Species

Rediscovery and critical notes on the existence of *Nymphoides aurantiaca* (Menyanthaceae) in Karnataka, India

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DISCOVERY SCIENTIFIC SOCIETY

ABSTRACT

During an exploration at the Western Ghats of Karnataka was collected an aquatic plant identified as *Nymphoides* species, after analysis of the plant parts identified as *Nymphoides aurantiaca* (Dalz.) O. Kuntze, which was rediscovered in the state after many years. This work gives color plate, herbarium, pollen and seed morphometry of the species with associated *Nymphoides hydrophyllum* (Lour.) Kuntze and *Nymphoides indica* (L.) Kuntze.

Keywords: Aquatic plants, Fimbrate margin, Bright yellow, Parasyncolpate pollen, pollen morphology, spheroidal seeds, Surface ornamentation.

1. INTRODUCTION

Nymphoides Seguier 56 accepted species and are cosmopolitan in distribution (POWO, 2025). India records ten species of *Nymphoides* (Shivrajan and Joseph, 1992; Punnakot et al., 2016). Dey *et al*., (2019) reported *N. aurantica* (Dalzell) Kuntze from Jalpaiguri, West Bengal, India with illustration. Flowering plants of Western Ghats reports six species from different states of Western Ghats (Nayar *et al*., 2014). Karnataka reports four species (Sanjappa and Sringeswara, 2019). Ravikumar *et al*., (2021) reported five species in his work Seed plant of Karnataka.

Ravikumar *et al*., (2021) reported *Nymphoides aurantiacum* from Karnataka and not included any district or region from Karnataka, but reported on the authority of Nayar *et al*., (2014). Nayar *et al*., (2014) in his work Flowering Plants of Western Ghats reported *Nymphoides aurantiacum* from Karnataka but not located in any district or region. The genus *Nymphoides* Seguier (Menyanthaceae) in India (Shivarajjan and Joesph, 1993) mentioned *N. aurantiacum* on the authority Meebold 9600 from Karnataka Concan region.

Light and scanning electron microscopic characterization of pollen grains of some wetland angiosperms from India reported *Nymphoides indica* has Parasyncolpate pollen (Oblate shape) with reticulate surface and *Nymphoides hydrophylla* has Parasyncolpate (Prolate shape) pollen with reticulate surface (Paul, *et al*., 2022).

Seed morphology of Indian species of *Nymphoides* reported nine species form India showing different variations in each seed. *N. peltata* has hairy outgrowths. *N. indica* has full blunt tubercles. *N. wightianum* has marginal single tubercle. *N.*

parvifolium has full tubercles all over the seed. *N. Sivarajanii* spreading clumped tubercles all over the seeds. *N. hydrophylla* shows tubercles with blunt apex in clumps (3-4). *N. macrospermum* shows full of tubercales with aculate surface. *N. krishnakesara* shows a foveate surface and broad based prickle like spines. *N. auranticum* shows spiny surface with a broad based spine with obtuse apex (Sivarajan, *et al.*, 1993).

2. MATERIAL AND METHODS

Study Area:

Yellapur taluk is located in the Uttar Kannada district of Karnataka state. Being located in the central part of the Western Ghats, it has evergreen and semi-evergreen forests. It receives the highest (3554.6 mm annual) rainfall during the monsoon season. It has an elevation ranging between 150 m to 600 m and is spread over 1313 km2. It includes three semi-evergreen forests, i.e., Angoda to the north-west, Telgeri to the northeast, and Sahasarahalli to the south-east. Kawadekeri lake is located in the Western Ghats of Sahasarahalli near Magod road with rich diversity of Trees, shrubs, climbers, herbs and fauna (Shreyas & Kotresha, 2022).

Micro (Pollen) and Macroscopic (Seed) analysis:

Pollens are studied under light microscope. Seeds were carefully mounted and evenly spread on carbon adhesive stubs using a fine paintbrush. The mounted samples were coated with gold using a mini sputter coater for 30 seconds at approximately 70 m Torr pressure. After sputter coating, the stubs were examined under a scanning electron microscope for microphotography, following the protocol described by Deshi *et al.,* (2025).

