



Aponogeton nateshii (Aponogetonaceae): A new species from India

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Abstract

A new species of *Aponogeton*, *A. nateshii* is described and illustrated here. The somatic chromosome count of the species is $2n = 30$.

Keywords: Concan, embryo, embryo appendages, Lateritic Plateau, Maharashtra, fresh water aquatic plant

Introduction

Globally the genus *Aponogeton* L.f. is represented by 57 species (The plant List, 2013) distributed in the tropical or subtropical regions of the Old World (Cook, 1996; Bruggen, 1985). In the revision of Indian Aponogetonaceae Yadav & Gaikwad (2003) reported 7 species viz., *A. appendiculatus* H. Bruggen, *A. bruggenii* S.R. Yadav & Govekar, *A. crispus* Thunb., *A. lakhonensis* A. Camus, *A. natans* (L.) Engl. & K. Krause, *A. satarensis* Sundararagh., A.R. Kulk. & S.R. Yadav and *A. undulatus* Roxb. Of these, *A. appendiculatus* H. Bruggen, *A. bruggenii* S.R. Yadav & Govekar and *A. satarensis* Sundararagh., A.R. Kulk. & S.R. Yadav are endemic to India.

During botanical exploration in the Ratnagiri district of Maharashtra we collected some interesting plants of *Aponogeton* in August 2014. After critical analysis and thorough literature survey (Yadav & Gaikwad, 2003; Cook, 1996; Bruggen 1985), it was revealed that the specimens belong to an undescribed species. It is now described and illustrated. In addition, mitotic chromosome studies were conducted to assess the relationship of this new species.

***Aponogeton nateshii* S.R. Yadav sp. nov. Fig. 1, 2**

Aponogeton nateshii resembles with *A. appendiculatus* with its appendaged embryo but differs in having a globular embryo with 16–20 spirally arranged

appendages (vs obovate embryo crowned with 4–6 appendages in *A. appendiculatus*). Other morphological differences between *A. nateshii* and *A. appendiculatus* are listed in Table 1.

Typus: INDIA, **Maharashtra**, Ratnagiri district, Rajapur, Karel, 16°33.839' N 73°21.396' E, 16 m, 24 Aug. 2014, V.S. Patil, A.R. Gholave, S.S. Kambale & S.R. Yadav SSK-294 (Holotypus CAL; isotypii BSI, K, & SUK).

Submerged freshwater aquatic perennial, 141–200 cm long. Rootstock tuberous; tubers 1.5–2 × 1.5–1.7 cm, ovate-elongate, often narrow below; roots fibrous, unbranched, developing from the top of the tuber. Leaves totally submerged, petiolate; petioles 9–16 cm long, channeled above, glabrous; laminae 17.5–30 × 5.5–6.8 cm, ovate - lanceolate, parrot green, shortly attenuate - rounded at base, acute-obtuse at apex, undulate at margin, main nerve prominent with 6 to 7 parallel nerves on either side. Spathes 0.9–1.9 × 0.9–1 cm, membranous, with 10–14 nerves, caducous, occasionally present at the tip of the spike, acute-acuminate, enclosing inflorescence when young. Peduncles 140–200 cm long, cylindrical; spike 9–25 cm long, simple or rarely biforked, densely flowered with flowers arranged along the axis facing in all directions. Tepals 2, persistent, 1–1.9 × 1–1.6 mm, obovate, obtuse, concave, 1-nerved,

fleshy, whitish, unequal. Stamens 6, in two whorls, 1.4–1.7 mm long, filaments 1–1.2 mm long, narrow above, anthers 0.4–0.5 × 0.4–0.6 mm, basifixed, bicelled, dehiscing longitudinally, pale yellow; pollen yellow. Carpels 3, 1–1.2 × 0.6–0.8 mm, stigma decurrent; ovary 0.25–0.40 × 0.35–0.45 mm, ovules usually 1 or rarely 2 per carpel. Follicles 3, ovoid, 6–12 × 4–8 mm, beak 3–4 mm long, curved, the appendages on follicle look like thorns arising longitudinally, at the top it looks like thorns but at the bottom they are lateral and scale-like; seeds 4–7.5 × 3–6.5 mm; pericarp smooth; embryo globular, 5–6 × 5.5–8.5 mm, with spirally arranged 15–20 ovate appendages; appendages 1.2–4.3 × 0.5–2.5 mm, grass-green.

Flowering & fruiting: August – September.

