

Endemic families of Madagascar. XII. Resurrection and taxonomic revision of the genera *Mediusella* (Cavaco) Hutchinson and *Xerochlamys* Baker (Sarcolaenaceae)

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ABSTRACT

The position of *Leptolaena* subgenera *Mediusella* Cavaco and *Xerochlamys* (Baker) Cavaco with respect to *Leptolaena* Thouars and *Sarcolaena* Thouars has long been debated along with the circumscription of species within these two groups. Recent advances in the molecular phylogeny of Sarcolaenaceae indicate that both *Mediusella* and *Xerochlamys* are not part of *Leptolaena*, requiring a generic recircumscription of the entities in the *Leptolaena-Sarcolaena-Mediusella-Xerochlamys* clade. The results of a previous multivariate analysis of morphological characters also showed that *Mediusella* and *Xerochlamys* include two and eight entities respectively, which are recognized here as distinct species. Three species of *Xerochlamys* (*X. coriacea*, *X. itremoensis* and *X. undulata*) are described as new, and *Mediusella arenaria* requires a new combination. The three new species are distinguished by their habit, the size, pubescence and margin of their leaves, and the structure of their inflorescences. A key to the species and information on their distribution, ecology and phenology are given. The conservation status of each species is evaluated according to IUCN Red List criteria; six species are considered endangered (EN), two are vulnerable (VU), one is near threatened (NT) and the last is of least concern (LC).

KEY WORDS

Sarcolaenaceae,
Mediusella,
Xerochlamys,
endemic,
Madagascar,
conservation,
new species.

RÉSUMÉ

Familles endémiques de Madagascar. XII. Résurrection et révision taxonomique des genres Mediusella (Cavaco) Hutchinson et Xerochlamys Baker (Sarcolaenaceae). La position de *Leptolaena* sous-genres *Mediusella* Cavaco et *Xerochlamys* (Bak.) Cavaco par rapport à *Leptolaena* Thouars et *Sarcolaena* Thouars ainsi que la circonscription des espèces appartenant à ces deux groupes ont été longtemps sujets à controverse. Une récente étude de phylogénie moléculaire suggère l'exclusion de *Mediusella* et *Xerochlamys* du genre *Leptolaena* et une reconsidération de la circonscription générique actuelle au sein du groupe *Leptolaena-Sarcolaena-Mediusella-Xerochlamys*. Les résultats d'une précédente analyse multivariée sur des caractères morphologiques ont aussi permis de distinguer deux et huit entités respectivement dans *Mediusella* et *Xerochlamys*. Ces entités sont reconnues et décrites ci-après comme espèces distinctes les unes des autres. Trois d'entre elles (*Xerochlamys coriacea*, *X. itremoensis* et *X. undulata*) sont nouvelles, et *Mediusella arenaria* requiert une nouvelle combinaison. Les trois nouvelles espèces se distinguent par leur port, la dimension, la pubescence et la marge de leurs feuilles, et par la structure de leurs inflorescences. Une clé des espèces ainsi que des informations sur la distribution, l'écologie et la phénologie sont présentées. Une évaluation préliminaire du statut de conservation de chaque espèce suivant les critères de l'UICN pour la Liste Rouge indique que six espèces sont en danger (EN), deux autres sont vulnérables (VU), et les deux dernières sont classées dans la catégorie presque menacée (NT) et préoccupation mineure (LC) respectivement.

MOTS CLÉS

Sarcolaenaceae,
Mediusella,
Xerochlamys,
endémique,
Madagascar,
conservation,
espèces nouvelles.

INTRODUCTION

Leptolaena Thouars *s.l.* belongs to the largest endemic Malagasy plant family, Sarcolaenaceae, which includes a total of eight genera and 63 species (Schatz 2001; Schatz *et al.* 2001; Lowry *et al.* 2002; Lowry & Rabehivitra 2006; Rabehivitra & Lowry 2009). It comprises three subgenera, of which *Leptolaena* subgenera *Mediusella* Cavaco and *Xerochlamys* (Baker) Cavaco have not yet been revised because of the uncertainties regarding their placement vis-à-vis *Leptolaena* and *Sarcolaena* Thouars, and the difficulty of adequately addressing problematical species boundaries using traditional taxonomic methods due to complex morphological variation (Schatz *et al.* 2001). Recent advances in the systematics of Sarcolaenaceae have shed new light on the status of these groups. Indeed, a phylogenetic study of the family using nuclear and chloroplast markers (T. Haevermans pers. comm.) shows that *Mediusella* and *Xerochlamys* are sister to each other, comprising a clade that is in turn sister to *Sarcolaena*. This study also indicates that *Leptolaena*

s.s., as circumscribed by Schatz *et al.* (2001), is monophyletic and is sister to the *Sarcolaena-Mediusella-Xerochlamys* clade. This evidence casts new light on the long-standing controversy regarding the placement of *Mediusella* and *Xerochlamys* (Cavaco 1951, 1952a, b; Carlquist 1964; Capuron 1970; Hutchinson 1973; Goldblatt & Dorr 1986; Nilsson & Randrianasolo 1999). The relationships between these two groups and their relatives revealed by the molecular phylogeny seem also to correlate with ecobiogeographic affinities: *Mediusella* and *Xerochlamys* occur only in drier areas of Madagascar, *Leptolaena* is mainly distributed in the humid regions, and *Sarcolaena* has representatives in both (Randrianasolo & Miller 1999; Schatz *et al.* 2001; Hong-Wa 2003).

This new phylogeny suggests a redefinition of *Leptolaena s.l.* to reflect a more natural treatment based on the principle of monophyly. Indeed, it is now clear that *Leptolaena s.l.* as currently circumscribed by some workers (e.g., Cavaco 1952a, b; Hong-Wa 2008) is paraphyletic. Several alternative circumscriptions are possible, some that are broad (considering

TABLE 1. — Summary of the various species circumscriptions of *Mediusella* and *Xerochlamys* (L., *Leptolaena*; M., *Mediusella*; X., *Xerochlamys*). Rows are species and columns represent different treatments and concepts. Shading and lines indicate evolution of concept among various authors for a given species or set of species; dashed lines between columns refer to synonymy between different names recognized by a given author and his predecessor; continuous lines indicate that the authors recognize different species; absence of lines between columns denotes similar concept.

Baker (1882)	Gérard (1915, 1919)	Perrier de la Bâthie (1931)	Cavaco (1951, 1952a, b)	This treatment
<i>X. pilosa</i>	<i>X. pilosa</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. bojeriana</i>
<i>X. bojeriana</i>	<i>X. bojeriana</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. bojeriana</i>
<i>X. grandidieri</i>	<i>X. grandidieri</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. bojeriana</i>
<i>X. pubescens</i>	<i>X. pubescens</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. bojeriana</i>
	<i>X. elliptica</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. elliptica</i>
	<i>X. villosa</i>	<i>X. pilosa</i>	<i>L. bojeriana</i>	<i>X. villosa</i>
		<i>X. luteola</i>	<i>L. luteola</i>	<i>X. villosa</i>
	<i>X. tampoketsensis</i>	<i>X. tampoketsensis</i>	<i>L. diospyroidea</i>	<i>X. tampoketsensis</i>
	<i>X. rupestris</i>	<i>X. tampoketsensis</i>	<i>L. diospyroidea</i>	<i>X. tampoketsensis</i>
<i>X. diospyroidea</i>	<i>X. diospyroidea</i>	<i>X. diospyroidea</i>	<i>L. diospyroidea</i>	<i>X. diospyroidea</i>
	<i>X. acuminata</i>	<i>X. arenaria</i>	<i>L. arenaria</i>	<i>M. arenaria</i>
	<i>X. arenaria</i>	<i>X. arenaria</i>	<i>L. arenaria</i>	<i>M. arenaria</i>
		<i>X. bernieri</i>	<i>L. bernieri</i>	<i>M. bernieri</i>
				<i>X. coriacea</i> sp. nov.
				<i>X. itremoensis</i> sp. nov.
				<i>X. undulata</i> sp. nov.

a larger *Leptolaena* or a larger *Sarcolaena*) and others narrow (treating each group as a separate genus). A very broadly defined *Leptolaena*, encompassing the current *Leptolaena s.l.* and *Sarcolaena*, is the most inclusive monophyletic group possible that encompasses the entire clade formed by the four entities, and if adopted it could be defined on the basis of a few involucre synapomorphies. Morphological incongruences, however, make it difficult to advocate such a circumscription, which would also require numerous nomenclatural changes. Another possible circumscription that is consistent with the requirement of monophyly involves defining *Sarcolaena* broadly to include *Mediusella* and *Xerochlamys*, an interpretation that would be supported by a set of shared morphological characters including the presence of large flowers and numerous stamens. However, *Mediusella* cannot be easily accommodated in *Sarcolaena s.l.* because of the presence of several characters, including free stipules, free inflorescence bracts and a woody involucre and pericarp (features that are also found in *Leptolaena*) whereas *Sarcolaena* and *Xerochlamys* have united, cone-shaped stipules, united inflorescence bracts, a fleshy involucre and a thin pericarp. Moreover, adopting a broadly circum-

scribed *Sarcolaena* would simply shift the problem of morphological discordance from *Leptolaena* to *Sarcolaena*. The alternative of treating *Mediusella* as distinct from a more narrowly defined *Sarcolaena* that includes *Xerochlamys* would render the latter paraphyletic. A final option that complies with the requirement of monophyly would be to treat each of the four entities as a distinct genus, and it is this solution that I adopt here, given that each forms a morphologically well-distinguished group that is also recognizable at the molecular level. Therefore, *Mediusella* and *Xerochlamys* are elevated to the generic rank, joining *Sarcolaena* as defined by Randrianasolo & Miller (1999) and *Leptolaena* as circumscribed by Schatz *et al.* (2001).

At the species level, Gérard (1915, 1919) provided the first comprehensive treatment of *Xerochlamys*. He described eleven species, of which only half were recognized by Perrier de la Bâthie (1931), who adopted a broader species concept. Species in Perrier de la Bâthie's treatment present an enormous variation in morphological features such as plant habit and leaf size, shape and pubescence. He suggested that this variability resulted from resprouting after the frequent bush fires that occur in the areas where some species

grow. Morphological incongruence within this group led Cavaco (1951, 1952a) to divide it into two entities (*Xerochlamys* and *Mediusella*), both of which he recognized as subgenera of *Leptolaena* because of shared characters with taxa included in that genus at the time, such as relatively small leaves without vernation traces, a one-flowered, dry involucre, and flowers with three sepals, five petals, a three-carpellate ovary, and a dry fruit. Later, Capuron (1970) recognized these three groups as distinct genera and further proposed that *L. bojeriana*, *L. diospyroidea* and *L. luteola* (H.Perrier) Cavaco, all members of *Xerochlamys*, were simply races of a variable species found in the central region of Madagascar. Thus, delimitation of species within this group has varied considerably among authors (see Table 1) although Cavaco's circumscription of infrageneric taxa has generally been followed recently. However, the existing taxonomy of *Mediusella* and *Xerochlamys* (Cavaco 1952a, b), especially at the species level, appears to underestimate morphological patterns of variation. In particular, the extensive synonymies proposed by Perrier de la Bâthie (1931) and Cavaco (1951, 1952a, b) poorly accounted for morphological discontinuities among the various entities they merged.

In order to clarify this situation, a multivariate analysis of morphological characters was performed using 211 herbarium specimens in an attempt to examine patterns of variation and re-assess species boundaries within *Mediusella* and *Xerochlamys* (Hong-Wa 2008). Characters traditionally used to delimit members of these two groups were evaluated along with potentially diagnostic features based on quantitative measurements from leaves, flowers and fruits. The results of this study showed that *Mediusella* and *Xerochlamys* were highly distinct morphologically and that entities within each genus could clearly be separated from each other. Ten entities were recovered from the principal component analysis and were regarded as working hypotheses for a species-level taxonomic evaluation. The major characters that served to delimit these ten entities were petiole, stamen and style length; leaf blade, involucre, sepal, petal and fruit size; and the number of involucre teeth. Qualitative features such as plant habit, pubescence and colour of organs also correlated strongly with the distinct entities obtained from the quantitative

analyses. Lastly, consideration of eco-geographical features gave further support to the recognition of these ten entities as distinct species.

Based on the results of this multivariate analysis (Hong-Wa 2008), which provides a robust framework for a taxonomic revision, the following species-level treatment is proposed for *Mediusella* and *Xerochlamys*. An identification key is presented, along with descriptions of the species, clarification of their nomenclature, notes on their distribution, ecology and phenology, accompanied by a list of specimens observed. Description of taxa is hierarchical and the terminology used follows that of Stearn (2004). Information on phenology, habitat and vernacular names comes from herbarium specimens and personal observation. Colours indicated in the descriptions refer to those observed in fresh material. CNARP is the acronym used for the herbarium of the Centre national d'Application de la Recherche pharmaceutique in Antananarivo, Madagascar. Detailed locality data are given, with geo-coordinates placed in brackets when assigned post-facto using the Gazetteer to Malagasy Botanical Collecting Localities (<http://www.mobot.org/MOBOT/Research/madagascar/gazetteer/>) and available maps. For each species, exsiccatae records are available on TROPICOS (www.tropicos.org) and high resolution images are available of types deposited at MO (<http://mobot.mobot.org/W3T/Search/image/imagefr.html>) and at P (<http://coldb.mnhn.fr/colweb/form.do?model=SONNERAT.wwwsonnerat.wwwsonnerat>). Barcodes are given for the types housed at P.

The present taxonomic revision of *Mediusella* and *Xerochlamys*, which recognizes 10 species, is the last major assessment in a series covering all of the vascular plant families endemic to Madagascar and the Comoros Islands (cf. Schatz *et al.* 1998, 1999a, b, 2000a, 2001; Randrianasolo & Miller 1999; Lowry *et al.* 1999, 2000, 2002; Lowry & Rabehevitra 2006; Rabehevitra & Lowry 2009). The re-evaluation of species circumscriptions, based primarily on morphological characters, is aimed to provide an updated taxonomic framework for assessing the risk of extinction of each species using IUCN (2001) criteria, and a preliminary evaluation of the conservation status of the species is presented. Although presence within protected areas is not formally recognized

as an IUCN criterion (IUCN 2001; but see also Schatz *et al.* 2000b), it has been recorded here for each species to provide additional information on their conservation status in recognition of current threats in Madagascar, where slash-and-burn cultiva-

tion, fires, and selective over-exploitation constitute a constant pressure on the island's remaining primary vegetation. Protected areas clearly play an important role in preventing imminent habitat loss, thereby deferring future decline (Schatz *et al.* 2000b).

KEY TO THE GENERA WITHIN THE GROUP A (*SENSU* CAPURON 1970) OF SARCOLAENACEAE

1. Stipules connate, cone-shaped; inflorescence bracts fused; involucre fleshy; flowers large; pericarp thin, dissociating into trichome-like structures 2
- Stipules free from one another; inflorescence bracts free; involucre woody; flowers small to large; pericarp thin or thick, not dissociating into trichome-like structures 3
2. Leaf blades usually with veneration traces; involucre soft *Sarcolaena*
- Leaf blades always without veneration traces; involucre dry *Xerochlamys*
3. Leaf blades glabrous or pubescent; flower small, with < 15 stamens; fruit surface smooth; pericarp thin *Leptolaena*
- Leaf blades always glabrous; flower large, with > 15 stamens; fruit surface sulcate; pericarp thick *Mediusella*

SYSTEMATICS

Genus *Mediusella* (Cavaco) Hutchinson

The Families of Flowering Plants Arranged According to a New System Based on their Probable Phylogeny: 347-348 (1973). — *Leptolaena* subgen. *Mediusella* Cavaco, *Bulletin du Muséum national d'Histoire naturelle*, 2^e sér., 23: 135 (1951). — Type: *Leptolaena bernieri* Baill.