3. RESULTS & DISCUSSION

Taxonomic Treatment:

Nymphoides aurantiaca (Dalz.) O. Kuntze, Rev. Gen. PI. 1: 429. 1891; Subram., Aquat. Ang. 24. 1962; *Limnanthemum aurantiacum* Dalz. in Hooker's J. Bot. Kew Gard. Misc. 2: 136. 1850; Clarke in Hook. f., F1. Brit. India 4: 132. 1883; Gamble, F1. Madras 2: 883. 1923. Type: Dalzell s.n., India, Bombay (lectotype K); (Figure 1 & 2**).**

Annual or perennial. Rhizome short, developing a cluster of uniphyllous, petiole-like, primary fertile shoots. Secondary fertile branches from the node of the primary shoot, sympodial, trailing on the water surface with many floating, internodes 5-30 cm long; nodes occasionally rooting; roots fibrous, simple or branched, long. Leaves all fertile, floating, orbicular-rounded, deeply cordate at base with narrow sinuses, entire or sub-entire, green above, purplish and gland-dotted below, to about 8 cm across. Inflorescence 1-2 flowered arising from the junction of the branch and the petiole on the primary shoot and lateral on secondary shoots, subtended by a bract. Bract ovate or oblong, to 6 × 2 mm. Pedicel to 5 cm in fruits. Flowers bisexual, homostylous. Calyx deeply 5 lobed; lobes oblong-spathulate, glandular outside; apex purplish; margin membranous. Corolla yellow; tube 7 mm long; lobes 5 - 7 × 4 mm, obovate-oblong. Apex distinctly 2 lobed; margin with fimbriately toothed wings. Stamens as many as petals, inserted at the sinuses of the corolla, alternating with tufts of yellow, glandular hairs; filaments short. Pistil bottle-shaped, yellow; disc glands not seen; style short, stout; stigma faintly 5 lobed. Capsule ovoid or obovoid, apiculate, as long as or slightly longer than the fruiting calyx. Seeds 12- 15 in each capsule, light brown, discoid, 2 mm across; surface densely aculeate; testa cells faintly foveal with obscure junctures.

Key to species of *Nymphoides* based on morphology:

1a	Flowers yellow, fimbrate margin	***N. aurantiaca***
1b	Flowers white	**2**
2a	Flowers white, fimbarte margin	***N. indica***
2b	Flowers white, cristate on petals	***N. hydrophyllum***

Ecology: The plant is located in the edge of the pond. Associated with *Limnophila indica*, *Utricularia aurea*, *Cyperus sp.*, *Limnophila repens*, *Nymphoides cristata*, *Euricaulon sp.*, *Hydrilla verticiliata*.

Flowering and fruiting season: October-November.

Collector no.: 02; **Collection date:** 15-11-2025; **Accession no.:** UASB 5905 (Figure 8A).

Distribution in World: India [Kerala (Kozhikode district; Malappuram district; Palakkad district; Alappuzha district), West Bengal (Jalpaiguri), **Karnataka (Present record- Kawadekeri Lake, Yellapura, Uttara Kannada district)**; Sri Lanka.

Pollen morphometry: Pollen is oblate shape with 3 notches. Parallel ridges are seen on the margin of pollen. Syncolpate apertures are seen (Figure 3A).



