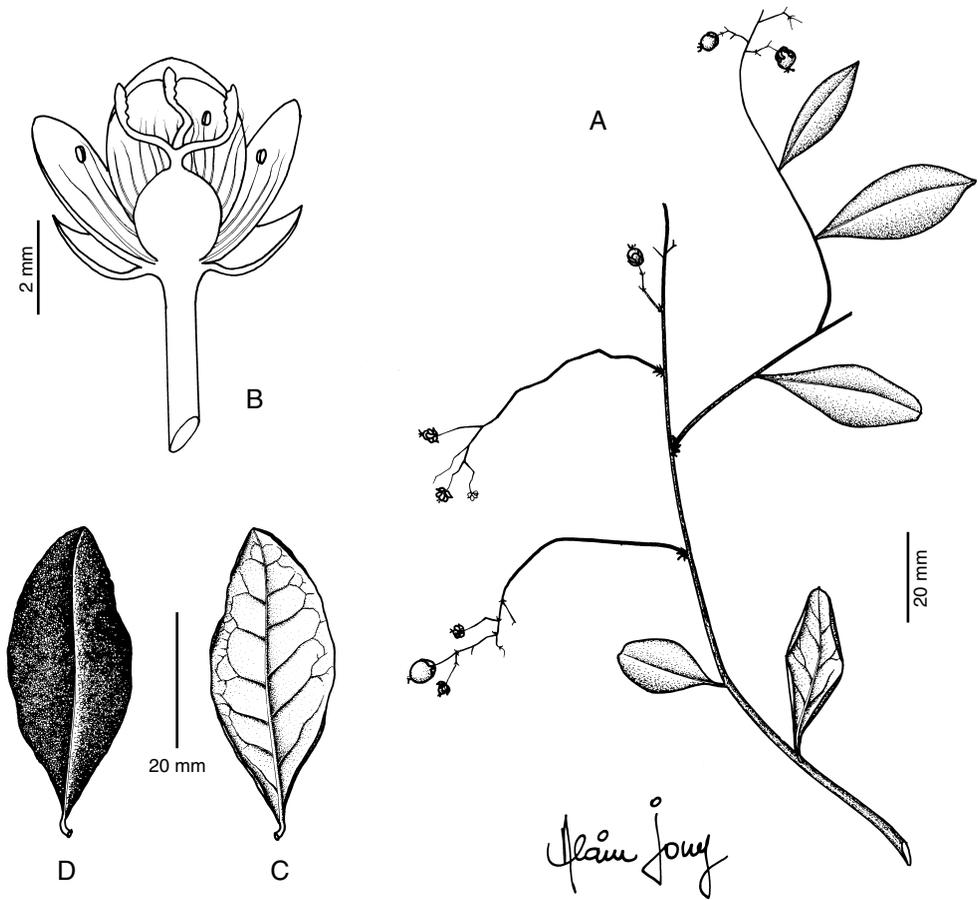


FIG. 11. — *Talinella tsitondroinensis* Appelq.: **A**, habit; **B**, female flower; **C**, leaf, adaxial surface; **D**, leaf, abaxial surface. *Perrier de la Bathie* 1385.

its leaf shape (which, though variable, usually is not symmetrically apiculate as is common in *T. pachypoda*); larger, white petals; long pink stigmas; and globose, unbeaked fruits. The size and number of the seeds of *T. tsitondroinensis* (up to 3 mm long, and only 1 per fruit in the type specimen) may also prove diagnostic. Like *T. latifolia*, *T. tsitondroinensis* has occasional anthers in female flowers, but is likely to be functionally dioecious.

DISTRIBUTION. — *Talinella tsitondroinensis* is known only from Mt Tsitondroina, in northwestern Madagascar (Fig. 6), on basalt. One of the duplicates indicates that the type collection was

from the summit; one summit of Tsitondroina is c. 391 m.

CONSERVATION STATUS. — Provisional IUCN Red List Category: Data Deficient (DD). As *T. tsitondroinensis* is known only from the type collection, and no efforts have been made to relocate it, it is considered to be Data Deficient. However, it may well prove to be endangered. The single known locality is not protected.

12. *Talinella xerophila* Appelq., sp. nov.