DESCRIPTION

Small trees or shrubs; young twigs flattened, glabrous, older twigs glabrous, with white lenticels. Leaves simple, two-ranked, blades entire, without veneration traces, glabrous, coriaceous, narrowly to broadly ovate, base cordate, sometimes rounded, margin entire, usually plane and sometimes sinuate or revolute, apex often acute but sometimes obtuse or acuminate; petiole glabrous, canaliculate; stipules

brown, glabrous, paired, free, early caducous. Flowers sometimes solitary or in inflorescences, terminal, cymose. Flowers shortly pedicelled, subtended by an involucre; involucre glabrous, woody, with 7-12 triangular teeth; sepals green, 3, obovate, deeply emarginate, persistent, imbricate, often abaxially densely pilose, adaxially glabrous, enclosed within the involucre; petals 5, obovate, contorted, glabrous, exceeding the involucre by 7-12 mm; disc annular, toothed; stamens > 20, in 1 or 2 whorls, filaments white to greenish, free, slender, of unequal length, anthers yellow, with 2 locules, opening by longitudinal slits; ovary superior, ovoid, with 3 locules, sulcate, pubescent, style green, slender, glabrous, stigma yellow, capitate. Fruits indehiscent, ovoid to globose, sulcate, usually enclosed within the woody involucre; pericarp intact at maturity; seeds black, ovoid, 1-4 per fruit.

KEY TO THE SPECIES OF *MEDIUSELLA* (CAVACO) HUTCHINSON

1. Leaf blades dull green beneath, sometimes broadly to often narrowly ovate, often abaxially folded along the midvein, smooth, the apex acute to acuminate; involucre thick, obconic, entirely or sometimes only partially enclosing the fruit; from Ankara (Besalampy) to Ambohipiraka 1. *M. arenaria*
- Leaf blades dull green to whitish beneath, broadly ovate, flat, sub-bullate, the apex acute to obtuse; involucre thin, oblong, only partially enclosing the fruit, which exceeds it by few millimeters; from Ankotekona to Vohémar 2. *M. bernieri*

1. *Mediusella arenaria* (F.Gérard) Hong-Wa

Xerochlamys arenaria F.Gérard, *Comptes rendus de l'Association française pour l'Avancement des Sciences* 1914 (sess. 43): 407 (1915). — *Leptolaena arenaria* (F.Gérard) Cavaco, *Bulletin du Muséum national d'Histoire naturelle*, 2^e sér., 23: 135 (1951). — Type: Madagascar, Prov. Mahajanga, pentes très sèches et dénudées du Besafotra, affluent du Menavava (Boina), sur les gneiss, [17°04'S, 46°39'E], VI.1900, fl., *Perrier de la Bâthie 1062* (holo-, P! [P00389109]; iso-, P! [P00389110]).

Xerochlamys acuminata F.Gérard, *Comptes rendus de l'Association française pour l'Avancement des Sciences* 1914 (sess. 43): 410 (1915). — Type: Madagascar, Prov. Mahajanga, Ouest, Marovato, Boina, bois secs, [17°00'S, 46°10'E], IV.1907, fl., *Perrier de la Bâthie 3028* (holo-, P! [P00490430]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Antsirana, Ambakirano, collines gréseuses sur la piste d'Ambilobe à Ambakirano, [13°14'S, 49°09'E], 9.III.1964, *Service Forestier 23413* (MO, P, TEF). — Ambilobe, [13°11'30"S, 49°03'30"E], 1.VIII.1959, *Decary s.n.* (TAN). — *Idem*, 5 km d'Ambilobe sur route de Daraina, 13°11'33"S, 49°04'32"E, 72 m, 29.V.2005, *Hong-Wa et al. 251* (CNAR, MO, P, TAN). — *Idem*, forêt à l'est d'Ambilobe, [13°11'30"S, 49°03'30"E], 17.X.1927, *Ursch 274* (P). — Ambohipiraka, montagne d'Ambohipiraka, [13°06'S, 49°08'E], 5.II.1960, *Cours & Humbert 5644* (P). — *Idem*, Mont Ambohipiraka au nord-est d'Ambilobe, [13°06'S, 49°08'E], 100-300 m, 3.II.1960, *Humbert & Cours 32855* (K, P). — 3.II.1960, *Humbert & Cours 32874* (P). — Anaborano, vallée de l'Ifasy en aval d'Anaborano, [13°34'S, 48°49'E], 50-200 m, 31.III.1951, *Humbert & Capuron 25931* (K, P). — Bemofa [= Bemafo], [13°32'S, 49°04'E], 0-200 m, 3.VI.1954, *Service Forestier 10437* (MO, P, TEF). — Ilevika, base des collines du Levika aux environs de Matsaborilava, [13°16'S, 49°01'E], 12.III.1951, *Service Forestier 3053* (K, MO, P, TEF). — Prov. Mahajanga, Ampasimantera, [15°56'S, 47°44'E], XII.1906, *Perrier de la Bâthie 3030* (K, P). — Ankara, massif de l'Ankara, [17°06'S, 46°06'E], 24.VII.1939, *Decary 14538* (P). — Ankerefo, [16°47'S, 44°24'E], 18.III.1954, *Service Forestier 9428* (P, TEF). — Betaramahamay, forêt sèche sur sable d'Ambohimanga, 15°57'05"S, 47°26'09"E, 232 m, 4.XII.2004, *Razakamalala 1820* (MO, P, TEF). — Betaramahamay, forêt de Bongolava Sud, route vers Mampikony, [15°57'S, 47°24'E], 200 m, 28.IX.1960, *Service Forestier 19787* (P, TEF). — Cap Saint André, [16°11'S, 44°27'E], 8.VI.1930, *Decary 7881* (P). — Madirovalo, forêt de Tsimabeomby, 16°29'25"S, 46°33'52"E, 105 m, 10.VII.2005, *Hong-Wa et al. 424* (MO, P, TAN). — *Idem*, collines sèches et sablonneuses aux environs de Madirovalo, [16°26'S, 46°32'E], III.1901, *Perrier de la Bâthie 1062bis* (P); *Perrier de la Bâthie 1062ter* (P). — Majunga, [15°40'S, 46°40'E], I.1921, *Perrier de*

la Bâthie 13475 (P). — Mampikony, [16°06'S, 47°38'E], I.1907, *Perrier de la Bâthie 3029* (P). — Marianano, [15°25'S, 46°39'E], VII.1921, *Perrier de la Bâthie 13914* (P). — Réserve naturelle intégrale d'Ankarafantsika, Ankorika, [16°00'S, 46°56'E], 100-150 m, 4.IV.1933, *Anonymous 35* (TAN). — 200 m, 31.VIII.1924, *Humbert & Perrier de la Bâthie 2340* (P); *Service Forestier 35* (MO, P); *Service Forestier 58* (P); *Service Forestier 63* (P); *Service Forestier 75* (P); *Service Forestier 86* (P).

DESCRIPTION

Trees 4-12 m tall, trunk to 30 cm dbh. Leaf blades bright green above, dull green beneath, narrowly or sometimes broadly ovate, 4-7 × 1-4 cm, often abaxially folded along the midvein, smooth, base cordate, margin plane to somewhat sinuate, apex acuminate, sometimes acute, midrib light green, slightly raised above, distinctly raised beneath, secondary veins conspicuous, 7-10 per side, 2-7 mm apart; petiole 6-11 mm long. Flowers solitary, or more often grouped into inflorescences, terminal, with 2 flowers, peduncle 1.5-2.5 mm long, glabrous; pedicel 1-2 mm long, glabrous. Involucre green, urceolate to infundibuliform, 4-13 × 4-14 mm, 1-1.2 mm thick, teeth 7-(12), 1-2 mm long; flowers 15-25 mm long at anthesis from apex of pedicel to apex of petals; sepals 3-8 × 3-5 mm; petals white, 11-17 × 4-7 mm, exceeding the involucre by 8-12 mm; disc 2-2.5 mm tall; stamens 32-44, 6.5-12.5 mm long; ovary 3-4.5 mm high, style 4-9 mm long, stigma 1 mm wide. Fruits subglobose to globose, 6.5-12 × 7-12 mm, often entirely enclosed within the accrescent involucre; seeds 3-5 × 2 mm, 1-3 per fruit.

PHENOLOGY

Flowering and fruiting from January to August.

VERNACULAR NAMES

Sana, Zahana.

HABITAT

Low elevation (50-200 m) dry forests on white sands and sandstone within the dry bioclimatic zone recognized by Schatz (2000, after Cornet 1974).

DISTRIBUTION

From Cap St André to around Ambilobe in NW Madagascar (Fig. 1).

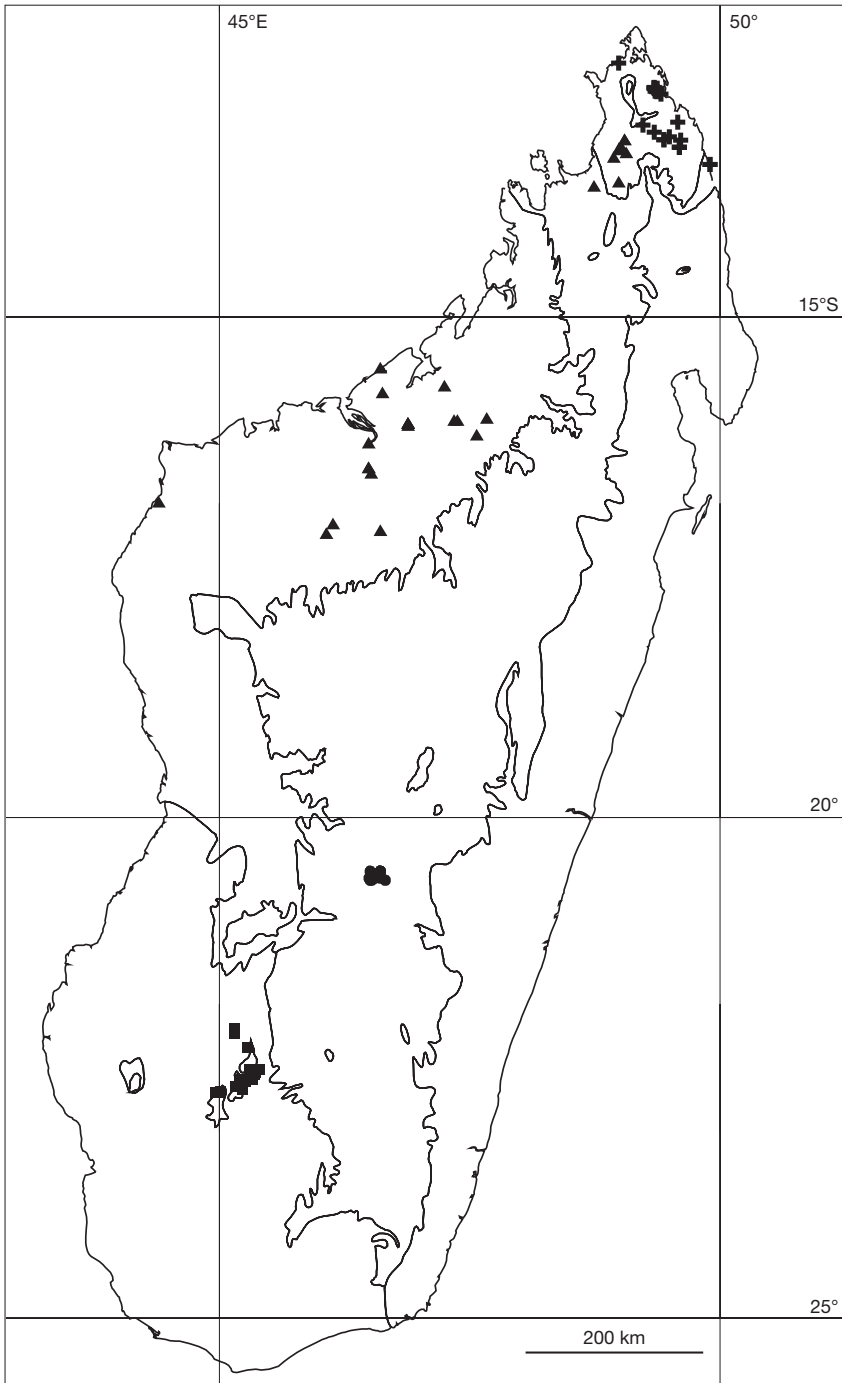


FIG. 1. — Distributions of *Mediusella arenaria* (F.Gérard) Hong-Wa (▲), *M. bernieri* (Baill.) Hutchinson (⊕), *Xerochlamys itremoensis* Hong-Wa, G.E.Schatz & Lowry (●) and *X. undulata* Hong-Wa (■) mapped on the bioclimatic zones of Madagascar (after Cornet [1974], simplified by Schatz [2000]).

REMARKS

Mediusella arenaria can be recognized by its glabrous, narrowly to sometimes broadly ovate, often abaxially folded leaves with a distinctly acute to acuminate apex, and its thick woody involucre enclosing the fruit often entirely or sometimes partially. These features distinguish *M. arenaria* from *M. bernieri*, its apparent closest relative and the only other member of *Mediusella*.

Mediusella arenaria was once placed within *Xerochlamys* by Cavaco (1952a, b). However, it lacks indumentum on the leaves; its involucre is woody rather than fleshy and has few teeth (*c.* 10 versus *c.* 20 in members of *Xerochlamys*); and its pericarp does not dissociate with age. In all these features, *M. arenaria* is, however, similar to *M. bernieri*, and they are therefore placed together in *Mediusella*.

CONSERVATION STATUS

Mediusella arenaria is restricted to northwestern Madagascar, but is widespread from Cap St André to Ambilobe. However, despite a large extent of occurrence (85 202 km²), its area of occupancy is only 198 km² and only four out of 20 subpopulations are found within protected areas (Réserve naturelle intégrale d'Ankarafantsika). This species is facing a continuing decline because of habitat destruction due to annual fires, wood exploitation and specificity of its substrate; it is assigned a preliminary conservation status of Near Threatened (NT). The last recent collection was made in 2005 (Hong-Wa et al. 424) in the area where the type was collected in 1900; the visit revealed only three individuals.

2. *Mediusella bernieri* (Baill.) Hutchinson

The Families of Flowering Plants Arranged According to a New System Based on their Probable Phylogeny: 347-348 (1973). — *Leptolaena bernieri* Baill., *Bulletin de la Société linnéenne de Paris* 1: 564 (1886). — *Xerochlamys bernieri* (Baill.) H.Perrier, *Bulletin de la Société botanique de France* 128: 59 (1931). — Type: Madagascar, Prov. Antsiranana, Vohémar, [13°21'S, 50°00'E], 1835, fr., *Bernier* 365 (holo-, P! [4 sheets: P00389104-06, P00490752]).

