



Cycas sancti-lasallei (Cycadaceae), a new species from the Philippines

E.M.G. Agoo¹, D.A. Madulid¹

Key words

cycad conservation
cycad taxonomy
Philippine *Cycas*
Philippine threatened plants

Abstract *Cycas sancti-lasallei*, a new species from Mindanao Island, the Philippines is described and illustrated. It can be distinguished from other *Cycas* species in the Philippines in having long leaves, undulating leaflets, and megasporophyll lamina with a semi-orbicular to orbicular base and triangular top with few but well-defined spines. A key to the species of *Cycas* currently described from the Philippines is provided.

Published on 14 September 2012

INTRODUCTION

In 2008, Lindstrom recognized ten *Cycas* species known from the Philippines namely *C. riuminiana* Porte ex Regel (Regel 1863), *C. wadei* Merr. (Merrill 1936); *C. curranii* (J.Schust.) K.D.Hill (Hill 1995); *C. edentata* de Laub. (De Laubenfels & Adema 1998); *C. zambalensis* Madulid & Agoo (Madulid & Agoo 2005); *C. aenigma* K.D.Hill & A.Lindstr., *C. lacrimans* A.Lindstr. & K.D.Hill, *C. nitida* K.D. Hill & A.Lindstr., *C. saxatilis* K.D.Hill & A.Lindstr., and *C. vespertilio* A.Lindstr. & K.D.Hill (Lindstrom et al. 2008). Eight of the ten *Cycas* species are endemic to the Philippines and two, *C. edentata* and *C. riuminiana*, also occur in other parts of Malesia. Natural populations of these species are found in mountains (*C. curranii*, *C. lacrimans*, *C. riuminiana*, *C. vespertilio*), as well as in specific habitats like *C. edentata* in rocky or sandy coastal areas, *C. nitida* and *C. wadei* in open grasslands, *C. saxatilis* confined to steep karst limestone cliffs and *C. zambalensis* in ultramafic soils. *Cycas aenigma* is known only in cultivation. Because of the demand for horticultural trade and destruction of their habitats, the natural populations of many of these species have become threatened. In the 2011 IUCN Red List of Threatened Species *C. curranii*, *C. wadei*, and *C. zambalensis* are listed as Critically Endangered, *C. riuminiana* as Endangered, *C. saxatilis* as Vulnerable, and *C. edentata* as Near Threatened (IUCN 2011).

Recent field surveys by the authors yielded several undescribed *Cycas* species in the Philippines. One of these, which is found in disturbed lowland evergreen rain forests and a reforestation site planted mostly with exotic species in Misamis Oriental, Mindanao, is being described in this paper.

KEY TO THE SPECIES OF PHILIPPINE CYCAS

1. Seeds ribbed 2
1. Seeds not ribbed 4
2. Seeds with 5–6 shallow ribs *C. wadei*
2. Seeds with more than 6 prominent ribs 3
3. Leaves 180–260 cm long, petiole 35–55 cm long, 15–30 % of entire leaf length; leaflets 150–360; seeds \geq 45 mm long *C. curranii*

3. Leaves 160–190 cm long, petiole 40–60 cm long, 25–35 % of entire leaf length; leaflets 100–380; seeds, \leq 40 mm long *C. saxatilis*
4. Megasporophyll lamina entire, without teeth 5
4. Megasporophyll lamina with teeth 6
5. Megasporophyll lamina not winged shaped; seeds flattened ovoid, 45–66 by 35–50 mm *C. edentata*
5. Megasporophyll lamina winged shaped; seeds obovoid, 36 by 27 mm *C. vespertilio*
6. Leaflets undulating; lateral spines of megasporophyll along triangular top of lamina *C. sancti-lasallei*
6. Leaflets not undulating; lateral spines of megasporophyll on the margins of the lamina 7
7. Petiole and rachis very tomentose, leaflets rigid and stiff *C. zambalensis*
7. Petiole and rachis not tomentose, leaflets not rigid and stiff 8
8. Leaves long, 220–300 cm; megasporophyll lamina lanceolate *C. aenigma*
8. Leaves short, less than 200 cm long; megasporophyll lamina not lanceolate 9
9. Leaves drooping; seeds without spongy endotesta *C. lacrimans*
9. Leaves not drooping; seeds with spongy endotesta . . 10
10. Apical spine of microsporophyll prominent, 13–23 mm long; seeds flattened ovoid, spongy endotesta on upper half or at the apical portion of the endosperm, 10–15 mm thick *C. nitida*
10. Apical spine of microsporophyll short, up to 10 mm; seeds ovoid, spongy endotesta very thin, less than 1 mm, surrounding the endosperm *C. riuminiana*

