

## *Cycas seshachalamensis* (Cycadaceae), a new cycad from Andhra Pradesh, India

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(Accepted June 25, 2016)

### ABSTRACT

*Cycas seshachalamensis* (Cycadaceae), a new species from the Andhra Pradesh, India, is described and discussed. The new species is distinguished from *C. circinalis*, *C. spherica* and *C. swamyi* by its subterranean spreading stem on which a cylindrical trunk, base abruptly swollen, leaf with 145–231 leaflets, median leaflets 21–31.5 cm long, apex acute or spinescent, margins slightly curved; cataphylls pilose; microsporophyll sterile apex 0.6–1.1 cm long and apical spine 1.1–1.3 cm long, spreading or slightly upturned; megasporophylls 15–20 cm long with 8–12 ovules, ovule bearing lamina linear, 7–9 cm long, lateral spines 18–30, 2–4 mm long and apical spine 8–12 mm long; seeds shape subglobose.

**Keywords:** Cycadaceae, *Cycas seshachalamensis*, new species, Andhra Pradesh, India

### INTRODUCTION

*Cycas* L., a gymnospermous genus belong to the subclass Cycadidae under order Cycadales and family Cycadaceae (Christenhusz *et al.*, 2011b; Christenhusz *et al.*, 2011). Globally, *Cycas* has ca. 100 species distributed in Madagascar, East Africa, India, Indo-China, Malesia, Japan, extending to Micronesia and Polynesia, Northern Territory and Western Australia, Southeastern Taiwan (De Laubenfels & Adema 1998; Lindstrom *et al.*, 2009) and in India, it is represented by 12 species (Lindstrom & Hill, 2007; Singh & Radha, 2008; Singh *et al.*, 2015; Prasad *et al.*, 2015).

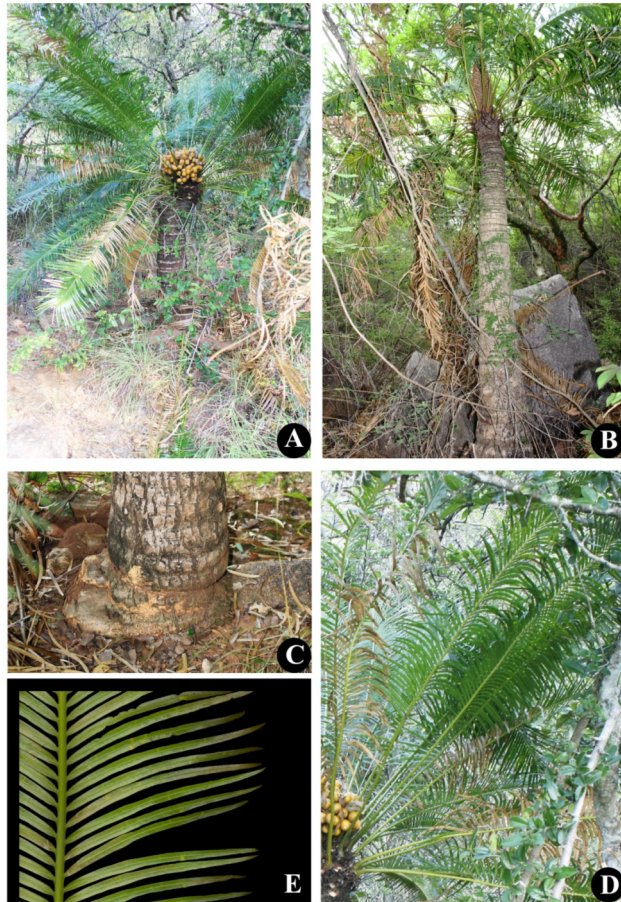
While inventorying the biodiversity of Seshachalam Biosphere Reserve (part of Eastern Ghats in Andhra Pradesh), authors have spotted interesting population of *Cycas* at the foot hills of the reserve in the Chamala forest Range, which were distinctly differing from the other species of *Cycas*. After critical examination of the specimens it is revealed that the seed and megasporophyll characters confer its position in the subsection *Cycas* of the section *Cycas*. The subsection *Cycas* represented by ca.16 species is distributed in India and Sri Lanka to Luzon, South and New Guinea (Lindstrom *et al.*, 2008 and 2009; Singh & Radha, 2008). In India, this subsection has great diversity and represented by 7 species (Lindstrom & Hill 2007; Singh & Radha, 2008). Perusal of literature revealed that certain characters of the specimens were not comparable to any of the known species in the subsection *Cycas*. Therefore, it is recognised as a new species. The novel species is allied to *C. circinalis*, *C. spherica* and *C. swamyi* but differ in many fetures which are tabulated here.