ADDITIONAL MATERIAL EXAMINED. — Madagascar. Prov. Antsiranana, Ambararata, route de Daraina, 50 km d'Ambilobe, 13°01'15"S, 49°26'26"E, 79 m, 29.V.2005, Hong-Wa et al. 253 (CNARP, MO, P, TAN). — Andrafiomena, [12°57'S, 49°19'E], 759 m, 19.I.1954, *Service Forestier* 8223 (P, TEF). — Ankotekona, massif de l'Ankotekona au sud de Mangaoka, [12°19'S, 49°04'E], 100-150 m, 3.II.1966, *Service Forestier* 24465 (P, TEF). — Daraina, forêt de Solaniampilana-Ma-roadabo, 13°10'36"S, 49°41'54"E, 110 m, 5.III.2004, *Gautier et al.* 4424 (G, MO). — *Idem*, Bekaraoka Sud, 13°10'36"S, 49°41'54"E, 167 m, 31.V.2005, Hong-Wa et al. 268 (CNARP, MO, P, TAN). — *Idem*, Hong-Wa et al. 269 (CNARP, MO, P, TAN). — *Idem*, Bekaraoka Sud, 13°10'28"S, 49°41'50"E, 153 m, 1.VI.2005, Hong-Wa et al. 286 (CNARP, MO, P, TAN). — *Idem*, forêt d'Antsaharaingy, 12°55'S, 49°40'E, 75 m, 3.III.2005, *Nusbaumer & Ranirison* 1534 (G, MO, P). — *Idem*, forêt de Bekaraoka, 13°60'29"S, 49°42'14"E, 185-460 m, 17.II.2004, *Ranirison & Nusbaumer* 453 (G, MO). — *Idem*, piste d'Ambohitsitondroina, 7 km au sud-ouest de Befarafara, 25.X.2003, *Ratovoson et al.* 754 (CNARP, MO, TAN). — *Idem*, *Ratovoson et al.* 761 (CNARP, MO, TAN). — Irodo, 12°38'33"S, 49°30'15"E, 59 m, 27.V.2005, Hong-Wa et al. 249 (CNARP, MO, P, TAN). — Sahafary, Andranomadiro, 10 km à l'ouest d'Irodo, 12°36'24"S, 49°26'21"E, 190 m, 27.VII.2004, *Be et al.* 52 (CNARP, MO, P, TAN). — *Idem*, forêt de Sahafary, 12°34'36"S, 49°27'41"E, 180 m, 24.VII.2004, *Guittou et al.* 33 (MO). — *Idem*, 12°36'18"S, 49°26'35"E, 270 m, 26.V.2005, Hong-Wa et al. 206 (CNARP, MO, P, TAN). — *Idem*, 12°36'34"S, 49°27'27"E, 282 m, 26.V.2005, Hong-Wa et al. 217 (CNARP, MO, P). — *Idem*, 26.V.2005, Hong-Wa et al. 218 (CNARP, MO). — *Idem*, forêt d'Andrafiabe, 12°34'34"S, 49°27'37"E, 271 m, 10.IX.2004, *Rakotondrarfara et al.* 271 (CNARP, MO, P, TAN). — *Idem*, plateau de Sahafary, 12°35'S, 49°26'5"E, 123 m, 24.II.2001, *Razafitsalama & Ludovic* 8 (MO, TAN, TEF). — *Idem*, bassin de la Saharenana, forêt de Sahafary, [12°34'S, 49°26'E], 100-300 m, 25.IV.1963, *Service Forestier* 22704 (MO, P, TEF). — *Idem*, 26.II.1964, *Service Forestier* 23317 (K, MO, P, TEF). — Vohémar, [13°21'S, 50°00'E], 1846, *Bernier* 2537 (P). — Without precise locality, *Baron* 6182 (K, P).

DESCRIPTION

Shrubs to small trees 8 m tall, trunk to 20 cm dbh. Leaf blades bright green above, dull green to sometimes whitish beneath, broadly ovate, 3-6 × 2-4 cm, flat, sub-bullate, base rounded to cordate, margin revolute, apex obtuse to rounded or sometimes acute, midrib yellowish, slightly sunken above, distinctly raised beneath, secondary

veins conspicuous, 5-12 per side, 4-9 mm apart; petiole 6-11 mm long. Flowers rarely solitary, usually in inflorescences, terminal, with 2-(3) flowers; peduncle 1-2 mm long, glabrous, pedicel 1-2 mm long, glabrous. Involucre green, urceolate, 3-10 × 3-8 mm, 0.7-1 mm thick, teeth 8-10, 0.5-1.8 mm long; flowers 14-22 mm long at anthesis from apex of pedicel to apex of petals; sepals 4-6 × 3-4 mm; petals white to pale yellow, 11-16 × 5-10 mm, exceeding the involucre by 7-11 mm; disc 1-4 mm tall; stamens 20-50, 6-12 mm long; ovary 3-7 mm high, style 4-8 mm long, stigma 2 mm wide. Fruits ovoid, 6-11 × 4-9 mm, exceeding the accrescent involucre by 2-7 mm; seeds 5 × 3 mm, 2-3 per fruit.

PHENOLOGY

Flowering and fruiting from February to July.

VERNACULAR NAME

Zahana.

HABITAT

Dry forests on sandstone, limestone and metamorphic and igneous rocks from 50 to 300 m in the dry bioclimatic zone.

DISTRIBUTION

From Ankotekona to Vohémar in NE Madagascar (Fig. 1).

REMARKS

Mediusella bernieri can be recognized by its broadly ovate leaf blades that are bright green above and dull green to sometimes whitish beneath, with an obtuse to rounded, sometimes slightly acute apex, and revolute margins; the prominent venation often makes them appear sub-bullate. Its flowers are pale yellow and its fruits are longer than the woody involucre.

CONSERVATION STATUS

Mediusella bernieri is known from nine subpopulations in an area of occupancy of 108 km² and an extent of occurrence of 3055 km². It is restricted to the northern part of Madagascar but is locally abundant, particularly in the region of Daraina.

However, none of the subpopulations occurs in a protected area, which suggests a projected population reduction within three generations due to habitat destruction. This species is provisionally considered to be Endangered [EN A3c; B1ab(i, ii, iii, iv)+2ab(i, ii, iii, iv)].

Genus *Xerochlamys* Baker

Journal of Botany, British and Foreign 20: 45 (1882). — *Leptolaena* subgen. *Xerochlamys* (Baker) Cavaco, *Bulletin du Muséum national d'Histoire naturelle*, 2^e sér., 23: 135 (1951). — Type: *Xerochlamys pilosa* Baker.

DESCRIPTION

Prostrate subshrubs to shrubs to small trees; young twigs usually flattened, tomentose or sometimes glabrous, older twigs glabrous or pubescent, without white lenticels. Leaves simple, two-ranked, blades entire, without vernation traces, usually pubescent, chartaceous, rarely coriaceous, elliptic, ovate or suboblong, base cordate to rounded, margin entire, plane, occasionally undulate, apex retuse to slightly acute; petiole pubescent, canaliculate; stipules brown, shortly pilose, paired, connate, cone-shaped. Flowers solitary or in inflorescences, terminal or axillary, cymose. Flowers sometimes sessile, often shortly pedicelled, subtended by an involucre; involucre pilose outside, with appressed trichomes inside, fleshy, with 12-28 triangular teeth; sepals green, 3, obovate or sometimes oblong, slightly to deeply emarginate, persistent, imbricate, often abaxially densely pilose, adaxially glabrous, exceeding the involucre; petals 5, obovate or oblong, contorted, glabrous, exceeding the involucre by 7-17 mm; disc annular, toothed; stamens > 20, filament white to greenish, free, slender, of unequal length, anthers yellow, with 2 locules, opening by longitudinal slits; ovary superior, globose to ovoid, with 3 locules, smooth or sulcate, pubescent, style light green, slender, densely pubescent, stigma yellow, 3-lobed. Fruits indehiscent, globose to ovoid, sulcate, exceeding the fleshy involucre; pericarp dissociating into trichome-like structures at maturity; seeds black to brown, ellipsoid to ovoid, (1-)2-12 per fruit.

KEY TO THE SPECIES OF *XEROCHLAMYS* BAKER

1. Largest leaf blades \leq 2 cm wide, elliptic to occasionally ovate 2
— Largest leaf blades $>$ 2 cm wide, often ovate to suboblong, sometimes elliptic 5
2. Leaf blades glabrous, rarely with few white trichomes 3
— Leaf blades pubescent at least on the abaxial surface 4
3. Prostrate shrub; largest leaf blades $<$ 2 cm long, glossy green above, green to yellowish beneath; midvein red; petals pink; endemic to Itremo 7. *X. itremoensis*
— Erect shrub; largest leaf blades \geq 2 cm long, dark green above, often whitish beneath; midvein green; petals white, rarely pink; from Ibity to Itremo 6. *X. elliptica*
4. Leaf blades elliptic to sometimes ovate, margin plane; petiole \leq 3 mm long; petals pink; from Miarinarivo-Arivorimamo to Isalo 3. *X. bojeriana*
— Leaf blades elliptic, margin undulate, erose (as if bitten by some animal, Stearn 2004); petiole $>$ 3 mm long; petals pale yellow to white; from Isalo to Col des Tapia (Fianarantsoa) 9. *X. undulata*
5. Leaf blades entirely glabrous, or scarce white trichomes sometimes present 6
— Leaf blades with indumentum on the abaxial surface or at least along the abaxial midvein 7
6. Leaf blades narrowly ovate to elliptic, coriaceous, base truncate to attenuate, margin irregularly undulate; involucre green, cupulate, brown tomentose; from Andringitra to Mandrare River basin 4. *X. coriacea*
— Leaf blades broadly ovate, chartaceous, base cordate to rounded, margin plane; involucre light brown, urceolate, yellow tomentose; from Mt. Vohibasias to Isalo 10. *X. villosa*
7. Leaf blades elliptic to suboblong, with scattered white indumentum on the abaxial surface or restricted to the abaxial midvein; petals pale yellow; from Cap St André to Tampoketsa d'Ankazobe and Tampoketsa d'Analamaitso 8. *X. tampoketsensis*
— Leaf blades ovate to rounded, rarely elliptic, entirely covered with dense golden indumentum at least on the abaxial surface; petals pink; endemic to Itremo 5. *X. diospyroidea*

3. *Xerochlamys bojeriana* (Baill.) Baker

Journal of the Linnean Society, Botany 25: 296 (1889). — *Sarcolaena bojeriana* Baill., *Adansonia* 10: 177 (1872). — *Leptolaena bojeriana* (Baill.) Cavaco, *Mémoires de l'Institut scientifique de Madagascar*, sér. B, 4: 64 (1952). — Type: Madagascar, without precise locality, date unknown, fl., *Bojer s.n.* (holo-, P! [P00389113]).

Xerochlamys pilosa Baker, *Journal of Botany, British and Foreign* 20: 45 (1882). — Type: Madagascar, on the top of a bleak stony hill in the west of the Betsileo-country, date unknown, fl., *Baron 134* (holo-, K [image seen]; iso-, P! [P00490727]).

Sarcolaena grandidieri Baill., *Bulletin de la Société linnéenne de Paris* 1: 565 (1886). — *Xerochlamys grandidieri*

(Baill.) Baker, *Journal of the Linnean Society, Botany* 25: 296 (1889). — Type: Madagascar, Prov. Fianarantsoa, Ambatomenaloha, [20°37'S, 46°33'E], 1876, fl., *Grandidier 63* (holo-, P! [3 sheets: P00389114-16]).

Xerochlamys pubescens Baker, *Journal of the Linnean Society, Botany* 25: 296 (1889). — Type: Madagascar, Imerina, Lahavohitra mountain, date unknown, fr., *Baron 5112* (holo-, K [image seen]; iso-, P! [2 sheets: P00389111-12]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Antananarivo, PK 36, route d'Antsirabe, [19°08'30"S, 47°31'30"E], 16.II.1966, *Rakotozafy 457* (TAN). — Ambatofotsy, [20°03'S, 47°05'E], 16.VII.1952, *Service Forestier 107-R-222* (P). — Ambatolampy, [19°22'S, 47°24'E], II.1953, *Bosser 4828* (TAN). — Ambohiponana, [20°04'S, 47°03"E], 1500 m, 20.XI.1912, *Viguiér &*

- Humbert 1416* (K, P). — Andramasina, [19°11'S, 47°35'E], II.1958, *Descoings 3106* (MO, TAN). — *Idem*, croupe rocailleuse aride entre Ambohimasina et Andramasina, 3.XII.1912, *Viguiet & Humbert 1915* (MO, P). — Andrangaranga, [19°00'S, 47°08'E], 14.I.1964, *Service Forestier 23206* (MO, P). — *Idem*, *Service Forestier 23206bis* (MO, P). — Ankaratra, [19°22'S, 47°15'E], 2250 m, 5.VIII.1989, *Du Puy & Du Puy MB279* (TAN). — *Idem*, [19°20'S, 47°16'E], 1700-2200 m, 27.IV.1955, *Humbert & Capuron 30301* (P). — Antongona, environs de Tananarive, [18°56'S, 47°16'E], I.1956, *Bosser 8947* (MO, P, TAN). — *Idem*, 4.XII.1959, *Peltier 1546* (P, TAN). — Antsirabe, 5 km of Antilarisona, north of Antsirabe, [19°51'S, 47°02'E], 1250-1300 m, 23.I.1975, *Croat 29219* (K, MO, P). — *Idem*, [19°51'S, 47°02'E], IV.1912, *Perrier de la Bâthie 3017* (P). — Arivonimano, [19°01'S, 47°11'E], 16.X.1992, *Allorge 660* (P). — *Idem*, 29.I.1960, *Peltier 1822* (P, TAN). — *Idem*, V.1956, *Service Agricole 1088* (MO, TAN). — *Idem*, massif de l'Ambohitrambo, 24.X.1965, *Service Forestier 24176bis* (P, TEF). — Behenjy, [19°12'S, 47°29'E], 1400-1500 m, 12.I.1972, *Cremers 1934* (TAN). — *Idem*, 11.V.1939, *Decary 13897* (P). — *Idem*, rocher d'Iaranandriana, 10.III.1984, *Dorr et al.* 2886 (K, MO, P). — *Idem*, north of Behenjy on road from Antananarivo to Antsirabe, 12.I.1986, *Dorr et al.* 4571 (K, MO, P). — *Idem*, 12.II.1938, *Herbier du Jardin Botanique de Tananarive 3172* (P). — *Idem*, *Perrier de la Bâthie 14630* (P). — *Idem*, entre Behenjy et Ambatolampy, PK 51, 1400 m, 1.IX.1949, *Service Forestier 647* (K, P, TEF). — Betafo, [19°50'S, 46°51'E], 19.XI.1912, *Viguiet & Humbert 1416* (K, P, TAN). — Between Miariarivo and Antananarivo, PK 60, [19°00'S, 47°03'E], I.1958, *Descoings 2897* (MO, TAN). — Faratsiho, [19°24'S, 46°57'E], IX.1921, *Perrier de la Bâthie 13938* (P). — Iarinandriana, 40 km de Tananarive, [19°10'S, 47°30'E], IV.1957, *Bosser 11062* (TAN). — Ibity, southwest slope of Mt. Kiboy, 20°03'50"S, 46°59'58"E, 1624 m, 27.I.2001, *Birkinshaw et al.* 816 (MO). — *Idem*, [20°07'S, 47°01'E], 22.VII.1989, *Du Puy et al. MB271* (MO, P, TAN). — *Idem*, Mt. Kiboy, 20°03'52"S, 47°00'03"E, 1662 m, 1.XI.2001, *Hong-Wa et al.* 1 (MO, P, TAN, TEF). — *Idem*, 1552 m, 20.VI.2005, *Hong-Wa et al.* 321 (MO, P, TAN). — *Idem*, [20°07'S, 47°01'E], 13.X.1970, *Keraudren-Aymonin & Aymonin 24587* (P). — *Idem*, 20°03'47"S, 47°00'02"E, 1650 m, 16.II.1997, *Lowry & Schatz 4814* (MO, P). — *Idem*, Ambohimanjaka, base est du Mt. Ibity, [19°45'S, 47°15'E], 1600 m, III.1920, *Perrier de la Bâthie 13208* (P). — *Idem*, 1800 m, III.1921, *Perrier de la Bâthie 13573* (P); *Perrier de la Bâthie 13573bis* (P). — 2000 m, IX.1921, *Perrier de la Bâthie 13969* (P). — [20°07'S, 47°01'E], 1200 m, III.1928, *Perrier de la Bâthie 18495* (P). — *Idem*, 20°04'10"S, 47°00'16"E, 1700 m, 17.II.2003, *Schatz et al.* 4126 (MO). — Itasy, PK 68, route Tananarive à l'Itasy, [18°57'S, 47°05'E], 11.XI.1970, *Keraudren-Aymonin & Aymonin 25416* (P). — Manandona, versant droit de la basse Manandona, [20°03'S, 47°03'E], 1200-1800 m, V.1920, *Perrier de la Bâthie 13165* (MO, P). — Manazary, [19°03'S, 46°52'E], 1300 m, 8.XII.1912, *Viguiet & Humbert 1956* (P). — Miariarivo, [18°57'S, 46°54'E], VII.1912, *Perrier de la Bâthie 3005* (P). — VI.1926, *Perrier de la Bâthie 17610* (P). — [18°56'S, 46°51'E], 1200 m, III.1926, *Perrier de la Bâthie 17615* (P). — Raminandro, [19°18'S, 47°00'E], I.1955, *Bosser 7558* (MO, P, TAN). — Sabotsy, [19°13'S, 47°36'E], II.1959, *Bosser 12784* (MO, P, TAN). — Sahanivotry, PK 202 de la route Tananarive-Fianarantsoa, [20°07'S, 47°04'E], 1500 m, 9.II.1949, *Service Forestier 230* (P, TEF). — Soamananety, 50 km west of Antananarivo, [18°59'S, 47°04'E], 1300-1400 m, 13.II.1985, *Barnett et al.* 459 (K, MO, P). — 27.I.1937, *Chardon & Bigogne s.n.* (P). — 57 km west of Antananarivo, 9.I.1985, *Dorr et al.* 3436 (K, MO, P). — *Idem*, route Tananarive-Miariarivo, PK 55, [18°58'S, 47°05'E], 1300 m, 14.XII.1989, *Evrard 11300* (P, TAN). — Talata-Volonondry, [18°45'S, 47°41'E], VIII.1906, *d'Alleizette 1265* (P). — Prov. Fianarantsoa, Ambandroja, [21°59'-22°00'S, 46°36'-46°37'E], 900-1360 m, 22.VII.1954, *Service Forestier 14491* (P, TEF). — Ambasy, [21°28'S, 46°11'E], 1100 m, 9.XII.1974, *Cremers 3581* (MO, P, TAN). — Ambatofinandrahana, 54 km east of Finandrahana, [20°35'S, 47°02'E], 1300 m, 25.I.1975, *Croat 29670* (MO, P). — *Idem*, 18 km west of Finandrahana, 1100 m, 26.I.1975, *Croat 29726* (MO). — *Idem*, [20°33'S, 46°48'E], 1600-1800 m, 23.II.1938, *Decary 13257* (P). — 3.II.1942, *Decary 17289* (P); *Decary 17358* (MO, P). — *Idem*, 7 km south-west of Ambatofinandrahana, on the route to Fenoarivo, 20°36'48"S, 46°49'31"E, 1300 m, 20.XI.1993, *Du Puy et al. M627* (K, MO, P, TAN, TEF). — Ambatomenaloha, [20°37'S, 46°33'E], 1876, *Grandidier 63* (P). — Ambohimanjaka, entre Antsirabe et Ambositra, [20°15'S, 47°06'E], 1500 m, 6.III.1985, *Dorr et al.* 3844 (K, MO, P). — *Idem*, 20°14'10"S, 47°05'59"E, 1500 m, 23.III.1999, *Labat et al.* 3009 (G, K, MO, P, TAN). — Ambositra, dans les bois de Tapia, [20°31'S, 47°15'E], 2.II.1942, *Decary 17246* (P). — Ankijana, [20°37'S, 47°05'E], 5.II.1955, *Service Forestier 13470* (P, TEF). — Col des Tapia, route d'Ihosy à Tuléar, [22°47'S, 45°01'E], 1000-1300 m, *Aubréville s.n.* (P). — *Idem*, a region of rocky wooded hills 48 km north of Ambositra, [20°15'S, 47°09'E], 1300-1400 m, 24.I.1975, *Croat 29348* (MO, TAN). — *Croat 29356* (MO, TAN) — *Idem*, Haute Sahatsio, 1600 m, 24.XII.1928, *Humbert 7110* (K, P, TAN). — 20.VII.1928, *Humbert & Swingle 4655* (P). — *Idem*, PK 200 entre Antsirabe et Ambositra, II.1960, *Keraudren 104* (P). — *Idem*, près d'Illaka, 1500 m, 26.X.1960, *Léandri 3327* (P). — *Idem*, massif de l'Isalo, second col des Tapia, entre Ranohira et Sakaraha, [22°47'S, 45°01'E], 1000-1300 m, 21.XI.1960, *Léandri & Saboureau 3962* (P). — *Idem*, premier col des Tapia, Ambositra, [20°15'S, 47°01'E], V.1969, *Morat 3174* (TAN). — Faliarivo, [20°39'S, 47°07'E], 24.I.1956,