Haec species Talinellae microphyllae Egglis similis, sed ab ea ramunculis papillois papillis albis et brunneis,

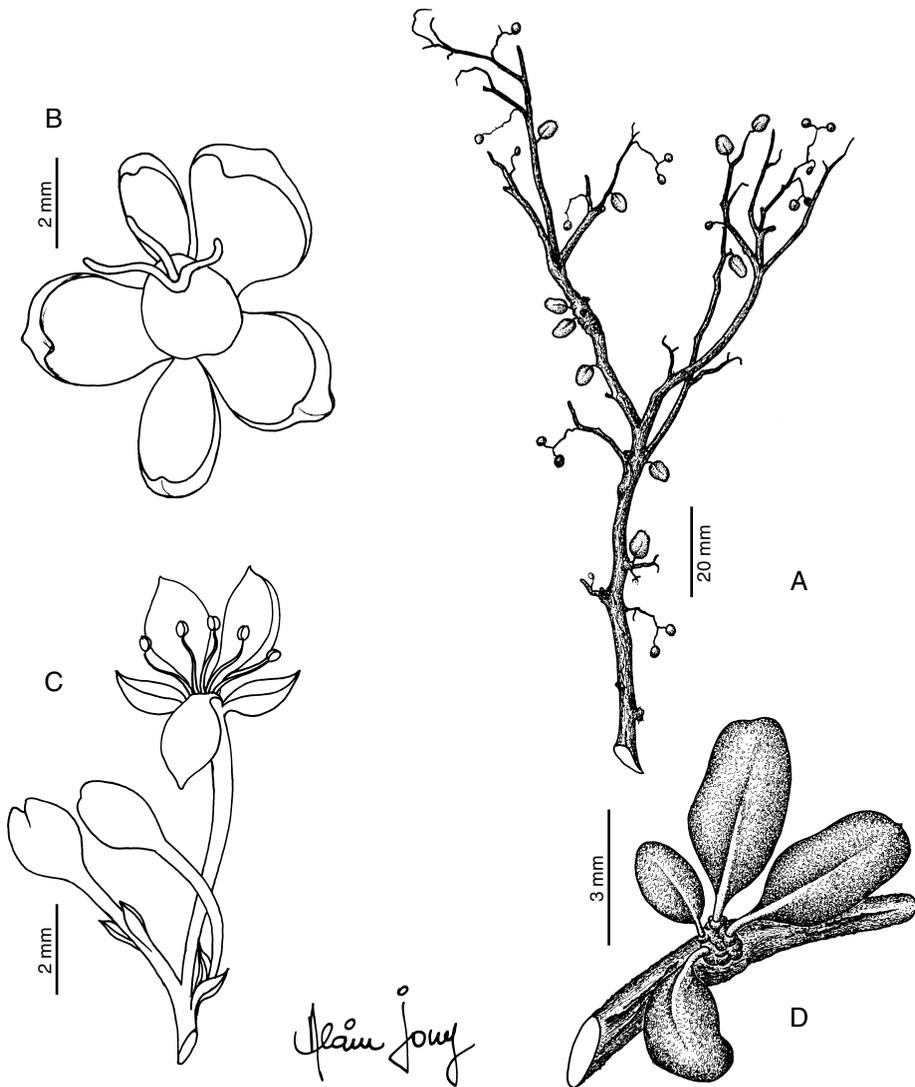


FIG. 12. — *Talinella xerophila* Appleg.: **A**, habit; **B**, female flower; **C**, male flower; **D**, leaf cluster, adaxial surfaces. A-C, Peltier 5871; D, Bosser 4101.

foliis late ovatis usque ad 6 mm longis et 3 mm latis marginibus non revolutis, bracteis paucis pallidis plerumque minus quam 0.5 mm longis, pedicellis 4-6 mm longis insuper dilatatis atque petalis 3 ad 5 saepe inaequalibus et irregulariter connatis post maturitatem fructus persistentibus differt.

TYPUS. — Service Forestier 28983, Prov. Toliara, environs de Sihanamavo, au S d'Ampanihy, sur sables

roux, 24°50'S, 044°43'E, ♀ fl., fr., 10 Dec. 1969 (holo-, P!; iso-, P!, TEF!).

Shrub, 0.5-1.0(-2.5) m high. Twigs frequently contorted; bark on larger twigs wrinkled, cracked or peeling, gray-brown to dull brown, glabrous; lenticels absent to numerous; small twigs densely papillose with white and brown

papillae or rarely glabrous; leaves and inflorescences clustered on very short shoots or borne singly on small slender lateral twigs. Leaves broadly obovate, to 6 mm long and 3 mm broad, thick or succulent; apex rounded, usually minutely apiculate; midrib usually visible but not prominent beneath. Inflorescences small cymes, borne in leaf axils or terminal on short shoots, reduced to 1-2 flowers or up to 3 times branched with several buds; peduncle filiform, white-papillate; bracts and bud scales very few, pale, 0.2-0.5(-0.8) mm long. Probably dioecious. Pedicel 4-6 mm long, sparsely papillate to glabrate. Sepals 1.2-1.8(-2.0) mm long, thick-textured, somewhat warty. Petals 3-5, irregularly fused, sometimes partly connate, often unequal or with one borne inside another, (1.5-)2.0-3.5 mm long, pink to pinkish green, greenish or white. Filaments *c.* 1.5 mm long, filiform; anthers 0.5 mm long, oblong. Female flowers sometimes with short, ciliate-edged staminodes. Stigma branches (2-)3, 1.1-1.6 mm long, slightly flattened, somewhat papillose or irregular along one edge, sessile. Fruit bacciform, elliptical to globose, reddish, 3.5-5.0 mm high, thin-fleshed, often with remnants of calyx and staminodes persisting, occasionally sparsely papillose; seeds 2-6, broadly reniform or elliptical, 1.7-2.2 mm long, with or without shallow obtuse ridge. Remains of perianth sometimes persist after fruit has fallen. — Fig. 12.