Habitat: The species grows in seasonal freshwater in a large pond on a lateritic plateau in Concan at an altitude of 16 msl. Common associates of the species are *Blyxa echinosperma* (C.B. Clarke) Hook.f., *Cleome chelidonii* L.f., and *Cryptocoryne spiralis* Fisch. ex Wydler.

Paratypes: INDIA, **Maharashtra**, Ratnagiri district, Rajapur, Karel, 08.08.2014, A.R. Gholve, S.S. Kambale & S.R. Yadav SSK- 303 (SUK!).

Etymology: Specific epithet honors Dr. S. Natesh, former adviser, Department of Biotechnology (DBT), Government of India, New Delhi, India for his valuable contribution to Plant Sciences.

Notes: Aquatic plants are known for high plasticity in vegetative characters and propagation through vegetative means. Embryos with appendages are not of common occurrence in *Aponogeton*; however it is reported in *A. appendiculatus* and presently

in *A. nateshii*. The former has embryo with 4–6 linear tortuous appendages while in the latter, the embryo is with 15–20 ovate-lanceolate spirally arranged appendages. Seed coat with appendages has been reported in *Cryptocoryne ciliata* (Roxb.) Fisch. ex Wydler (Griffith, 1847) and thought to be an adaptation towards anchoring of the embryo to the substratum. However in *Aponogeton nateshii* the appendages are green and seem to play role in photosynthesis (Sokoloff, pers. comm.). The embryos escape from decaying fruits and settle down in water at 2 meter depth on floor of pond where they germinate.

A. appendiculatus is usually found in brackish water; however it has also been collected by authors from river beds of fresh water at Kabini River, Mananthavady, Wayanad District, Kerala. *Aponogeton nateshii* is so far known only from one seasonal fresh water pond.

Chromosome number in the systematics of Aponogetonaceae are important to support the phylogenetic studies (Donald *et. al.*, 2000). Yadav and Gaikwad (2003) reported the cytology of 6 species and 2 interspecific hybrids of Indian Aponogetonaceae, $2n = 30$ (*A. appendiculatus*), $2n = 84$ (*A. appendiculatus* × *A. undulatus*), $2n = 74$ (*A. appendiculatus* × *A. undulatus*), $2n = 56$ (*A. bruggenii*), $2n = 32$ (*A. crispus*), $2n = 80$ (*A. natans*), $2n = 26$ (*A. satarensis*), $2n = 70, 74, 86$ (*A. undulatus*). In addition to an appendaged embryo, the chromosome number $2n=30$ in *A. appendiculatus* and *A. nateshii* also indicate a patristic relationship.

Distribution: The species is so far known only from type locality, ie. Karel, Rajapur, Ratnagiri District, Maharashtra, India.

Table 1. Comparison of important morphological characters of *A. appendiculatus* and *A. nateshii*.

Characters	<i>A. appendiculatus</i>	<i>A. nateshii</i>
Leaves	Elliptic-lanceolate	Ovate-lanceolate
Petiole	c. 30 cm long.	c. 16 cm long.
Lamina	c. 55 × 4.2 cm.	c. 30 × 6.8 cm.
Peduncle	c. 65 cm long; as long as leaves	c. 200 cm long; 5 times longer than leaves
Embryo	Obovate, crowned with 4–6 linear tortuous appendages in single whorl at the top of embryo.	Globular, covered with 15–20 spirally arranged ovate-lanceolate appendages

