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. iremoensis* 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
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; Rabehevitra & 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 Mediussella and Xerochlamys (L., Leptolaena; M., Mediussella; 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.

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<tr>
<th>Baker (1882)</th>
<th>Gérard (1915, 1919)</th>
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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 involucral 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 Mediussella 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, Mediussella 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 circumscribed Sarcolaena would simply shift the problem of morphological discordance from Leptolaena to Sarcolaena. The alternative of treating Mediussella 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, Mediussella 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 synonymsies 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 involucral 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, exsiccate 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/coldweb/form.do?model=SONNERAT wwsonnerat.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 cultivation, 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 SARCOLENAE

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 vernation traces; involucre soft ................................... Sarcolaena
   — Leaf blades always without vernation traces; involucre dry ............................. Xerochlamys

3. Leaf blades glabrous or pubescent; flower small, with < 15 stamens; fruit surface smooth; pericarp thin ................................................................................................ 4
   — Leaf blades always glabrous; flower large, with > 15 stamens; fruit surface sulcate; pericarp thick ............................................................................................................ Mediusella

SYSTEMATICS

Genus Mediusella (Cavaco) Hutchinson


DESCRIPTION

Small trees or shrubs; young twigs flattened, glabrous, older twigs glabrous, with white lenticels. Leaves simple, two-ranked, blades entire, without vernation 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 Ambobihiriraka .............................................................. 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


**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, apiculate acumenate, 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 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 involucrum 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]).
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, Mediusella 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 due to 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


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


**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 retruse 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 pubescent 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 obleng, 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, 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 ≤ 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. iremoensis
   — Erect shrub; largest leaf blades ≥ 2 cm long, dark green above, often whitish beneath; midvein green; petals white, rarely pink; from Ifity to Itremo .............. 6. X. elliptica

4. Leaf blades elliptic to sometimes ovate, margin plane; petiole ≤ 3 mm long; petals pink; from Miarinarivo-Arivonimamo 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. Vohibasia 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


Taxonomic revision of Medieuella and Xerochlamys (Sarcolaenaceae)

**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 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 brownomentum 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 Mirinarivo-Arionimamo 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 *Sarcocolaena 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 13938 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 36055 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.

**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, exserted 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,


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, exserted 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]).


**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 notho-


DESCRIPTION
Shrubs prostrate; young twigs tomentose, older twigs glabrous. Leaf blades glossy green above, green to yellowish beneath, narrowly elliptic, 1-2 x 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 x 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 x 3-5 mm, slightly emarginate, exserted 3-4 mm beyond the involucre; petals pink to white, oblong, 12-13 x 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 x 4.5-6 mm, exserted 1-2 mm beyond the accrescent involucre; seeds black, ellipsoid, 2-4 mm long, 4-7 per fruit. 

7. Xerochlamys iltremoensis
Hong-Wa, G.E. Schatz & Lowry, sp. nov. (Fig. 5)

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

TYPUS. — Madagascar. Prov. Fianarantsoa, Itremo, Massif de l’Itremo, Antsirakambiaty, végétation basse à Pachypodium brevicaule dominée par Xerochlamys,
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, *Xerichlamys itremoensis* is assigned a preliminary status of Endangered [EN B1ab(i,ii,iii,iv)+2ab (i,ii,iii,iv)].

*Xerichlamys 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. *Xerichlamys tampoketsensis* F. Gérard


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 x 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, exserted 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 19 780 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(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, involuco 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!).

**Description**

Shrubs; young and old 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, exserted 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


### Additional Material Examined


### Conservation Status

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, exserted 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 7-11 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


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.

Acknowledgements
I thank P. F. Stevens and P. P. Lowry II for critical comments on previous versions of this manuscript. I am also grateful to T. Haevermans and an anonymous reviewer for their constructive comments. The Missouri Botanical Garden’s office in Madagascar, the Association nationale pour la Gestion des Aires protégées (ANGAP), and Fanamby provided support towards the fieldwork. Great appreciation is owed to T. Andriamihajarivo, F. Ratovoson, N. L. Ravalomanarivo and L. J. Berthieu for field assistance and to R. L. Andriamihariosoa for the illustrations. I also acknowledge the following herbaria for making their collections available: MO, P, TAN
and TEF. This study was co-funded by the Christensen Research Scholarship awarded through the International Center for Tropical Ecology at the University of Missouri – St Louis and the Missouri Botanical Garden.

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Submitted on 7 July 2008; accepted on 18 May 2009.