DESCRIPTION OF SPECIES

Cycas sancti-lasallei Agoo & Madulid, *sp. nov.* — Fig. 1, 2

A congeneribus philippinensibus foliis longis (2.2–3 m), pinnulae undulatis, megasporophyllorum laminis basi semi-orbiculari ad orbiculari apice triangulari spinis lateralibus distinctis spina apicali brevi differt. — Typus: *Agoo 10-085* (holo PNH; iso DLSU), Philippines, Mindanao, Misamis Oriental, Cagayan de Oro, Cugman River Watershed, disturbed lowland forests, March 2010.

Etymology. The species is named in honour of Saint John Baptiste de la Salle, the patron saint of teachers and founder of the De La Salle Schools.

¹ Biology Department, De La Salle University-Manila, Taft Avenue, Manila, The Philippines;
corresponding author e-mail: esperanza.agoo@dlsu.edu.ph.

Table 1 Comparison of morphology of *C. sancti-lasallei* with other closely similar species.

	<i>C. edentata</i>	<i>C. vespertilio</i>	<i>C. sancti-lasallei</i>
Height	to 10 m	to 3 m	to 5 m
Leaf length	130–230 cm	128–210 cm	220–300 cm
Leaflet number per side	100–200	93–117	60–162
Leaflet length	12–37 cm	18–27 cm	18–35 cm
Leaflet width	1.1–1.9 cm	1–1.4 cm	0.8–1.5 cm
Leaflet shape	slightly recurved, not undulating	slightly falcate; sometimes undulating	slightly falcate; undulating
Petiole length	30–90 cm	46–52 cm	45–63 cm
Pinnacanth	many	many	absent or very few, to 13 spines on each side
Megasporophyll length	24–50 cm	17–19 cm	30–43 cm
Megasporophyll lamina	lanceolate	rhomboid, winged	semi-orbicular to orbicular; top triangular; brown tomentose
Megasporophyll sterile part length	43–120 mm	16–18 mm	basal orbicular part: 25–35 mm top triangular part: 20–40 mm
Megasporophyll sterile part width	20–40 mm	32–35 mm	basal orbicular part: 25–38 mm top triangular part: 18–28 mm
Teeth number and dimensions	indistinct	none	7–9 spines; basal ones: 4–11 by 1 mm; top ones: 10–11 by 1 mm
Apical spine length	14–40 mm	35–38 mm	25–50 mm
Seed shape	flattened ovoid	obovoid	ovoid
Seed number	2–4 pairs	3–4 pairs	1–3 pairs
Seed length	45–70 mm	30–36 mm	45–50 mm
Seed width	35–50 mm	25–27 mm	35–45 mm
Spongy endotesta layer	up to 15 mm	up to 1 mm	2–3 mm

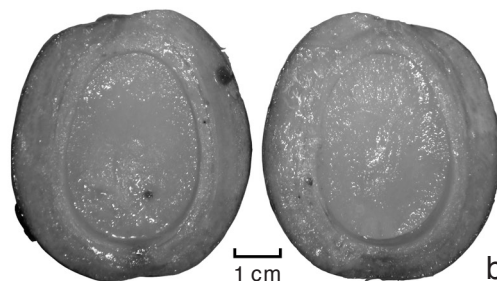
Stems arborescent, to 5 m high, to 20 cm diam, not swollen at the base; bark rough. Leaves green, glossy, 220–300 cm long, flat to somewhat keeled in section, tip terminated with a pair of leaflets; petiole 45–63 cm long, glabrous, pinnacanth absent or up to 13 pairs, 3 mm high; leaflets 60–162 on each side, 0.75–2 cm apart on rachis, margins slightly recurved, undulating, apex acute, not spinescent; basal leaflets 30 by 1.3–1.5 cm, 1.5–2 cm apart, inserted at 85–90° to the rachis; median leaflets 33–35 by 1.3–1.5 cm, 1–1.5 cm apart, inserted at 65–70° to the rachis; top leaflets 18–26 by 0.8–1 cm, 0.75–1 cm apart, inserted at 40–45° to the rachis; midvein raised above and below. Pollen cones not seen. Megasporophylls 30–43 cm long; brown tomentose; lamina at the base semi-orbicular to orbicular, 25–35 by 25–38 mm, margins smooth; at the top triangular, 20–40 by 18–28 mm, with 7–9 lateral spines, 4–11 by 1 mm; apical spine 25–50 by 3–5 mm. Seeds in 1–3 pairs, ovoid, 50 by 35–45 mm, sarcotesta yellowish, 5 mm thick,

fibrous layer absent, sclerotesta 1 mm thick, spongy endotesta 2–3 mm thick.