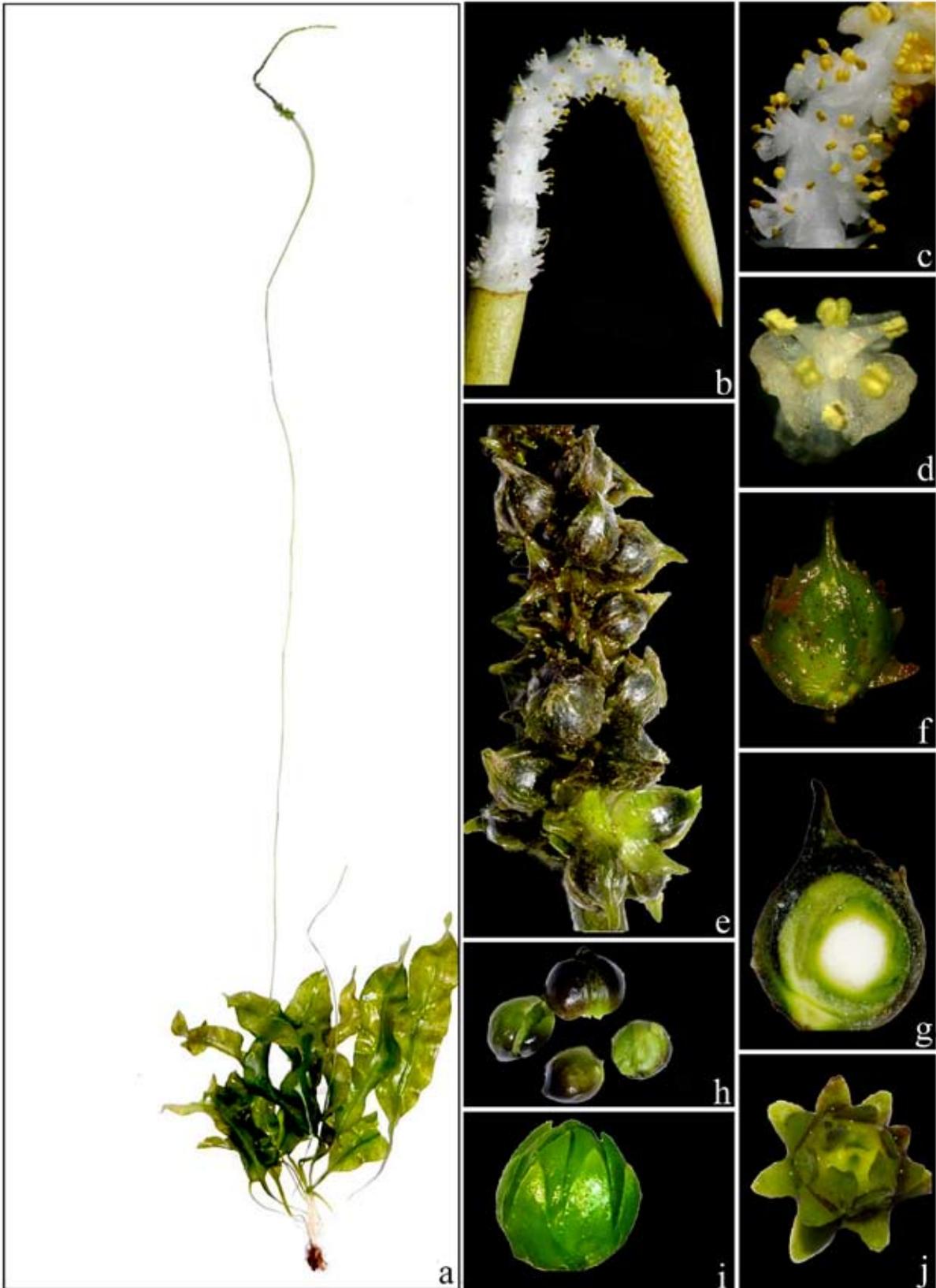


Fig. 1. *Aponogeton nateshii* S.R. Yadav *sp. nov.*: **a.** Habit: flowering plant; **b.** Inflorescence; **c.** Inflorescence: close-up; **d.** Single flower; **e.** Infructescence; **f.** Follicle; **g.** L.S. of follicle; **h.** Seeds with pericarp; **i.** & **j.** Embryo.