Descoings 2036 (TAN). — 1600 m, III.1934, *Humbert 14494* (P). — *Humbert 14495* (MO, P). — 15.I.1955, *Humbert & Capuron 28012* (MO, P). — *Idem*, lisières de la forêt de Faliarivo, 15.I.1955, *Service Forestier 11546* (P, TEF). — Ilaka, [20°15'S, 47°09'E], 27.III.1952, *Service Forestier 4632* (P, TEF). — Itremo, [20°34'21"S, 46°34'54"E], I.1964, *Bosser 18876* (P, TAN). — *Idem*, montagnes à l'ouest d'Itremo, [20°35'S, 46°38'E], 1500-1700 m, 17.I-22.IV.1955, *Humbert 30021* (MO, P). — *Idem*, [20°32'S, 46°33'E], 1.XII.1970, *Keraudren-Aymonin & Aymonin 25756* (P); *Keraudren-Aymonin & Aymonin 25756bis* (P); *Keraudren-Aymonin & Aymonin 25780* (P); *Keraudren-Aymonin & Aymonin 25784* (P). — *Idem*, eastern margin of the Itremo massif, c. 19 km west of Ambatofinandrahana, 20°34'21"S, 46°34'54"E, 1580 m, 11.III.2000, *Schatz et al. 3982* (MO); *Schatz et al. 3985* (MO). — Itremo, [20°32'S, 46°33'E], 4.III.1955, *Service Forestier 13994* (MO, P, TEF). — *Idem*, aux environs du col de l'Itremo, [20°36'S, 46°34'E], 1600-1700 m, 27.XI.1969, *Service Forestier 28895* (P, TEF). — Ivato, 12 km à l'ouest d'Ivato, piste d'Ambatofinandrahana, [20°40'S, 47°08'E], VI.1969, *Morat 3316* (TAN). — *Idem*, 12 km à l'ouest d'Ivato, route de Morondava, XI.1970, *Morat 3676* (P, TAN). — Parc national d'Isalo, [22°11'S, 45°10'E], 1.XI.1940, *Decary 16335* (P). — *Idem*, traversée de l'Isalo Nord, à l'est de Sahanafa, [22°19'S, 45°18'E], 1000 m, 28.XI-4.XII.1946, *Humbert 19543* (P). — *Idem*, à l'ouest de Ranohira, [22°11'S, 45°10'E], 800-1250 m, 29.I-2.II.1955, *Humbert 29819* (P). — 1000-1300 m, 19.XI.1960, *Léandri & Saboureau 3933* (P). — 19.XI.1960, *Réserves Naturelles 11222* (P). — Ranomafana, 20°30'43"S, 46°46'31"E, 1475 m, 7.II.2001, *Andriamihajarivo et al. 38* (MO, TAN, TEF). — *Andriamihajarivo et al. 39* (MO, TAN). — Sahambano, PK 20, route de Ihosy à Ivohibe, [22°29'S, 46°16'E], V.1973, *Morat 4254bis* (P, TAN). — Sahatsiho-Ambohimanjaka, entre Antsirabe et Ambositra, PK 202, [20°11'S, 47°05'E], 1400 m, IX.1956, *Bosser 9967* (MO, P, TAN). — Vatomitombo, au sud d'Antsirabe, [20°14'S, 47°06'E], 1800 m, 3.V.1961, *Service Forestier 23496* (K, MO, P, TEF). — Prov. Toamasina, Analarohy, au nord d'Andilamena, [16°48'S, 48°32'E], 1000 m, XI.1922, *Perrier de la Bathie 15006* (P). — Mangoro, [18°53'S, 48°07'E], 800 m, VIII.1912, *Perrier de la Bathie 3003* (P). — Tampoketsa d'Anosibe, [18°09'S, 49°23'E], 1500 m, 5.V.1967, *Service Forestier 26307* (P, TEF). — Without precise locality, *Baron 947* (K, P); *Baron 1873* (K, P); *Baron 5119* (K, P). — 23.V.1931, *Basse s.n.* (P). — 23.I.1975, *Croat 29208* (MO). — *Le Myre de Vilers s.n.* (P). — *Perrier de la Bathie 13606* (P).

DESCRIPTION

Shrubs; young and older twigs pubescent. Leaf blades glossy dark green above, light green beneath, elliptic or occasionally ovate, 0.5-2.5 × 0.3-2 cm,

chartaceous to sometimes subcoriaceous, sparsely pubescent above, densely pubescent beneath, base rounded, margin plane, apex retuse or occasionally acute, midrib light brown, flat above, slightly raised beneath, secondary veins indistinct, 6-12 per side, 1-2.5 mm apart, looping 0.2-1 mm from the margin; petiole 0.7-3 mm long, pubescent. Flowers solitary or in inflorescences, terminal, with 2 flowers; peduncle 1-2 mm long, pubescent, pedicel 1-2 mm long, pubescent. Involucre brown, cupulate, 2-6 × 3-9 mm, with short brown tomentum interspersed with dense white trichomes, teeth 14-28, 0.4-2.4 mm long; flowers 11-22 mm long at anthesis from apex of pedicel to apex of petals; sepals oblong, 4-8 × 3-6 mm, deeply emarginate, exerted 2-4 mm beyond the involucre; petals pink fading to white, oblong, 9-22 × 4-9 mm, exceeding the involucre by 13-16 mm; disc 2-2.5 mm tall; stamens 25-35, 6.5-13 mm long; ovary globose, 3 mm high, style 6-13 mm long, pubescent, stigma 0.4-1.4 mm wide. Fruits globose to subglobose, 5-9 × 5-10 mm, exceeding the accrescent involucre by 4-7 mm; seeds brown, ovoid, 2-3 mm long, 2-11 per fruit.

PHENOLOGY

Flowering and fruiting all year round; peaking from September to April.

VERNACULAR NAMES

Hatsikana, Katikana.

HABITAT

Evergreen sclerophyllous *Uapaca bojeri* Baill. (tapia) woodland on various rocky substrates up to 2000 m elevation within the subhumid bioclimatic zone.

DISTRIBUTION

Central region of Madagascar from Miarinarivo-Arivotrimamo to Isalo National Park (Fig. 2).

REMARKS

Xerochlamys bojeriana can be recognized by its small (< 3 cm long), elliptic to ovate leaf blades covered with sparse white trichomes on both surfaces, and its flowers with pink petals. This species differs from *X. undulata* by its short petiole

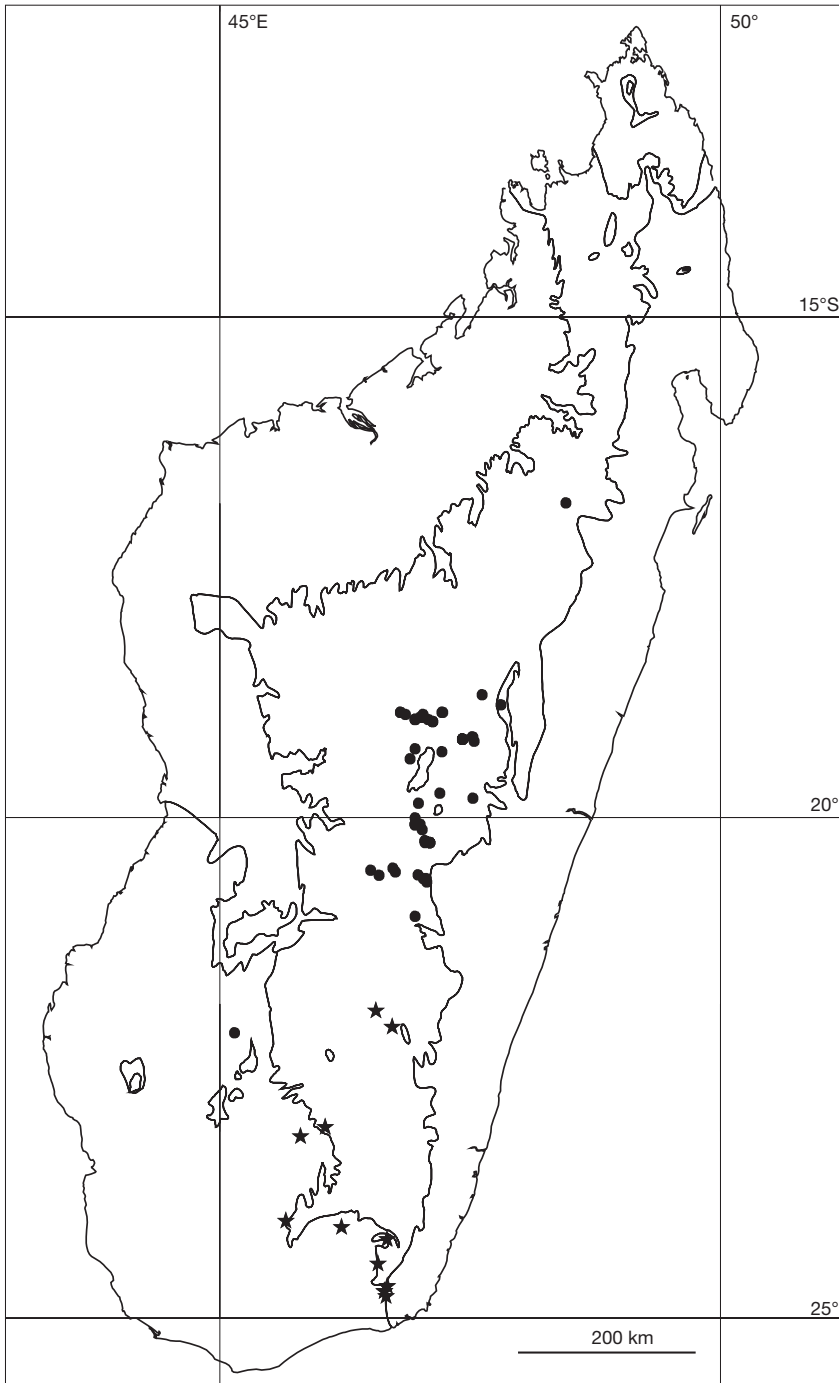


FIG. 2. — Distributions of *Xerochlamys bojeriana* (Baill.) Baker (●) and *X. coriacea* Hong-Wa (★) mapped on the bioclimatic zones of Madagascar (after Cornet [1974], simplified by Schatz [2000]).

(< 3 mm long vs. 3-7 mm), the length to width ratio of the elliptic leaf blades (3:1 vs. 2:1), its plane (vs. undulate) leaf margin, and its pink (vs. pale yellow to white) flowers. *Xerochlamys bojeriana* can be distinguished from *X. elliptica* most easily by its having trichomes on the leaf blades (vs. entirely glabrous).

Previous authors such as Perrier de la Bâthie (1931) and Cavaco (1952a, b) circumscribed *Xerochlamys bojeriana* very broadly to include material assigned here to *X. elliptica* and *X. undulata*. The present circumscription includes the types of three previously described taxa: 1) *Baron 134*, the type of *X. pilosa*, has small (≤ 1 cm long) elliptic, pubescent leaf blades with acute apices; 2) *Grandidier 63*, the type of *Sarcoleena grandidieri*, whose leaf blades are ovate and more or less glabrous; and 3) *Baron 5112*, the type of *X. pubescens*, whose leaves are larger (≥ 2 cm long), ovate and pubescent. Although these types seem to represent distinct morphological forms and other collections can be associated with each one, there are also intermediates between them, and when taken together they form a coherent albeit variable group.

The specimen of *Perrier de la Bâthie* bearing the number 13988 has been reassigned the number 13938 based on information from the collector's fieldbook, in which the number 13988 refers to a species of *Angraecum* Bory whereas 13938 refers to a species of *Xerochlamys*. Moreover, labels of the specimen bearing the number 13988 have been overwritten, adding further support for reassigning it to 13938 (P. B. Phillipson pers. comm.). Specimens of *Perrier de la Bâthie* 13989 cited by Cavaco (1952b) and referred to as *Xerochlamys bojeriana* have not been located and their identity remains uncertain.

CONSERVATION STATUS

With an extent of occurrence of 36 055 km² and an area of occupancy of 2900 km², *Xerochlamys bojeriana* is provisionally considered to be Least Concern (LC) as it is widely distributed and occurs in many protected areas. However, the potential habitat of this species is locally threatened by mostly annual fires.

4. *Xerochlamys coriacea* Hong-Wa, sp. nov. (Fig. 3)

Arbuscula, foliis ellipticis pubinervis coriaceis ad apices obtusis et ad bases attenuatis, floribus axillaribus, involuacro albo piloso 12-24 dentato, fructibus globosis polyspermis.

TYPUS. — Madagascar. Prov. Toliara, above Ankoba village, near east edge of Andohahela National Park, Parcel 1, transitional forest along ridge above village, 24°46'45"S, 46°43'17"E, 675 m, 22.I.2008, fl., Lowry et al. 6966 (holo-, MO!; iso-, G, K, MO!, P!, TAN).