The material here classified as *Talinella xerophila* was included in EGGLI'S (1997) concept of *T. microphylla*. Both species are adapted to dry depauperate southern habitats, and they bear an extraordinary superficial resemblance. However, *T. xerophila* typically has 3-5 petals rather than 2, its stigmas are sessile, and its twigs are often densely pubescent with white and brown papillae; it may be dioecious rather than gynodioecious, although existing material is limited. These characters suggest that *T. xerophila* is more closely related to the widespread group of species including the southeastern *T. dauphinensis* and *T. humbertii* than to *T. microphylla* and *T. grevei*. *Talinella xerophila* may be further distinguished by its leaves, which are broadly obovate (to 6 mm by 3 mm) and usually not strongly rolled up as in

T. microphylla, and by its tiny inflorescences with fewer, paler bracts. The petals may be pink to green or white in *T. xerophila*, but are never reported to be pink in *T. microphylla*. Dry portions of the perianth sometimes linger on the pedicel after the sexual parts have been lost and the fruit perhaps dispersed, a state that has not been observed in any other species of *Talinella*. *Talinella xerophila* has a much wider distribution than *T. microphylla* and is found on sand, whereas *T. microphylla* occurs on limestone around Lac Tsimanampetsotsa.

DISTRIBUTION. — *Talinella xerophila* is known from the arid region at the southern tip of Madagascar (Fig. 10); it grows primarily on sand at low altitudes.

VERNACULAR NAME. — Sohy (*Bosser 4101*).

CONSERVATION STATUS. — Provisional IUCN Red List Category: Least Concern (LC). It should be noted that, although the distribution of *T. xerophila* is broad, only seven localities are known, and the habitat is not protected.

PARATYPES. — MADAGASCAR: *Bosser 3752*, Prov. Toliara, Ifotaka, bush sur sables roux, 24°48'S, 046°08'E, ♂ fl., Nov. 1952 (P); *Bosser 4101*, Prov. Toliara, Ifotaka (Mandrare), bush xérophile sur sable, 24°48'S, 046°08'E, ♀ fl., fr., Nov. 1952 (P, MO, K, TAN); *Bosser 14436*, Prov. Toliara, environs d'Ambovombe (sud), bush dégradé, 25°10'S, 046°05'E, Mar. 1960 (P, MO); *Chauvet 414*, Prov. Toliara, route de Tsihombe à Beloha, 3 Apr. 1953 (P, TEF); *Peltier 5871*, Prov. Toliara, Tranoroa, 24°42'S, 045°04'E, ♀ fl., 2 Apr. 1966 (P); *Randrianaivo et al. 884*, Fiv. Fort-Dauphin, Com. Ranopiso, Fkt. Andranomainty, Forêt de Mangatsiaka à 52 km W de Fort-Dauphin, RN 13, forêt sèche à *Alluaudia*, 24°58'33"S, 046°32'46"E, 90 m, fr., 3 Dec. 2002 (MO); *Service Forestier 22463*, Antanimora, près du terrain d'aviation, bush dégradé sur sables, 24°49'S, 045°40'E, 26 Jan 1963 (TEF).

UNCLASSIFIABLE SPECIMENS

MADAGASCAR: *Bosser 17406*, Prov. Fianarantsoa, district Ihosy, route de Ranotsara, vestige de forêt tropophile, ♀ fl., Feb. 1963 (P). — *Bosser 17900*, Prov. Fianarantsoa, environs d'Ihosy, fr., Feb. 1968 (P).

These specimens from the central part of southern Madagascar fall into the group of

species affiliated with *T. dauphinensis*. *Bosser 17406* was collected at the same locality as *Bosser 17406bis* (the type of *T. bosseri*; cf. Fig. 4) but has leaves of a very different shape (broader, shorter, and more symmetrical), smaller inflorescences, and smaller flowers. It was suggested by EGGLE (1997) to represent a disjunct locality of *T. pachypoda*, otherwise known only from the extreme north, but this identification is inconsistent with floral morphology. A fruiting specimen from the nearby Ihozy region, *Bosser 17900*, has similar broad, papery leaves and small infructescences. These two specimens appear different from the large-leaved southern specimens (especially *Humbert 13115*) tentatively placed within *T. humbertii*, and cannot be identified with any other species herein recognized. Both are in poor condition, with little fertile material and most of the leaves broken or suffering from precollection insect damage, so that an adequate description could not be produced. As the habitat around Ihozy is greatly degraded, these populations, if still present, may be in imminent danger of extinction and their relocation would be highly desirable.

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