### Taxonomic treatment

*Cycas seshachalamensis* P.V. Chalapathi Rao, N.V. Sivaram Prasad, P. Madhu Babu, K. Prasad and P.V. Prasanna sp. nov.

**Type: INDIA.** Andhra Pradesh: Chittoor district, Seshachalam hills, Chamala Range, Bakarapet forest area, Mayurasarovaram, 520 m alt., 13° 38' 92.1" N, 79° 11' 26.1" E, 24 May 2012, N.V. Sivaram Prasad & P. Madhu Babu 401 (Holotype: CAL!; Isotype: 401 BSID!) (Fig. 1 & 2).

Subterranean spreading stem on which a cylindrical trunk, base abruptly swollen, 2–4.5 m tall, ca. 104 cm diam, branched or unbranched, bark light grey, ; bark thick with persistent leaf base. Leaves pinnate, deep green, glossy, 1.57–1.86 m long, leaflets 145–231, flat in section, not keeled, with brown tomentum shedding as the leaf expands, rachis consistently not terminated by a spine; petiole 26–37 cm long (15–30% of total leaf), glabrous, spinescent for 30–60% of length; spines short, straight, 2 mm long; basal leaflets not reduced to spines, linear, 14–18 cm long, 6–8 mm broad; median leaflets strongly falcate, linear, 21–31.5 cm long, 9–10 mm broad, decurrent for 8–10 mm, narrowed to 3–5 mm at base, 8–11 mm apart on rachis, margins slightly recurved; apex acute or spinescent; midrib strongly raised below and slightly raised above; apical leaflets paired, not reduced into spines, straight, linear, 12–16 x 0.6–0.7 cm. Cataphylls densely orange-brown pilose, pungent, narrowly triangular, 5.5–6.5 cm long, persistent. Pollen cones orange-brown or light



**Figure 1.** *Cycas seshachalamensis* A. Female Plant. B. Male Plant. C. Strongly swollen base. D. Leaves. E. Close of median leaflets.