PARATYPES. — Madagascar. Prov. Fianarantsoa, Malazarivo, [21°57'S, 46°36'E], 17.II.1955, *Service Forestier* 13769 (K, P, TEF). — Réserve naturelle intégrale d'Andringitra, [22°07'S, 46°46'E], 1200 m, IV.1921, *Perrier de la Bâthie* 13604 (P). — 26.XII.1952, *Réserves Naturelles* 4877 (MO, P, TAN). — 16.V.1955, *Réserves Naturelles* 7179 (P, TEF). — 23.XI.1955, *Réserves Naturelles* 7495 (P, TEF). — Prov. Toliara, Ampandrandava, [24°05'S, 45°41'E], 1100 m, I.1943, *Herbier du Jardin Botanique de Tananarive* 5823 (P). — IV.1943, *Herbier du Jardin Botanique de Tananarive* 6412 (P). — *Idem*, environs d'Ampandrandava, entre Bekily et Tsivory, I.1943, *Seyrig* 454 (P). — IV.1943, *Seyrig* 454B (P). — Analamary, proche du village Fenoarivo, [23°13'S, 45°50'E], 800 m, 22.X.1954, *Service Forestier* 12129 (P, TEF). — Bekily, [24°13'S, 45°19'E], 400 m, 14.I.1954, *Service Forestier* 8394 (P, TEF). — Imonty, bassin de réception de la Mananara, affluent du Mandrara, pentes occidentales des montagnes entre l'Andohahela et l'Elakelaka, [24°48'S, 46°41'E], 900-950 m, II.1934, *Humbert* 14098 (P). — Ivakoany, [23°49'S, 46°23'E], 12.IV.1954, *Service Forestier* 10200 (P, TEF). — Mahamavo, bassin de réception de la Mananara, affluent du Mandrara, pentes occidentales des montagnes entre l'Andohahela et l'Elakelaka, [24°45'S, 46°43'E], 450 m, I-II.1934, *Humbert* 13756 (P). — Mt. Vohitrosy, vallée moyenne du Mandrara près d'Anadabolava, [24°16'S, 46°43'E], 800-850 m, XII.1933, *Humbert* 12680 (K, MO, P). — Réserve naturelle intégrale d'Andohahela, [24°31'-24°53'S, 46°37'-46°52'E], 6.I.1951, *Réserves Naturelles* 2759 (MO, P, TAN). — 7.VIII.1955, *Réserves Naturelles* 7476 (P, TEF). — *Idem*, sur la crête du Vataza, au sud-est d'Imonty, 16.I.1963, *Service Forestier* 22452 (K, P, TEF). — Vohidava, vallée moyenne du Mandrara près d'Anadabolava, [24°09'S, 46°15'E], 750-810 m, XII.1933, *Humbert* 12618 (P). — 6.XI.1963, *Service Forestier* 22599 (P, TEF). — Vohipola, au nord de Betroka, [23°08'S, 46°05'E], 1100-1300 m, XI.1933, *Humbert* 11633 (P).

DESCRIPTION

Trees 4-8 m tall, trunk to 20 cm dbh; young twigs slightly tomentose, older twigs glabrous. Leaf blades

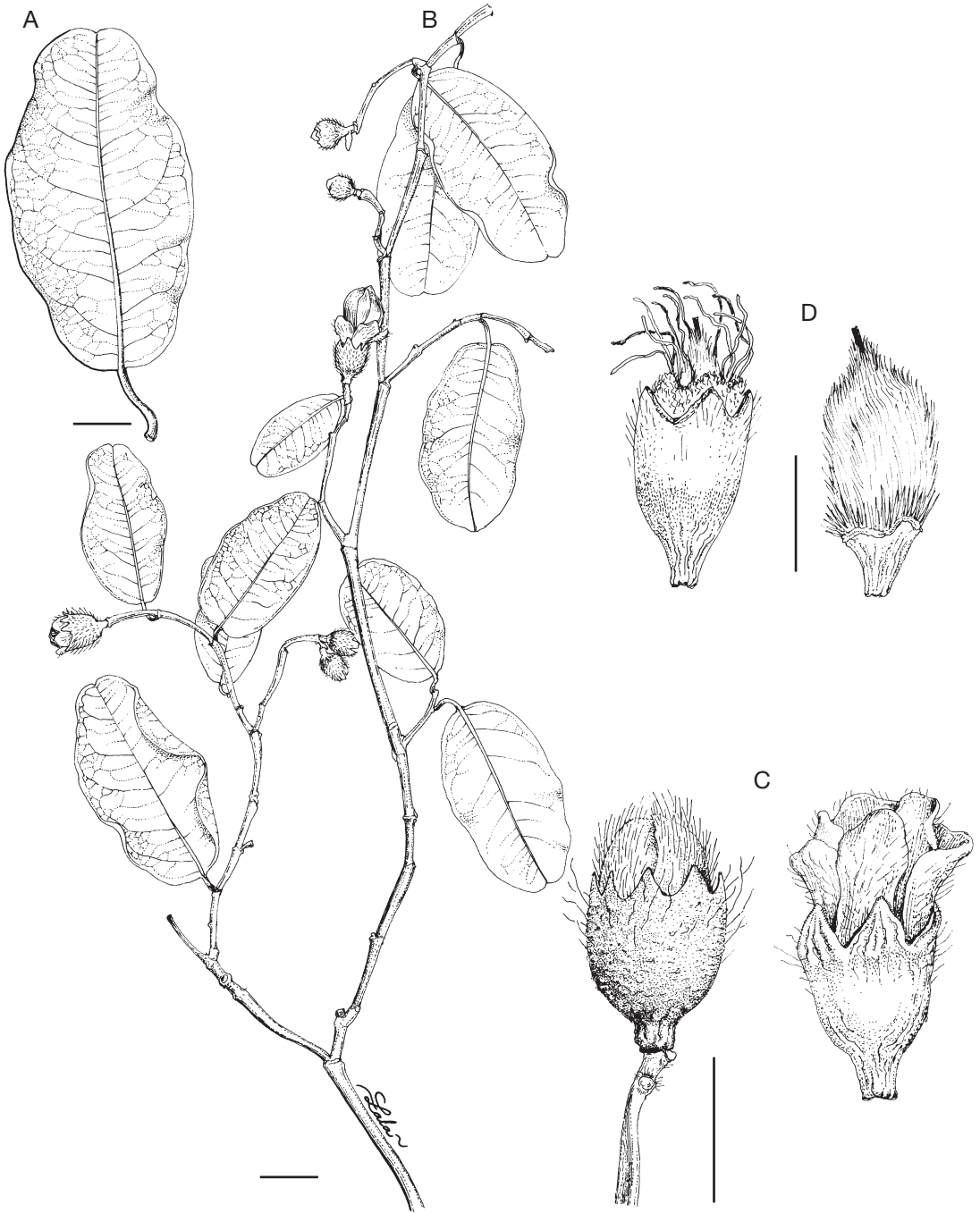


FIG. 3. — *Xerochlamys coriacea* Hong-Wa: **A**, leaf; **B**, flowering branch; **C**, flower buds; **D**, fruit with and without involucre. *Humbert 12680*. Scale bars: A, C, D, 5 mm; B, 1 cm.

light green above, darker green beneath, elliptic to narrowly ovate, 3-6 × 1-2 cm, coriaceous, rarely with trichomes on the abaxial midvein, base truncate to sometimes attenuate, margin irregularly undulate, apex obtuse to occasionally retuse, midrib green to yellowish, slightly raised above, distinctly raised beneath, secondary veins distinct, 7-12 per side, 2-6 mm apart, looping 0.5-2 mm from the margin; petiole 4-12 mm long, with sparse trichomes. Flowers solitary or in inflorescences, axillary, with 2 or 3 flowers; peduncle 1-2 mm long, glabrous, pedicel 1-2 mm long, glabrous. Involucre green, cupulate, 3-6 × 4-10 mm, brown tomentose when young with a few white trichomes, teeth 12-24, 0.8-2 mm long; flowers 19-30 mm long at anthesis from apex of pedicel to apex of petals; sepals obovate, 6-8 × 4-7 mm, slightly emarginate, exerted 2-5 mm beyond the involucre; petals white, obovate, 13-21 × 6-12 mm, exceeding the involucre by 10-15 mm; disc 1.7-2 mm tall; stamens 18-42, 8.4-19 mm long; ovary globose, 3-3.4 mm high, style 6.5-16.3 mm long, pubescent, stigma 0.5-1.5 mm wide. Fruits ovoid, 5-9 × 6-12.5 mm, exceeding the accrescent involucre by 2-6 mm; seeds brown, ellipsoid, 2-3 mm long, 3 or 4 per fruit.

PHENOLOGY

Flowering and fruiting from November to February.

VERNACULAR NAMES

Fotona, Hary, Kotika, Vandrozo.

HABITAT

In subhumid to dry forests and thickets, on metamorphic and igneous rocks from 450 to 1200 m, at the border of the subarid and humid, and in the subhumid bioclimatic zones.

DISTRIBUTION

From Andohahela to near Andringitra in SE Madagascar (Fig. 2).

REMARKS

Xerochlamys coriacea is a small tree that can be recognized by its elliptic, coriaceous leaf blades borne on a long petiole (up to 12 mm). This species shows

some variation in leaf size. Specimens from the northern part of its range (Andringitra) have larger leaf blades (> 4 cm long) than those from material collected toward its southern limits, which also have thicker leaves, possibly because this species grows in less humid habitats in the south. Perrier de la Bâthie also mentioned on the label of one of his collections (13604) that the larger leaves were from a fertile resprouting shoot. Despite this variation in leaf size, specimens assigned to *X. coriacea* form a coherent group with distinctive features that are also geographically correlated. *Xerochlamys coriacea* differs from *X. villosa* in particular by its smaller, elliptic, coriaceous (vs. ovate, chartaceous) leaf blades with irregularly undulate (vs. plane) margins, its inconspicuous (vs. prominent) secondary veins and its brown tomentose (vs. yellow tomentose) involucre bearing sparse white trichomes. Its leaves differ from those of *X. tampoketsensis* by the same characters and additionally by their truncate to attenuate (vs. rounded) base.

CONSERVATION STATUS

With an extent of occurrence of 22 006 km², an area of occupancy of only 90 km², and nine subpopulations of which two are located within protected areas (Réserves naturelles intégrales d'Andohahela and Andringitra), *Xerochlamys coriacea* is assigned a preliminary status of Vulnerable [VU B2ab(i,ii,iii)].

5. *Xerochlamys diospyroidea* (Baill.) Baker,

Journal of the Linnean Society, Botany 25: 296 (1889). — *Sarcolaena diospyroidea* Baill., *Bulletin de la Société linéenne de Paris* 1: 565 (1886). — *Leptolaena diospyroidea* (Baill.) Cavaco, *Bulletin du Muséum national d'Histoire naturelle*, 2^e sér., 23: 135 (1951). — Type: Madagascar, Prov. Fianarantsoa, Ambatomenaloha, [20°37'S, 46°33'E], 1876, fl., *Grandidier* 62 (holo-, P! [P00047871]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Fianarantsoa, Itremo, [20°32'S, 46°33'E], 1700 m, IX.1956, *Bosser* 10022 (P, TAN). — 1964, *Bosser* 18876 (P, TAN). — *Idem*, along road between Finandrahana and Itremo, 27-40 km west of Finandrahana, 1400-1500 m, 26.I.1975, *Croat* 29847 (MO, TAN). — [20°33'S, 46°36'E], 1300-1400 m, 27.I.1975, *Croat* 29899 (MO, TAN). — *Idem*, 20°36'38"S, 46°35'03"E, 1570 m, 18.VIII.2003, *Hong-Wa et al.* 144 (MO, P,

TAN). — *Idem*, massif de l'Itremo, Ianasana, 20°34'08"S, 46°35'44"E, 1433 m, 23.VI.2005, *Hong-Wa et al.* 350 (MO, P, TAN); *Hong-Wa et al.* 351 (MO, P, TAN). — *Hong-Wa et al.* 352 (MO, P, TAN). — *Idem*, montagnes ouest d'Itremo, [20°32'S, 46°33'E], 1500-1700 m, 17-22.I.1955, *Humbert 28153* (MO, P). — *Idem*, 20°35'09"S, 46°35'46"E, 1440 m, 23.III.1999, *Labat et al.* 3029 (B, G, K, MO, P, TAN, WAG). — 20°35'34"S, 46°35'37"E, 1410 m, 26.III.1999, *Labat et al.* 3038 (B, G, K, MO, P, TAN, WAG). — *Idem*, Antsirakambiaty, 20°35'22"S, 46°34'01"E, 1830 m, 27.III.1999, *Labat et al.* 3052 (B, G, K, MO, P, TAN, WAG). — *Idem*, 20°58'45"S, 46°58'73"E, 1513 m, 23.II.2001, *Ludovic & Razafitsalama 4* (MO, P, TAN, TEF). — *Idem*, Ianasana, 7 km à l'ouest d'Itremo, 20°36'06"S, 46°34'18"E, 1630 m, 1.II.1999, *Messmer & Andriatsiferana 750* (G, MO, P). — [20°32'S, 46°33'E], 1300-1800 m, XI.1970, *Monat 3659* (P, TAN). — [20°34'S, 46°38'E], 1500 m, II.1919, *Perrier de la Bâthie 12486* (P). — [20°36'S, 46°32'E], 1500 m, 6-8.III.1999, *Rabenantoandro et al.* 63 (MO, P, TAN). — *Idem*, route to Morondava, 42.5 km west of Ambatofinandrahana, [20°35'S, 46°36'E], 1500 m, 6.VII.1992, *A. Randrianasolo 234* (MO). — *Idem*, eastern margin of the Itremo Massif, c. 19 km west of Ambatofinandrahana, 20°34'21"S, 46°34'54"E, 1580-1700 m, 10.III.2000, *Schatz et al.* 3960 (MO, P). — *Idem*, Anasana, PK 112, [20°32'S, 46°33'E], 3.VIII.1959, *Service Forestier 19503* (P, TEF). — *Idem*, rive droite de l'Ambatorangotana, massif de l'Itremo, [20°34'S, 46°35'E], 1650-1700 m, 21.II.1970, *Service Forestier 29042* (MO, P, TEF). — Around Ambatofinandrahana, [20°33'S, 46°48'E], 17.II.1938, *Decary s.n.* (TAN). — *Raub 799* (TAN). — Mt. Ambatomenaloha (Itremo massif), [20°37'S, 46°33'E], 1500 m, 17.I.1955, *Service Forestier 11551* (K, P, TEF).

DESCRIPTION

Shrubs to small trees; young twigs tomentose, older twigs pubescent. Leaf blades dark green above, lighter beneath, ovate to rounded, rarely elliptic, 2-4.5 × 1.5-3.4 cm, subcoriaceous, densely covered with erect golden trichomes, base rounded, margin revolute, apex obtuse to emarginate, midrib visible only beneath, secondary veins indistinct, 6-10 per side, 2.5-4 mm apart, looping 1-3.5 mm from the margin; petiole 2-5 mm long, pubescent. Inflorescences terminal sometimes axillary, with 2-8 flowers; peduncle 1-3 mm long, pubescent, pedicel absent to 0.5 mm, pubescent. Involucre brown, cupulate, 3-10 × 4-10 mm, with dense golden trichomes, teeth 18-27, 1-3.2 mm long; flowers 15-25 mm long at anthesis from apex of pedicel to apex of petals;

sepals oblong, 6-10 × 3-7 mm, deeply emarginate, exerted 1-4 mm beyond the involucre; petals dark pink fading to white, oblong, 12-24 × 5-13 mm, exceeding the involucre by 9-14 mm; disc 2-3 mm tall; stamens 20-44, 8-17 mm long; ovary ovoid, 3 mm high, style 6-14 mm long, pubescent, stigma 0.5-1 mm wide. Fruits subglobose to globose, 6-10 × 7-10 mm, exceeding the accrescent involucre by 2-5 mm; seeds brown, ellipsoid 2-4 mm long, 3-12 per fruit.