Distribution — Mindanao, Misamis Oriental, Cagayan de Oro, Cugman river watershed. Endemic.

Ecology & Habitat — In low elevation secondary forests and reforestation areas. Also found in cultivation in the vicinities of the watershed area.

Conservation status — Critically Endangered. Its extent of occurrence may be estimated to be less than 100 km² within the Cugman River Watershed, on the slopes of the highly urbanized Cagayan de Oro City. Intensive reforestation and ecotourism efforts are implemented only in a portion of its natural habitat. The area not within the scope of these protection efforts is vulnerable to habitat destruction through establishment of human settlements, orchards, domestic agri-crop gardens and industrial agricultural plantations. Collection of firewood and other non-timber forest products is also a threat to its habitat.

**Fig. 1** *Cycas sancti-lasallei* Agoo & Madulid. a. Megasporophyll; b. seeds.

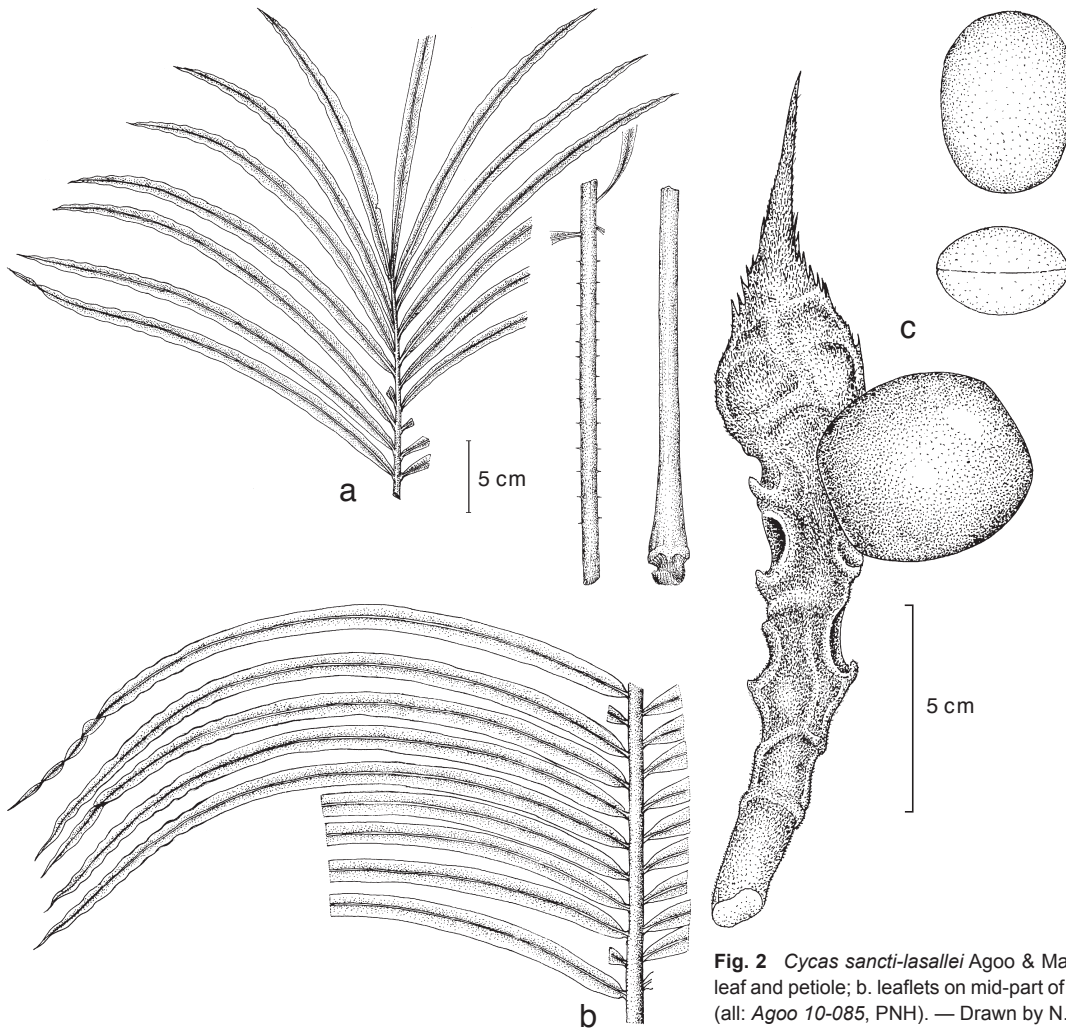


Fig. 2 *Cycas sancti-lasallei* Agoo & Madulid. a. Leaflets on upper part of leaf and petiole; b. leaflets on mid-part of leaf; c. megasporophyll and seeds (all: Agoo 10-085, PNH). — Drawn by N. Diego.