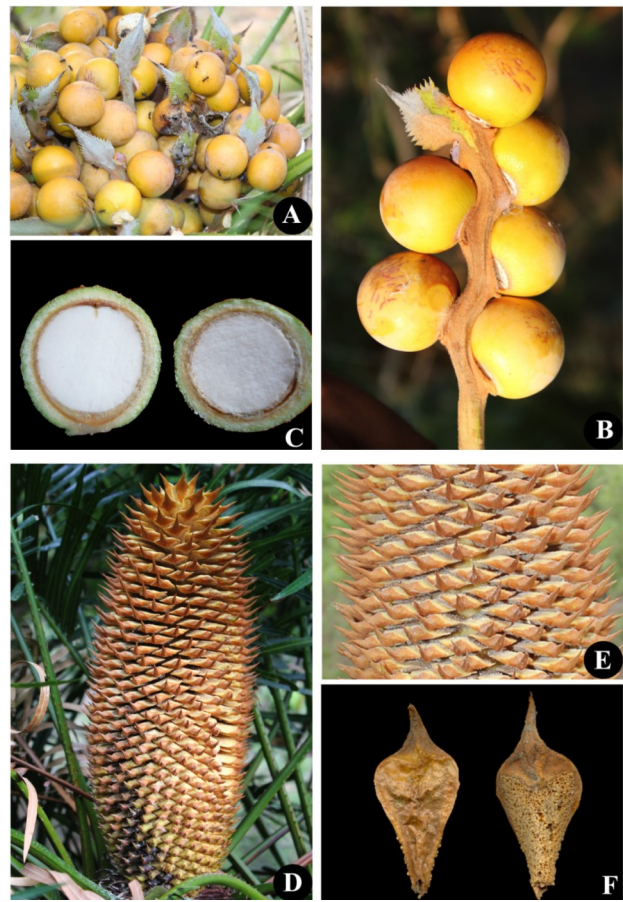
brown, fusiform, 26–30.5 cm long, 9–12 cm wide, sessile; microsporophyll lamina firm, not thickened dorsiventrally, 4–5.5 cm long, 1.6–2 cm wide, fertile zone 2.5–3.5 cm long, sterile apex 0.6–1.1 cm long; apical spine prominent, gradually raised, spreading or slightly upturned, 1.1–1.3 cm long. Megasporophylls covered with orange-brown or grey tomentose, tomentum persistent, 15–20 cm long; ovules 8–12, glabrous; ovule bearing fertile lamina linear, 7–9 cm long; sterile lamina broadly ovate, shortly dentate with 18–30 lateral spines; lateral spines short, 2–4 mm long, 1–2 mm wide; apical spine distinct from lateral spines, 8–12 mm long, 2–3 mm wide at base. Seeds subglobose, 2–3 cm long, 2–2.5 cm wide; sarcotesta green when young, turns yellow at maturity, 3–4 mm thick; fibrous layer absent; sclerotesta smooth, spongy layer absent.

**Phenology.** — February–May.

**Etymology.** — The specific epithet is named after the type locality, the Seshachalam hills from where the present novelty is distributed.

**Distribution.** — Rarely found in the foot hills of Seshachalam forests in Chittoor district of Andhra Pradesh.

**Habitat.** — Generally grows in dry deciduous forest at an elevation range from 200–600 m.



**Figure 2.** *Cycas seshachalamensis* A. Megasporophylls. B. Mature ovules. C. Cross section of ovules. D. Pollen cone. E & F. Close of up microsporophylls.

**Paratype.** — INDIA. Andhra Pradesh: Chittoor district, Seshachalam hills, Chamala Range, Bakarapet forest area, Near Mayurasarovaram, 540 m alt., 27 Dec 2012, N.V. Sivaram Prasad 409 (BSID!; SVUTY!); N.V. Sivaram Prasad, P.V. Prasanna & M. Sankar Rao 010309 (BSID!); 500 m alt., 09 Oct 2014 K. Prasad & P.V. Prasanna 006416 (BSID); 510 m alt., 30 Nov 2014, K. Prasad 006447 (BSID).

**Conservation status.** — *Cycas seshachalamensis* is now known only from Seshachalam hills in Chittoor district of Andhra Pradesh and its extent of occurrence (EOO) is less than 100 sq. km and the area of occupancy (AOO) is less than 10 sq. km and hence categorized as Critically Endangered (B1ab(iii,v)+2ab(iii,v)) following IUCN 11.0 version (IUCN Standards and Petitions Subcommittee, 2014).

## DISCUSSION

*Cycas seshachalamensis* sp. nov. is allied to *C. circinalis*, *C. spherica* and *C. swamyi* but differs in having Subterranean spreading stem on which a cylindrical trunk, base abruptly swollen; leaf with 145–231 leaflets; median leaflets 21–31.5 cm long, 9–10 mm broad, apex acute or spinescent, margins slightly curved; cataphylls pilose; pollen cones fusiform, microsporophyll sterile apex 0.6–1.1 cm long and apical spine 1.1–1.3 cm long, spreading

**Table 1.** A comparison morphological characters of *Cycas seshachalamensis* with *C. circinalis*, *C. spherica* and *C. swamyi*.