PHENOLOGY

Flowering and fruiting from October to June.

VERNACULAR NAMES

Kitoto.

HABITAT

Xerochlamys diospyroidea is one of the dominant elements of the evergreen sclerophyllous *Uapaca bojeri* (tapia) woodland in the Itremo massif, occurring on quartzite, marble, and metamorphic and igneous substrates from 1100-1800 m in the subhumid bioclimatic zone.

DISTRIBUTION

In central Madagascar in the area around Itremo (Fig. 4).

REMARKS

Xerochlamys diospyroidea can be easily recognized by its dense golden indumentum that covers the flattened young twigs, both surfaces of the leaves and the involucre, its leaf blades less than 5 cm long, and its dark pink flowers fading to white at maturity.

The type specimen of this species (*Grandidier 62*) has relatively small (< 3 cm long) elliptic leaf blades with an acute apex, while all other specimens collected from the same region have larger, more or less ovate to round leaf blades with an obtuse to rounded apex. However, *Humbert 28153* has lamina of both shapes: the specimen at MO and the one of duplicates at P have small elliptic and acute leaf blades corresponding to those of the type, whereas the other specimen at P has four fragments, three with small elliptic blades and one with larger

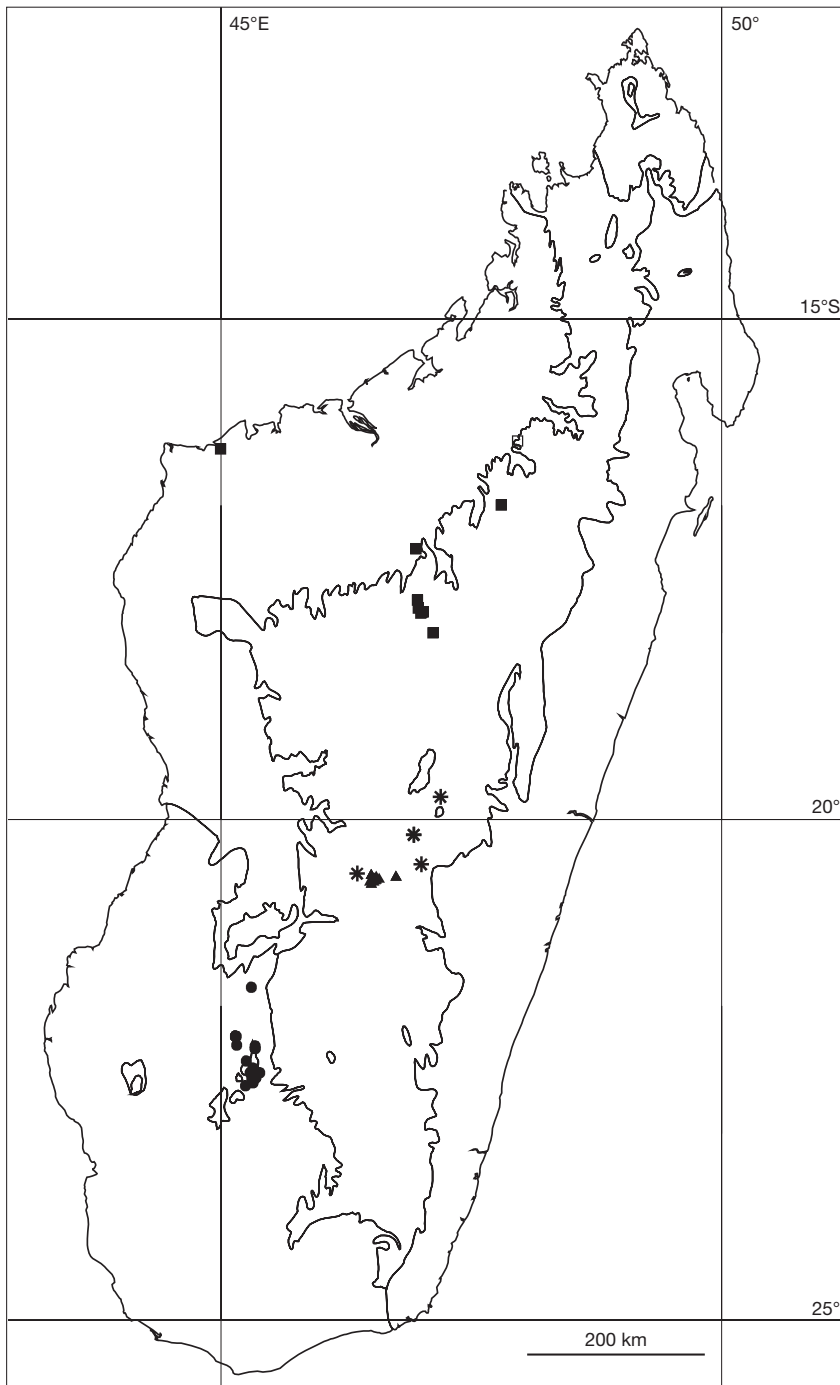


FIG. 4. — Distributions of *Xerochlamys elliptica* F.Gérard (*), *X. diospyroidea* (Baill.) Baker (▲), *X. tampoketsensis* F.Gérard (■) and *X. villosa* F.Gérard (●) mapped on the bioclimatic zones of Madagascar (after Cornet [1974], simplified by Schatz [2000]).

rounded blades. Apart from differences in leaf shape and size, indumentum density varies slightly between the two forms. It is unclear whether the two entities comprising *Humbert 28153* represent different developmental stages of the same individual or were collected from separate plants; they are both in flower. The elliptic form is the less common of the two, but both come from the same area and are certainly variants of the same taxon, perhaps occurring in different habitats, or possibly one of them displaying post-fire morphology. Despite this variation, both forms can be easily distinguished from other co-occurring species such as *X. itremoensis*, which is glabrous, *X. elliptica*, which is also glabrous and moreover differs in having mostly white flowers (vs. dark pink fading to white at senescence in *X. diospyroidea*), and *X. bojeriana*, which is pubescent, but has white trichomes and small leaf blades (< 3 cm long) and short petiole (< 3 mm long). Field observations also indicate that these four species distinctly differ in growth form; *X. diospyroidea* is a dense, erect shrub to a small tree, *X. bojeriana* is a slender, erect shrub, *X. elliptica* is a small tree, and *X. itremoensis* is a prostrate shrub.

CONSERVATION STATUS

Xerochlamys diospyroidea is a very abundant local endemic from the Itremo massif, and has not been recorded within a protected area. With an extent of occurrence of 468 km², an area of occupancy of 63 km², and only five known subpopulations, this species is preliminarily assigned a status of Endangered [EN B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)].

6. *Xerochlamys elliptica* F.Gérard

Comptes rendus de l'Association française pour l'Avancement des Sciences 1914 (sess. 43): 407 (1915). — Type: Madagascar, sur le quartz du mont Ibity, dans des bois à tapia du centre de l'île, [19°45'S, 47°15'E], 1400 m, VI.1912, fl., *Perrier de la Bâthie 3009* (holo-, P! [P00389117]; iso-, K [image seen]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Antananarivo, Ibity, 20°08'23"S, 46°58'44"E, 1385 m, 21 VI.2005, *Hong-Wa et al. 330* (MO, P, TAN). — 20°08'40"S, 46°58'53"E, 1426 m, *Hong-Wa et al. 347*

(MO, P, TAN). — Prov. Fianarantsoa, Ihadilana, 20°26'17"S, 47°03'42"E, 1449 m, 22.VI.2005, *Hong-Wa et al. 349* (MO, P, TAN). — Itremo, 20°31'55"S, 46°24'28"E, 1617 m, 24.VI.2005, *Hong-Wa et al. 356* (MO, P, TAN).

DESCRIPTION

Small trees; young and older twigs glabrous. Leaf blades dark green above, whitish beneath, elliptic, 2.6–4 × 1–2 cm, subcoriaceous, glabrous, base cuneate, margin plane, thickened, apex slightly emarginate, midrib green, flat to slightly raised above, raised beneath, secondary veins conspicuous, 8–10 per side, 3.5–5 mm apart, looping 0.8–2 mm from the margin; petiole 3–5 mm long, glabrous. Flowers often solitary or sometimes in inflorescences, axillary, with 2 flowers; peduncle 1–2.5 mm long, glabrous; pedicel absent to 0.5 mm long, glabrous. Involucre light brown, cupulate, 3–7 × 3–9 mm, glabrous, occasionally with sparse white trichomes, teeth 13–21, 1–2 mm long; flowers 13–26 mm long at anthesis from apex of pedicel to apex of petals; sepals oblong, 7–9 × 3–6.5 mm long, deeply emarginate, exerted 2–6 mm beyond the involucre; petals white, rarely pinkish, oblong, 10–19 × 6.5–13 mm, exceeding the involucre by 7–12 mm; disc 2.5–4 mm tall; stamens 18–37, 8–14.5 mm long; ovary ovoid, 3–4 mm high, style 7–12 mm long, basally pubescent, stigma 2 mm wide. Fruits globose, 4–9 × 4–9 mm, exceeding the accrescent involucre by 4–8 mm; seeds black, flattened-ellipsoid, 2–5 mm long, 1–10 per fruit.

PHENOLOGY

Flowering and fruiting in June.

VERNACULAR NAME

Kitoto.

HABITAT

Quartzite substrate in evergreen sclerophyllous *Uapaca bojeri* (tapia) woodland from 1300 to 1600 m in the subhumid bioclimatic zone.

DISTRIBUTION

Known from only five specimens collected at Ibity and the Itremo massif (Fig. 4).

REMARKS

This species can be recognized by its glabrous, elliptic leaf blades that are dark green above and whitish beneath, its very prominent venation, and its often solitary white flowers enclosed within a cupulate involucre. All these characters distinguish it from *X. bojeriana*, which is characterized by pubescent, elliptic to occasionally ovate leaf blades, indistinct leaf venation, and pink flowers often grouped into inflorescences. Gérard (1915, 1919) described *X. elliptica*, initially known from only a single specimen (Perrier 3009), but Perrier de la Bâthie (1931) and Cavaco (1952a, b) considered it to represent nothing more than an individual of *X. bojeriana* that was vigorously resprouting. Additional material now shows, however, that the features distinguishing *X. elliptica* are constant between individuals, across habitats and through time. Field observations also show that *X. elliptica* differs from several broadly co-occurring congeners (*X. bojeriana*, *X. diospyroidea* and *X. itremoensis*) by its growth pattern and its white (vs. pink) flowers.

Xerochlamys elliptica differs from *X. villosa* by its small leaf blades that are < 4 cm long (vs. > 4 cm in *X. villosa*), elliptic (vs. ovate), and abaxially white (vs. dull green), and its cupulate (vs. urceolate) involucre that is often glabrous (vs. yellow tomentose) but sometimes bears white trichomes.

CONSERVATION STATUS

With an extent of occurrence of 2491 km², an area of occupancy of 36 km² and none of the four sub-populations growing in currently protected areas, *Xerochlamys elliptica* should be considered Endangered [EN B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)].

7. *Xerochlamys itremoensis*

Hong-Wa, G.E.Schatz & Lowry, sp. nov.

(Fig. 5)

Arbuscula prostrata, caulis rubris, ramis junioribus pilosis, foliis ellipticis glabris ad apices acutis et ad bases attenuatis, floribus axillaribus solitariis.

TYPUS. — Madagascar. Prov. Fianarantsoa, Itremo, Massif de l'Itremo, Antsirakambiaty, végétation basse à *Pachypodium brevicaula* dominée par *Xerochlamys*,

sol sommaire sur quartzite, 20°35'34"S, 46°34'18"E, 1830 m, 27.III.1999, fr., *Labat et al.* 3057 (holo-, Pl, iso-, G, K, MO!, Pl, TAN!).

PARATYPES. — Madagascar. Prov. Fianarantsoa, Itremo, [20°32'S, 46°33'E], 1500-1685 m, I.1964, *Bosser 18879* (MO, P, TAN); *Bosser 18879bis* (MO, P, TAN); *Bosser 18879ter* (P). — 27.I.1975, *Croat 29827* (MO, TAN); *Croat 29851* (MO, TAN). — 12.I.1973, *Guillaumet 4259* (P). — Massif de l'Itremo, Ianasana, 20°34'40"S, 46°35'11"E, 1558 m, 25.VI.2005, *Hong-Wa et al.* 359 (MO, P, TAN). — *Idem*, [20°36'S, 46°39'E], 1500-1700 m, 17.I-22.IV.1955, *Humbert 28175* (MO, P). — [20°32'S, 46°33'E], 1.XII.1970, *Keraudren-Aymonin 25788* (MO, P); *Keraudren s.n.* (MO, P). — 1300-1600 m, XI.1970, *Morat 3655* (P, TAN). — 20°36'47"S, 46°34'44"E, 1710 m, 23.III.1996, *Rakotomalaza et al.* 671 (MO). — [20°36'S, 46°32'30"E], 1700 m, 6.VII.1992, *A. Randrianasolo 237* (MO) — *Idem*, eastern margin of the Itremo Massif, c. 19 km west of Ambatofinandrahana, 20°34'21"S, 46°34'54"E, 1580-1700 m, 10.III.2000, *Schatz et al.* 3959 (MO, P). — *Idem*, [20°36'S, 46°34'E], 1600-1700 m, 27.XI.1969, *Service Forestier 28898* (MO, P). — Mt. Ambatomenaloha (Itremo massif), [20°37'S, 46°33'E], 17.I.1955, *Service Forestier 11558* (MO, P).

DESCRIPTION

Shrubs prostrate; young twigs tomentose, older twigs glabrous. Leaf blades glossy green above, green to yellowish beneath, narrowly elliptic, 1-2 × 0.3-0.6 cm, chartaceous, glabrous, base cuneate, margin plane, apex acute, midrib red, slightly sunken above, distinctly raised beneath, secondary veins conspicuous, 7-9 per side, 2-2.5 mm apart, looping c. 0.7 mm from the margin; petiole 1.8-2.1 mm long, glabrous. Flowers solitary, axillary; peduncle 2-6 mm long, with short indumentum, pedicel 1-2 mm long, short tomentose; involucre brown, urceolate, 3.5-5 × 4-5 mm, glabrous (with sparse white trichomes), teeth 11-17, 1-2 mm long; flowers 15-20 mm long at anthesis from apex of pedicel to apex of petals; sepals oblong, 6-10 × 3-5 mm, slightly emarginate, exserted 3-4 mm beyond the involucre; petals pink to white, oblong, 12-13 × 5-6.5 mm, exceeding the involucre by 8-9 mm; disc 2 mm tall; stamens 30, 6-10 mm long; ovary globose to ovoid, 3 mm high, style 7-10 mm long, basally pubescent, stigma 1-2 mm wide. Fruits subglobose to ovoid, 5-8 × 4.5-6 mm, exserted 1-2 mm beyond the accrescent involucre; seeds black, ellipsoid, 2-4 mm long, 4-7 per fruit.