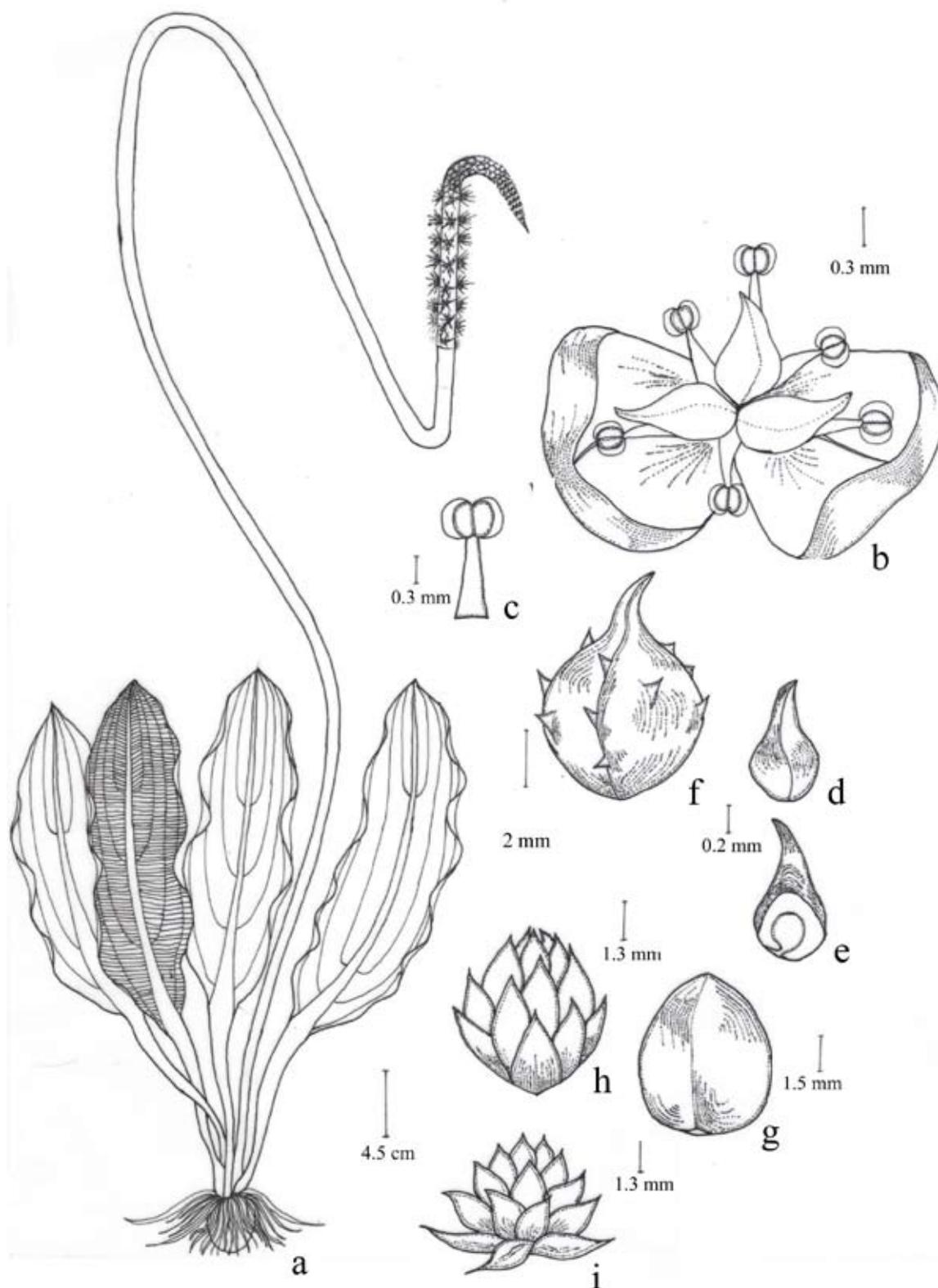


Fig. 2. *Aponogeton nateshii* S.R. Yadav *sp. nov.*: **a.** Habit: flowering plant; **b.** Flower; **c.** Stamen; **d.** Carpel; **e.** L. S. of ovary; **f.** Follicle; **g.** Seed; **h** & **i.** Embryo (Illustrated by Miss. V.S. Patil based on A.R. Gholave, S.S. Kambale & S.R. Yadav SSK - 294 & SSK - 303).

Conservation status: *Aponogeton nateshii* is so far known only from the type locality; it is assessed as Data Deficient (DD) following the IUCN Categories and Criteria (IUCN 2010).

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Literature cited

- Bruggen, H.W. van. 1985.** *Monograph of the genus Aponogeton (Aponogetonaceae)*. In: J. Grau, P. Hiepko & P. Leins (Eds), *Bibliotheca Botanica* **33(137)**: 1–76.
- Cook, C.D.K. 1996.** *Aquatic and Wetland Plants of India*. Oxford University Press, London.
- Donald, H.L., Michael, L.M., & W.L.J. Surrey 2005.** Phylogeny and systematics of *Aponogeton* (Aponogetonaceae): The Australian Species. *Syst. Bot.* **30 (3)**: 503–519.
- Griffith, W. 1847.** On the *Ambrosinia ciliata* of Roxburgh. *Trans. Linn. Soc. London, Bot.* **20 (2)**: 263–276.
- IUCN Standards and Petitions Subcommittee. 2010.** Guidelines for Using the IUCN Red List Categories and Criteria, Version 8. Prepared by the Standards and Petitions Subcommittee in March 2010.
- The Plant List. 2013.** Version 1.1. Published on the Internet; <http://www.theplantlist.org/> (accessed 30th July 2013).
- Yadav, S.R. & S.P. Gaikwad 2003.** A Revision of the Indian Aponogetonaceae. *Bull. Bot. Surv. India* **45**: 39–76.

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