Characters	<i>Cycas circinalis</i>	<i>Cycas spherica</i>	<i>Cycas swamyi</i>	<i>Cycas seshachalamensis</i> sp. nov.
<b>Base of the stem</b>	Not subterranean	Not subterranean	Not subterranean, strongly swollen or not	Subterranean spreading stem on which a cylindrical trunk, base abruptly swollen
<b>Leaves</b>	Semiglossy	Semiglossy	Glossy	Glossy
<b>Leaves length (cm)</b>	150–270	95–185	75–150	157–186
<b>No. of leaflets for leaf</b>	54–110	55–130	70–150	145–231
<b>Petiole length (cm)</b>	34–70	27–50	15–30	26–37
<b>Median leaflet length(cm)</b>	22–36	18–27	13–21	21–31.5
<b>Median leaflet width (mm)</b>	9–14	7–12	6–9	9–10
<b>Median leaflet apex</b>	Softly acuminate	Softly acuminate	Spinescent	Acute or spinescent
<b>Median leaflet margins</b>	Flat	Flat or slightly decurved	Flat	Slightly curved
<b>Median leaflet midrib below</b>	Flat	Raised	Flat	Raised
<b>Cataphylls</b>	Thinly sericeous or lacking tomentum	Thinly sericeous or lacking tomentum	Thinly sericeous or lacking tomentum	Pilose
<b>Pollen cones</b>	Ovoid to conical	Narrowly ovoid	Oblong	Fusiform
<b>Pollen cones colour</b>	Light brown	Orange	Reddish-orange	Orange-brown or light brown
<b>Pollen cones length (cm)</b>	24–48	Ca. 45	Ca. 50	26–30.5
<b>Microsporophyll sterie apex (cm) long</b>	Ca. 0.5	Ca. 0.4	Ca. 0.5	0.6–1.1
<b>Microsporophyll apical spine length (cm)</b>	2–3.9	Ca. 1.7	2–3.9	1.1–1.3
<b>Megasporophylls length (cm)</b>	20–35	20–25	12–25	15–20
<b>Ovules</b>	4–14	3–8	4–10	8–12
<b>Lamina length (cm)</b>	2.7–4	2.8–4.3	4–6	7–9
<b>Lamina shape</b>	Lanceolate	Lanceolate	Lanceolate	Linear
<b>Lamina margin</b>	Regularly dentate	Shallowly pectinate or Regularly dentate	Regularly dentate	Dentate
<b>Lateral spines</b>	10–28	21–25	15–19	18–30
<b>Lateral spines length (mm)</b>	1–4	5–10	2–8	2–4
<b>Apical spine length (mm)</b>	14–34	17–29	13–34	8–12
<b>Seeds shape</b>	Elongated	Subglobose	Spherical	Subglobose
<b>Seeds length (cm)</b>	3–3.9	Ca. 2.5	2.5–4	2–3
<b>Sarcotesta</b>	Light yellow	Yellow	Brownish red at maturity	Green when young, becoming yellow at maturity

or slightly upturned; megasporophylls 15–20 cm long with 8–12 ovules, ovule bearing lamina linear, 7–9 cm long, lateral spines 18–30, 2–4 mm long and apical spine 8–12 mm long; seeds shape subglobose. Detailed comparison of 3 species is presented in Table 1.

### ACKNOWLEDGEMENTS

Authors gratefully acknowledge the logistic support provided by Sri A.V. Joseph, IFS, Principal Chief Conservator of Forest (Head of Forest Force) Andhra Pradesh. We Thank P. Radha & J.S. Khuraijam for valuable suggestions and Dr. P. Singh, Director, Botanical Survey of India, Kolkata for providing facilities. Grateful thanks to Dr. P. Venu & Dr. L. Rasingam, Botanical Survey of India, Deccan Regional Centre for encouragement. Authors thank all the forest officials and field staff of Tirupathi Wildlife circle, A.P. forest department.

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