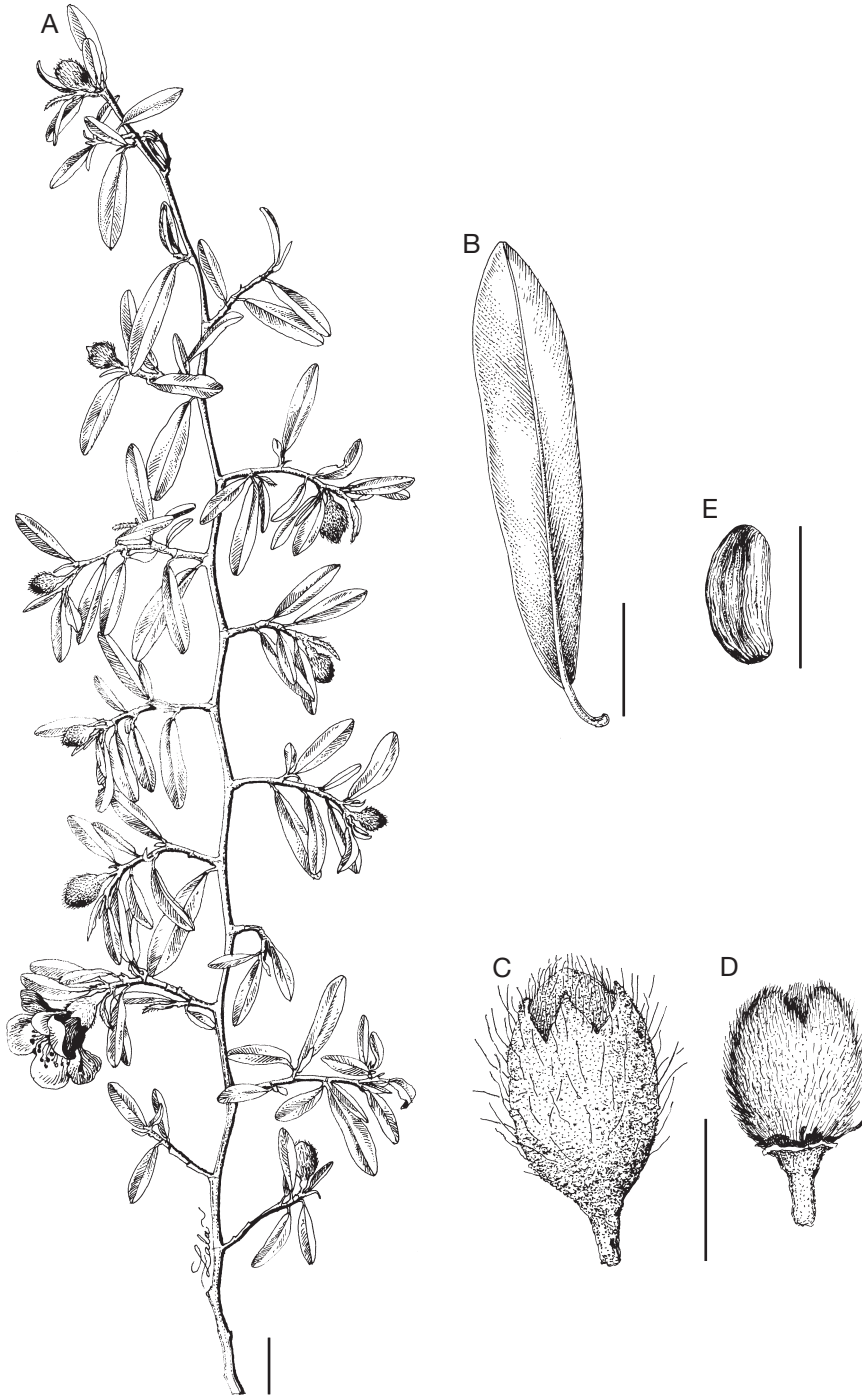


FIG. 5. — *Xerochlamys itremoensis* Hong-Wa, G.E.Schatz & Lowry: A, flowering branch; B, leaf; C, flower bud; D, fruit; E, seed. *Service Forestier 28898*. Scale bars: A, 1 cm; B-D, 5 mm; E, 4 mm.

PHENOLOGY

Flowering and fruiting from November to April.

HABITAT

Woodland at 1300-1800 m elevation, on quartzite, marble, and metamorphic and igneous rocks in the subhumid bioclimatic zone.

DISTRIBUTION

Known only from the Itremo massif (Fig. 1).

REMARKS

This species can be recognized by its prostrate habit, its glabrous, narrowly elliptic leaf blades less than 1 cm across with an acute apex, and its solitary, pink to white flowers. Observations in the field indicate that this species grows in close proximity with *X. diospyroidea* but differs by its prostrate (vs. erect) habit, its glabrous (vs. pubescent), narrowly elliptic (vs. ovate) leaf blades and its solitary flowers (vs. flowers borne in inflorescences). It likewise differs from *X. bojeriana* and *X. elliptica*, which are erect shrubs with wider leaf blades that are respectively pubescent and glabrous. Unlike *X. diospyroidea*, the latter two species have not been seen growing in the same habitat as *X. itremoensis*, although they occupy the same general area.

CONSERVATION STATUS

With an area of occupancy of 54 km², an extent of occurrence no larger than that, and two subpopulations, neither occurring within a protected area, *Xerochlamys itremoensis* is assigned a preliminary status of Endangered [EN B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)].

Xerochlamys itremoensis and *X. diospyroidea* are known only from the Itremo massif in central Madagascar. This massif, characterized by quartz and marble outcrops, harbours many locally endemic plants (e.g., succulents, palms, and orchids) that are regularly affected by bush fires, intensive exploitation and marble mining. Because of its unique vegetation and the high level of threat, the Itremo massif has been identified as a top priority for conservation (Birkinshaw *et al.* 2004), and is now being represented among the "Système d'Aires protégées de Madagascar" (SAPM).

8. *Xerochlamys tampoketsensis* F.Gérard

Comptes rendus de l'Association française pour l'Avancement des Sciences 1914 (sess. 43): 409 (1915). — Type: Madagascar, Prov. Mahajanga, cimes gneissiques du Tampoketsa, entre le Bemarivo et l'Anjobona, [16°08'S, 48°02'E], VII.1905, fr., *Perrier de la Bâthie 3032* (holo-, P! [2 sheets: P00389120-21]).

Xerochlamys rupestris F.Gérard, *Comptes rendus de l'Association française pour l'Avancement des Sciences* 1914 (sess. 43): 408 (1915). — Type: Madagascar, Prov. Mahajanga, région du Cap St André, Mt. Ambohitrosy, rochers granitiques, [16°47'S, 45°01'E], V.1904, fr., *Perrier de la Bâthie 3027* (holo-, P! [P00389118]; iso-, P! [P00389119]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Antananarivo, Analanomby, [19°45'S, 47°05'E], 2.IX.1937, *Herbier du Jardin botanique de Tananarive 3027* (P). — Andranofeno-Sud, 18°04'53"S, 47°10'23"E, 1400 m, I.2000, *Andrianjafy et al.* 6 (MO, P, TAN). — *Idem*, 34 km north of Ankazobe along the route from Antananarivo-Mahajanga at PK 135, 18°04'53"S, 47°10'23"E, 1400 m, 4.III.2000, *Schatz et al.* 3947 (MO). — Tampoketsa d'Ankazobe, route Tananarive-Majunga, PK 184, [17°53'S, 47°03'E], IV.1958, *Descoings 3286* (MO, TAN). — *Idem*, PK 181, [17°52'S, 47°04'E], 31.I.1972, *Jacquemin 895* (P). — 23.II.1973, *Jacquemin 1250* (P). — *Idem*, cimes du Tampoketsa au-dessus de Mahatsinjo, [17°52'S, 47°03'E], 1300 m, I.1927, *Perrier de la Bâthie 17876* (K, MO, P, TAN). — Prov. Mahajanga, Antsifabositra, 17°13'41"S, 46°59'55"E, 560 m, 7.V.2005, *Andrianjafy et al.* 1026 (MO, P, TAN). — *Andrianjafy et al.* 1033 (MO, P, TAN). — Beveromay, cime du Tampoketsa de Tsaratanana entre le Mahajamba et le Bemarivo, [16°47'S, 47°52'E], 1200 m, VII.1920, *Perrier de la Bâthie 13214* (P). — Mahatsinjo, 17°49'55"S, 47°01'39"E, 1398 m, 16.VII.2005, *Hong-Wa et al.* 495 (MO, P, TAN). — *Idem*, sur le Tampoketsa, au sud de Mahatsinjo, [17°45'S, 45°01'E], VII.1925, *Perrier de la Bâthie 17329* (P).

DESCRIPTION

Small trees 2-5 m tall, tortuous; young twigs tomentose, older twigs glabrous. Leaf blades dark green above, dull green beneath, elliptic to suboblong, 3-6 × 2-3 cm, subcoriaceous, white-pubescent when young, glabrous at maturity or trichomes restricted to the abaxial midvein, base rounded, margin plane, apex obtuse, sometimes rounded, midrib yellow, slightly sunken above, distinctly raised beneath, secondary veins prominent, 7-10 per side, 2.5-5 mm apart, looping 1-2.3 mm from the

margin; petiole 3-7.5 mm long, pubescent. Flowers sometimes solitary or usually in inflorescences, terminal, with 2 flowers; peduncle 0.5-1 mm long, pubescent, pedicel 1-3 mm long, pubescent. Involucre brown, cupulate, 5-7 × 4-10 mm, with white trichomes, teeth 13-20, 1.2-2.4 mm long; flowers 20-30 mm long at anthesis from apex of pedicel to apex of petals; sepals oblong, 7-9 × 4-7 mm, slightly emarginate, exerted 3-4 mm beyond the involucre; petals pale yellow, oblong, 19-24 × 8-12 mm, exceeding the involucre by 14-17 mm; disc 2.7-3.3 mm tall; stamens 27-40, 11-16 mm long; ovary ovoid, 2.7-4 mm high, style 11-12 mm long, pubescent, stigma 1 mm wide. Fruits globose to subglobose, 6-11 × 6-12 mm, exceeding the accrescent involucre by 2-8 mm; seeds black, flattened-ellipsoid, 3-4 mm long, 2-6 per fruit.

PHENOLOGY

Flowering and fruiting from January to July.

HABITAT

Dry habitats on gneiss and granite from 500-1400 m in subhumid and dry bioclimatic zones.

DISTRIBUTION

From near Cap St André to Tampoketsa d'Ankazobe and Tampoketsa d'Analamaitso in NW Madagascar (Fig. 4).

REMARKS

This species can be recognized by its generally glabrous leaf blades that are sometimes pubescent along the midvein, its pubescent petiole, and its pale yellow flowers each subtended by a brown involucre.

Xerochlamys tampoketsensis is somewhat variable in leaf shape and size. On material with small (≤ 4 cm long) leaf blades (*Descoings 3286*, *Perrier 3032*), the blades are more or less suboblong; the former specimen also has leaves with a midrib bearing evident indumentum. Larger leaves (> 4 cm long), such as those found on *Perrier 13214* and on *Andrianjafy 1026* and *1033*, are elliptic and glabrous. This variability appears to have led Cavaco (1952b) to regard the taxon recognized here as a variety of *X. diospyroidea*, especially because the small leaved

specimens superficially seem comparable to material of the latter. However, *X. tampoketsensis* differs from *X. diospyroidea* by its suboblong to elliptic (vs. ovate to rounded) leaf blades, its white pubescence restricted to the midvein at maturity when present (vs. golden pubescence throughout the leaf surfaces), its pale yellow (vs. pink) petals and the number of seeds per fruit (2-6 vs. 3-12).

CONSERVATION STATUS

With an extent of occurrence of 19780 km², an area of occupancy of 63 km², and six subpopulations, of which just one occurs in a protected area (Tampoketsa d'Analamaitso), *X. tampoketsensis* is provisionally classified as Vulnerable [VU B1ab(ii,iii,iv)+B2ab(ii,iii,iv)].

9. *Xerochlamys undulata* Hong-Wa, sp. nov.

(Fig. 6)

Arbuscula, foliis ellipticis subtus pilosis ad apices retusis ad bases truncatis et ad margines undulatis, floribus terminalibus, involucro rubro piloso.

TYPUS. — Madagascar. Prov. Toliara, Ranohira, forêt d'Ankijabe, 22°39'58"S, 45°16'45"E, 871 m, 27.VI.2005, fl., *Hong-Wa et al. 372* (holo-, MO!; iso-, G!, K!, P!, TAN!).

PARATYPES. — Madagascar. Prov. Fianarantsoa, 5 km east of Ilakaka, valley west of Isalo Mts, 825 m, 14.X.1970, *Fosberg 52418* (MO). — Ankazomanga, 22°46'36"S, 45°01'28"E, 1067 m, 28.VI.2005, *Hong-Wa et al. 386* (MO, TAN); *Hong-Wa et al. 387* (MO, P, TAN). — Ianakandrarezo, [22°35'S, 45°23'E], 14.VI.1967, *Service Forestier 26379* (P, TEF). — Col des Tapia, near limit of Ihosy subdivision, 59 km east of Sakaraha, [22°47'S, 44°58'E], 900 m, 3.II.1975, *Croat 30611* (MO, TAN). — Col des Tapias, [22°47'S, 45°00'E], *Homolle 1548bis* (P). — III.1960, *Keraudren 455* (MO, P). — *Idem*, deuxième col des Tapia entre Ranohira et Sakaraha, 31.X.1960, *Léandri 3506* (MO, P); *Leroy 3* (MO). — [22°46'S, 45°01'E], III.1970, *Morat 3476* (P, TAN). — 500-1200 m, 26.II.1949, *Service Forestier 549* (MO, P, TEF). — 514-1268 m, II.1955, *Service Forestier 11660* (P, TEF). — Ihosy, [22°24'S, 46°08'E], *Raub 1506* (MO). — Ilakaka, [22°43'S, 45°11'E], III.1970, *Morat 3603* (P). — 31.III.1966, *Peltier 5785* (P). — [22°39'S, 45°13'E], 650 m, 29.V.1955, *Service Forestier 14289* (P, TEF). — Lalanandro, [22°19'S, 46°07'E], 1245 m, 19.XII.1968, *Service Forestier 28500* (K, MO, P). — Parc national d'Isalo, [22°08'-22°40'S,

45°10'-45°24'E], 514-1268 m, II.1956, *Bosser 9182* (MO, P, TAN). — [22°36'S, 45°22'E], 800 m, 29.I.1955, *Cours 5031* (P). — [22°45'S, 45°15'E], 31.X.1940, *Decary 16281* (P). — [22°11'S, 45°10'E], *Decary 16283* (P). — *Idem*, northwest of Ranohira, [22°33'S, 45°19'E], 800 m, 13.II.1990, *Du Puy et al. MB668* (MO, P, TAN). — [22°36'S, 45°22'E], 800 m, 29.I.1955, *Herbier de la Station agricole de l'Alaoitra (G. Cours) 5031* (MO, P). — *Idem*, forêt d'Ampandrabe, 22°36'51"S, 45°20'45"E, 905 m, 19.XII.2001, *Hong-Wa & Ludovic 37* (MO, P, TAN, TEF). — *Idem*, plateaux et vallée de l'Isalo au col des Tapias, [22°47'S, 45°01'E], 1000 m, 28.XI-4.XII.1946, *Humbert 19611* (MO, P). — *Idem*, à l'ouest de Ranohira, [22°11'S, 45°10'E], 800-1250 m, 19.XI.1960, 29.I-10.IV.1955, *Humbert 28696* (P); *Humbert 28729* (P). — [22°08'S, 45°10'E], 800-1000 m, 30.VII.1928, *Humbert & Swingle 5040* (P). — 14.X.1970, *Keraudren-Aymonin & Aymonin 24675* (P). — Massif de l'Isalo à Betamanga, 1000-1300 m, 20.XI.1960, *Léandri & Saboureau 3955* (K, MO, P). — *Idem*, south of 11 km Ranohira-Sakaraha, [22°39'S, 45°21'E], 900 m, 8.VIII.1995, *Leeuwenberg & Rapanarivo 14619* (K, MO, P, TAN, WAG). — Isalo, 800 m, 6.XI.1978, *Lorence 2069* (K, MO, P, TAN). — *Idem*, [22°11'S, 45°10'E], 900 m, X.1924, *Perrier de la Bâthie 16594* (P); *Perrier de la Bâthie 16606* (P). — *Idem*, 22°38'34"S, 45°20'06"E, 820 m, 30.IV.1998, *Randrianaivo et al. 226* (MO). — *Idem*, 34 km west of Ranohira along the Sahanafa trail, 22°16'30"S, 45°22'E, 1200-1500 m, 6.VII.1992, *A. Randrianasolo 240* (MO). — *Idem*, [22°33'S, 45°25'E], 30.VII.1963, *Rauh 10378* (TAN). — Ranohira, PK 712, [22°38'S, 45°20'E], 0-800 m, 23.VII.1955, *Service Forestier 13897* (P, TEF). — [22°47'S, 45°00'E], 19.IV.1958, *Service Forestier 18580* (P, TEF). — 23.V.1965, *Service Forestier 24112* (K, MO, P, TEF). — [22°40'S, 45°16'30"E], 800-1000 m, 11.VII.1992, *A. Randrianasolo 243* (MO). — Sakaraha, 57 km south of Ranohira, [22°46'S, 45°01'E], 1000 m, 11.VII.1992, *A. Randrianasolo 241* (MO); *A. Randrianasolo 242* (MO).

