



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

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## 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.

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## 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.

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**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,

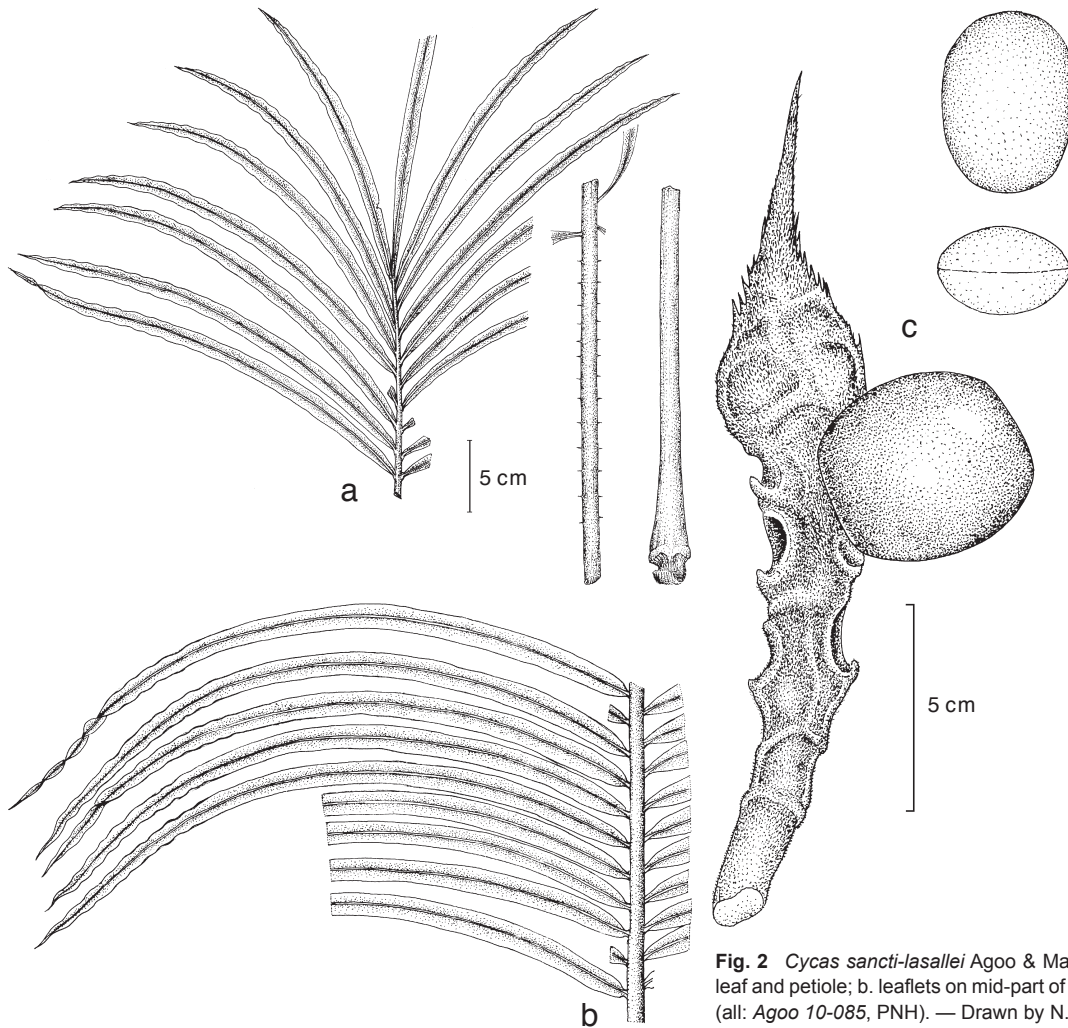
fibrous layer absent, *sclerotesta* 1 mm thick, spongy endotesta 2–3 mm thick.

**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 km<sup>2</sup> 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.

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