In a vulnerability assessment of the watershed (Pasco & Picut 2011), it was noted that the area is assessed as low to highly vulnerable to landslide and soil erosion. The plants are also collected by the local people for ornamental purposes.

Specimens examined. MINDANAO, Misamis Oriental, Cagayan de Oro, Barangay Cugman, Sitio Malasag, Agoo 10-085 (holo PNH), Mar. 2010; Barangay Cugman, Sitio Malasag, Agoo 11-401 (PNH), Aug. 2011; Barangay Catanico, Agoo 11-402 (PNH), Aug. 2011; Barangay Cugman, Sitio Malasag, Mapawa Nature Park, Timola 001 (PNH), Sept. 2011.

Notes — The species can be distinguished from the other Philippine species by a combination of characters: long leaves, long petiole with very few to no spines, undulating leaflets, megasporophyll lamina with semi-orbicular to orbicular base, which then gradually narrows to a triangular tip with 7–9 well-defined lateral spines, and further narrowing into an apical spine.

Leaflet undulation is a consistent character for all the individuals observed in its entire range of distribution. Lindstrom et al. (2008) noted that *C. vespertilio* has undulating leaflets but our observations show that this character is not consistent for this species.

The seeds of *C. sancti-lasallei* are larger than *C. vespertilio*. The spongy endotesta of *C. sancti-lasallei* is also 2–3 times thicker than the sclerotesta while that of *C. vespertilio* is very thin. The seeds float in water.

A specimen (NSW 403470) from a cultivated plant by S. Walkley of Burpengary, Queensland of unknown provenance in the Philippines resembles this species. Another specimen (*Lastimoso & Callado s.n.*) from a female plant cultivated in Calinog, Iloilo,

Panay Island also shows similarities with this species, however, its provenance also cannot be verified or confirmed.

Acknowledgements The authors would like to thank For. John Rey Callado of the Philippine National Museum for assisting in the assessment of the conservation status of the species; Mr. Ernesto Pelaez and For. Jonathan Primne of E. Pelaez Ranch Inc. for providing assistance and access to the Mapawa Nature Park; Department of Environment and Natural Resources, Cugman for assistance and access to their garden; Nemesio Diego, Botany Division, Philippine National Museum, for the illustrations; and Dr. Jan Frits Veldkamp, NCB Naturalis, section NHN, Leiden, the Netherlands for the Latin translation.

REFERENCES

De Laubenfels DJ, Adema F. 1998. A taxonomic revision of the genera *Cycas* and *Epicycas* gen. nov. (Cycadaceae). *Blumea* 43: 351–400.
 Hill KD. 1995. Infrageneric relationships, phylogeny and biogeography of the genus *Cycas* (Cycadaceae). In: Vorster P (ed), CYCAD 93, The 3rd International Conference on Cycad Biology, Proceedings: 139–162. Cycad Society of South Africa, Stellenbosch.
 IUCN. 2011. IUCN Red List of Threatened Species. Version 2010.4. www.iucnredlist.org. Downloaded on 9 Feb. 2011.
 Lindstrom AJ, Hill KD, Stanberg LC. 2008. The genus *Cycas* (Cycadaceae) in the Philippines. *Telopea* 12, 1: 119–145.
 Madulid DA, Agoo EMG. 2005. A new species of *Cycas* (Cycadaceae) from the Philippines. *Blumea* 50: 519–522.
 Merrill ED. 1936. A new Philippine species of *Cycas*. *Philippine Journal of Science* 50: 233–239.
 Pasco MM, Picut NG. 2011. Vulnerability assessment of Cugman River Watershed. IUFRO World Series 29: Asia and the Pacific Symposium Vulnerability Assessments to Natural and Anthropogenic Hazards. Kuala Lumpur.
 Regel E. 1863. *Cycas riuminiana* Porte. *Gartenflora* 12: 16–17.