DESCRIPTION

Shrubs; young and older twigs pubescent. Leaf blades bright green above, dull green beneath, elliptic, 1-3.5 × 0.6-2 cm, chartaceous, abaxially sparsely pubescent, adaxially glabrous, base cordate occasionally truncate, margin undulate, erose, apex retuse, midrib reddish, flat to slightly sunken above, slightly raised beneath, secondary veins indistinct, 6-10 per side, 1-4 mm apart, looping 0.2-1.5 mm from the margin; petiole 3-7 mm long, pubescent. Flowers solitary or in inflorescences, terminal, with 2 flowers; peduncle 2-3 mm long, pubescent, pedicel 0.5-2.5 mm long, pubescent. Involucre reddish,

urceolate, 2-7 × 3-9 mm, red tomentose interspersed with sparse white trichomes, teeth 9-20, 0.8-2 mm long; flowers 11-25 mm long at anthesis from apex of pedicel to apex of petals; sepals oblong, 4-7 × 3-5.5 mm, slightly emarginate, exerted 1-3 mm beyond the involucre; petals pale yellow to white, oblong, 9-17 × 5-8 mm, exceeding the involucre by 7-10 mm; disc 1-2.3 mm tall; stamens 18-23, 4-10 mm long; ovary globose, 2-4 mm high, style 5-12 mm long, basally pubescent, stigma 0.3-1 mm wide. Fruits globose to ovoid, 4-9 × 4-11 mm, exceeding the accrescent involucre by 1-4 mm; seeds brown, ellipsoid, 2-4 mm long, 2-6 per fruit.

PHENOLOGY

Flowering and fruiting from October to July.

VERNACULAR NAME

Foto.

HABITAT

On sandstone from 500-1500 m within the sub-humid and subarid bioclimatic zones.

DISTRIBUTION

Localized around Isalo National Park in SW Madagascar (Fig. 1).

REMARKS

This species can be distinguished from *X. bojeriana* by its undulate, pubescent leaves, its long petiole (> 3 mm), its pale yellow to white flowers, and the red indumentum covering its involucre. *Xerochlamys undulata* occurs in the same area as *X. villosa*, but differs by its small leaf blades that are ≤ 3.5 cm long (vs. > 3.5 cm long in *X. villosa*), and are elliptic and pubescent (vs. ovate and glabrous), its pale yellow to white (vs. white) petals, and its red pubescent (vs. yellow tomentose) involucre. Field observations show that the erose leaf margin of *X. undulata* (the blades appearing to have been eaten by insects) is widespread across individual plants and is a very distinctive feature of this species. Another striking pattern observed in the field is the tendency of *X. undulata* to grow in dense monospecific populations, interspersed with only few other plant species.

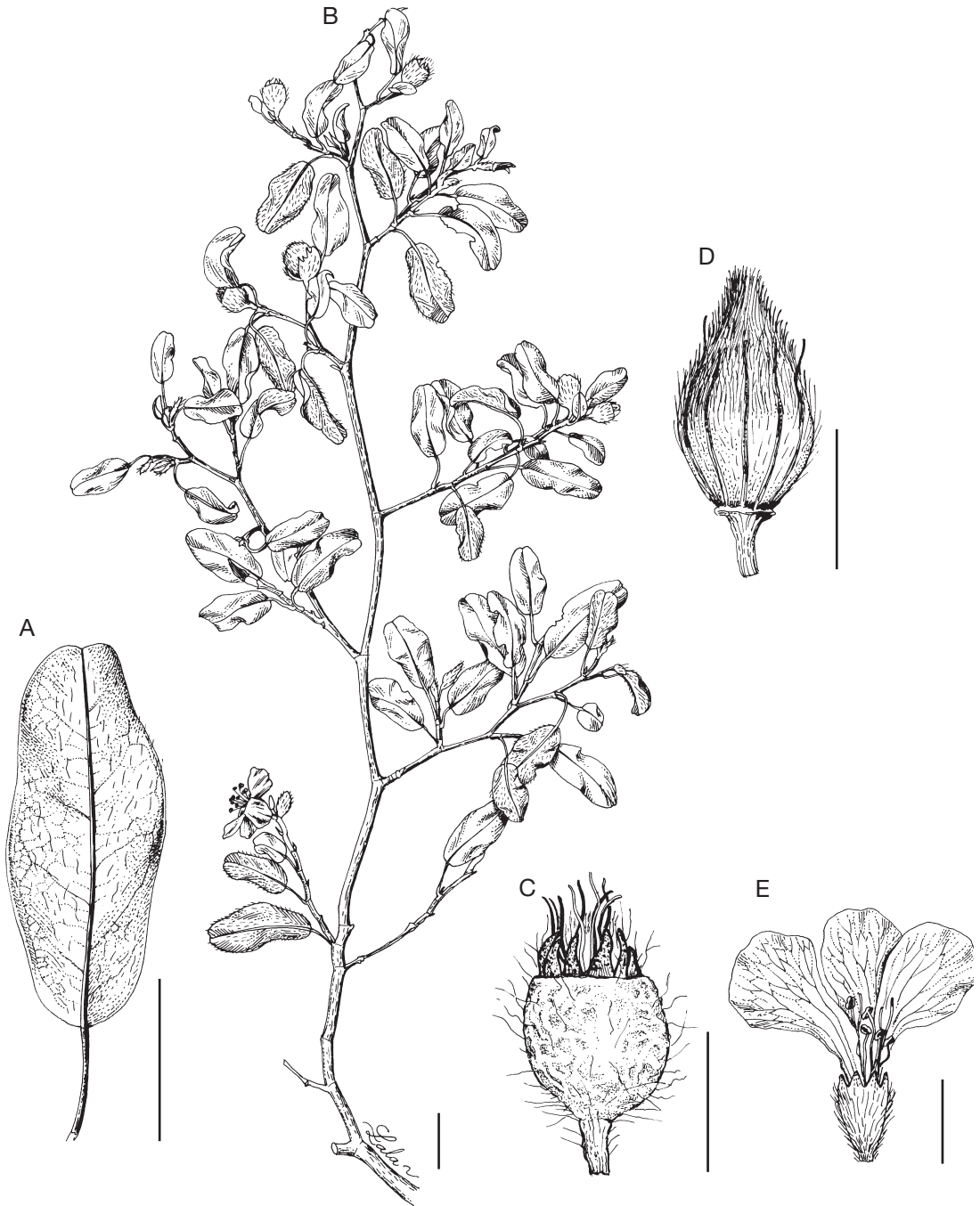


FIG. 6. — *Xerochlamys undulata* Hong-Wa: A, leaf; B, flowering branch; C, D, fruit with and without involucre; E, flower. Hong-Wa 372. Scale bars: A, B, 1 cm; C-E, 5 mm.

CONSERVATION STATUS

With an extent of occurrence of 3238 km², an area of occupancy of 72 km² and three subpopulations, only one of which occurs within the Isalo National Park, *Xerochlamys undulata* is assigned a preliminary conservation status of Endangered [EN B1ab(i, ii, iii, iv)+2ab(i, ii, iii, iv)].

10. *Xerochlamys villosa* F.Gérard

Comptes rendus de l'Association française pour l'Avancement des Sciences 1914 (sess. 43): 408 (1915). — Type: Madagascar, Prov. Toliara, massifs gréseux du mont Vohibasia, dans le bassin du Mangoky, dans le sud-ouest de l'île, 500 m, [21°41'S, 45°20'E], VIII.1910, fr., *Perrier de la Bâthie* 3011 (holo-, P! [P00389140]; iso-, P! [P00389141]).

Xerochlamys luteola H.Perrier, *Bulletin de la Société botanique de France* 128: 57 (1931). — Type: Madagascar, Prov. Fianarantsoa, Isalo, près de Ranohira, grès, [22°11'S, 45°10'E], 800 m, X.1924, fr., *Perrier de la Bâthie* 16694 (holo-, P! [P00389142]; iso-, MO!, P! [2 sheets: P00389143-44]).

ADDITIONAL MATERIAL EXAMINED. — **Madagascar.** Prov. Fianarantsoa, between Tametsoa and Sahanafy, [22°18'S, 45°22'E], 700-1100 m, 30.I.1955, *Cours* 5045 (K, MO, P). — Parc national d'Isalo, [22°33'S, 45°25'E], II.1963, *Bosser* 17245 (MO, P, TAN). — *Idem*, rebords est de l'Isalo à l'ouest de Ranohira, [22°36'S, 45°23'E], 31.XII.1962, *Chauvet* 393 (K, MO, P, TEF). — *Idem*, 800 m, 29.I.1955, *Cours* 5041 (K, MO, P). — *Idem*, 10 km west of Ranohira, [23°16'S, 45°11'E], 810 m, 3.II.1975, *Croat* 30570 (MO, TAN). — *Idem*, 10 km southwest of Ranohira, [22°30'S, 45°15'E], 800-900 m, 27.III.1985, *Dorr et al.* 4182 (K, MO, P). — *Idem*, northwest of Ranohira, [22°33'S, 45°19'E], 800 m, 14.II.1990, *Du Puy et al.* MB659 (P, TAN); *Homolle* 1341 (P); *Homolle s.n.* (P). — Parc national de l'Isalo forêt d'Ampandrabe, 22°36'51"S, 45°20'45"E, 905 m, 19.XII.2001, *Hong-Wa & Ludovic* 38 (MO, P, TAN, TEF). — *Idem*, ouest de Ranohira, [22°11'S, 45°10'E], 800-1250 m, 29.I-10.IV.1955, *Humbert* 28698 (P). — 30.VII.1928, *Humbert & Swingle* 4992 (MO, P). — *Idem*, falaise au nord de Sakamalio, [22°26'S, 45°17'E], 21.IV.1967, *Jacquemin* 334 (P). — *Idem*, Ranohira-Sakaraha, [22°39'S, 45°21'E], 900 m, 8.VIII.1995, *Leeuwenberg & Rapanarivo* 14620 (K, MO, P, TAN). — *Idem*, 15 km southwest of Ranohira, [22°41'S, 45°16'E], 800 m, 1.II.1990, *Phillipson* 3408 (K, MO, P, TAN). — *Idem*, 34 km west of Ranohira along the Sahanafa trail, 1200-1500 m, 6.VII.1992, *A. Randrianasolo* 239 (MO). — *Idem*, à l'ouest de Ranohira,

[22°11'S, 45°10'E], 514-1268 m, 24.I.1955, *Service Forestier* 11672 (K, MO, P, TEF). — 17-18.VI.1958, *Service Forestier* 18574 (K, MO, P, TEF). — Ranohira, 22°37'04"S, 45°21'45"E, 871 m, 27.VI.2005, *Hong-Wa et al.* 380 (MO, P, TAN). — [22°33'S, 45°25'E], 800 m, 13.VII.1954, *Service Forestier* 14325 (P, TEF).

DESCRIPTION

Trees 4-8 m tall, trunk to 20 cm dbh; young twigs yellow-tomentose, older twigs glabrous. Leaf blades glossy bright green above, dull green beneath, broadly ovate or sometimes elliptic, 4-8 × 2-4 cm, chartaceous, with scattered trichomes on the abaxial midvein only when young, glabrous at maturity, base cordate to rounded, margin plane, apex rounded to emarginate, midrib yellow, slightly raised above, distinctly raised beneath, secondary veins prominent, 6-14 per side, 5-6 mm apart, looping 1-4 mm from the margin; petiole 4.5-11 mm long, glabrous. Flowers solitary, axillary, or rarely inflorescences axillary or terminal, with 2 flowers; peduncle 1-3 mm long, glabrous, pedicel absent to 1 mm long, glabrous. Involucre light brown, urceolate, 3-10 × 4-10, yellow tomentose with scattered white trichomes, teeth 12-20, 0.5-2.8 mm long; flowers 20-37 mm long at anthesis from apex of pedicel to apex of petals; sepals obovate, 5-12.5 × 4-9 mm, deeply emarginate, exerted 3-5 mm beyond the involucre; petals white, obovate, 17-27 × 8-15 mm, exceeding the involucre by 14-17 mm; disc 2-3.5 mm tall; stamens 24-47, 8-18 mm long; ovary ovoid, 3-4 mm high, style 7-17 mm long, basally pubescent, stigma 2-3 mm wide. Fruits ovoid to subglobose, 7-11 × 5.5-12 mm, exceeding the accrescent involucre by 2-7 mm; seeds black, ovoid, 2-4 mm long, 3-6 per fruit.

PHENOLOGY

Flowering and fruiting from December to July.

VERNACULAR NAME

Foto.

HABITAT

On sandstone in evergreen sclerophyllous *Uapaca bojeri* (tapia) woodland from 800-1200 m in sub-humid and subarid bioclimatic zones.

DISTRIBUTION

From Mt. Vohibasia to Isalo National Park in SW Madagascar (Fig. 4).

REMARKS

This species can be distinguished by its large (> 4 cm long) and broadly ovate, glabrous leaf blades that are glossy bright green above and dull green beneath, its distinct leaf venation, and its large white flowers subtended by a yellow-tomentose, urceolate involucre. Both *Xerochlamys villosa* and *X. undulata* are found around the Isalo massif, but field observations indicate that the former is abundant on rocky substrates whereas the latter grows in sandy areas. The two species clearly differ from each other by the length (≥ 4 cm long in *X. villosa* vs. < 4 cm long in *X. undulata*) and the shape (ovate vs. elliptic) of their leaf blades, the absence (vs. presence) of trichomes, the colour of the petals (white vs. pale yellow to white) and of the indumentum on the involucre (yellow vs. red).

Perrier de la Bâthie (1931) described *Xerochlamys luteola*, failing to recognize that it represented the same entity as *X. villosa*, which he erroneously placed in synonymy under *L. bojeriana*. Indeed, the type of *X. villosa* (Perrier 3011, the only material available to him at the time) differs from *X. bojeriana* in several notable ways, including leaf blade shape and size, petiole length, and the shape and size of the involucre. Although no additional material of *X. villosa* s.s. has been collected since the type was made, *X. luteola* is clearly the same taxon.

CONSERVATION STATUS

Xerochlamys villosa has only been recorded in less than five locations within and around the Isalo and Vohibasia National Parks. With an extent of occurrence of 938 km², an area of occupancy of 90 km², this species is provisionally considered Endangered [EN B1ab(i,ii,iii,iv)+2ab(i,ii,iii,iv)].

UNPLACED MATERIAL

Madagascar. Prov. Fianarantsoa: Ambatofinandrahana, 20°30'43"S, 46°46'31"E, 1475 m, 31.VII.2001, *Andriamihajarivo et al. 11* (MO, P, TAN, TEF). — [20°33'S, 46°48'E], 1600-1800 m, 9.II.1938, *Decary 13081* (MO,

P). — Andranofimoritra, bassin supérieur de l'Onilahy, [23°53'S, 46°31'E], 1000-1200 m, 19.XII.1928, *Humbert 7047* (P). — Itremo, eastern margin of the Itremo Massif, c. 19 km west of Ambatofinandrahana, 20°34'21"S, 46°34'54"E, 1580-1700 m, 10.III.2000, *Schatz et al. 3963* (MO).

REMARKS

The four specimens listed above could not be placed in any of the species recognized here because of their unusual morphology. The material represented by *Andriamihajarivo et al. 11* may be a hybrid between *Xerochlamys diospyroidea* and *X. bojeriana*, and likewise *Humbert 7047* may be the result of hybridization involving *X. diospyroidea* and *X. coriacea*, or they may be completely distinct entities that could be recognizable with additional collections. By contrast, material of *Decary 13081* appears to be related to *X. elliptica*, but cannot be accommodated therein because the leaf blades are broadly elliptic, deeply emarginate and lack the whitish coloration beneath, the secondary veins are not prominent and the specimen is described to be a small bush with pink flowers, whereas *X. elliptica* is a small tree generally with white flowers. The fourth specimen (*Schatz et al. 3963*) seems to represent nothing more than a variant of *X. bojeriana* as it has the same pubescent and elliptic (albeit almost cuneiform) leaf blade, which is also larger than usual; but these odd features, as well as the absence of reproductive organs on this specimen, preclude the confident assignment of a name.

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