Figure 1. A. ***Nymphoides aurantiaca*** located habitat with associated plants; **B.** Habit of *Nymphoides aurantiaca*

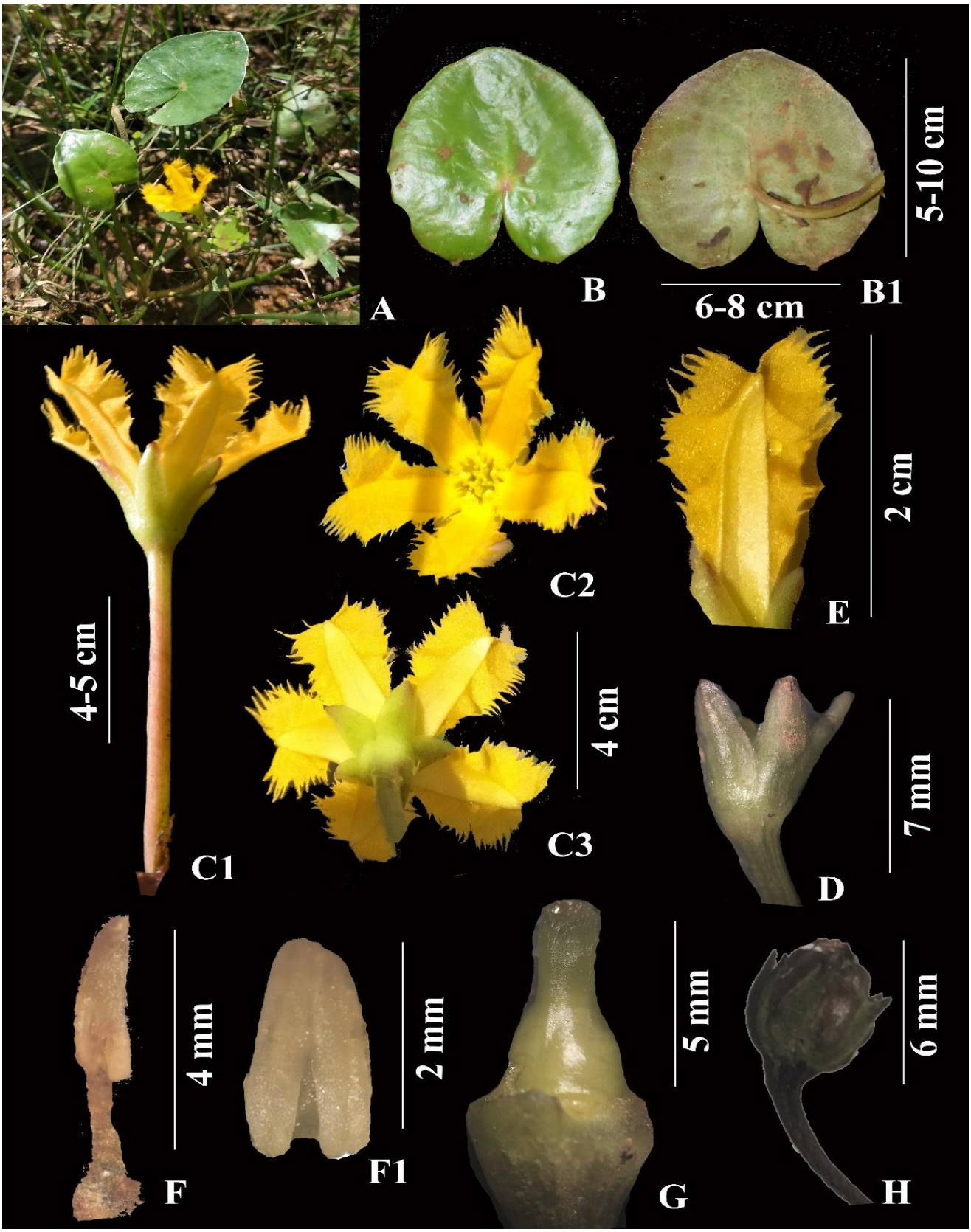


Figure 2. *Nymphoides aurantiaca* **A.** Habit; **B.** Dorsal leaf; **B1.** Ventral leaf; **C.** Flowers; **C1.** Flower side view with pedicle; **C2.** Top view of flower; **C3.** Back view of flower; **D.** Calyx; **E.** Single corolla showing fimbrate margin; **F.** Anther; **F1.** Anther lobe enlarged; **G.** Ovary with stigma and style; **H.** Fruit with pedicle (Photography by Dr. Shreyas Betageri)

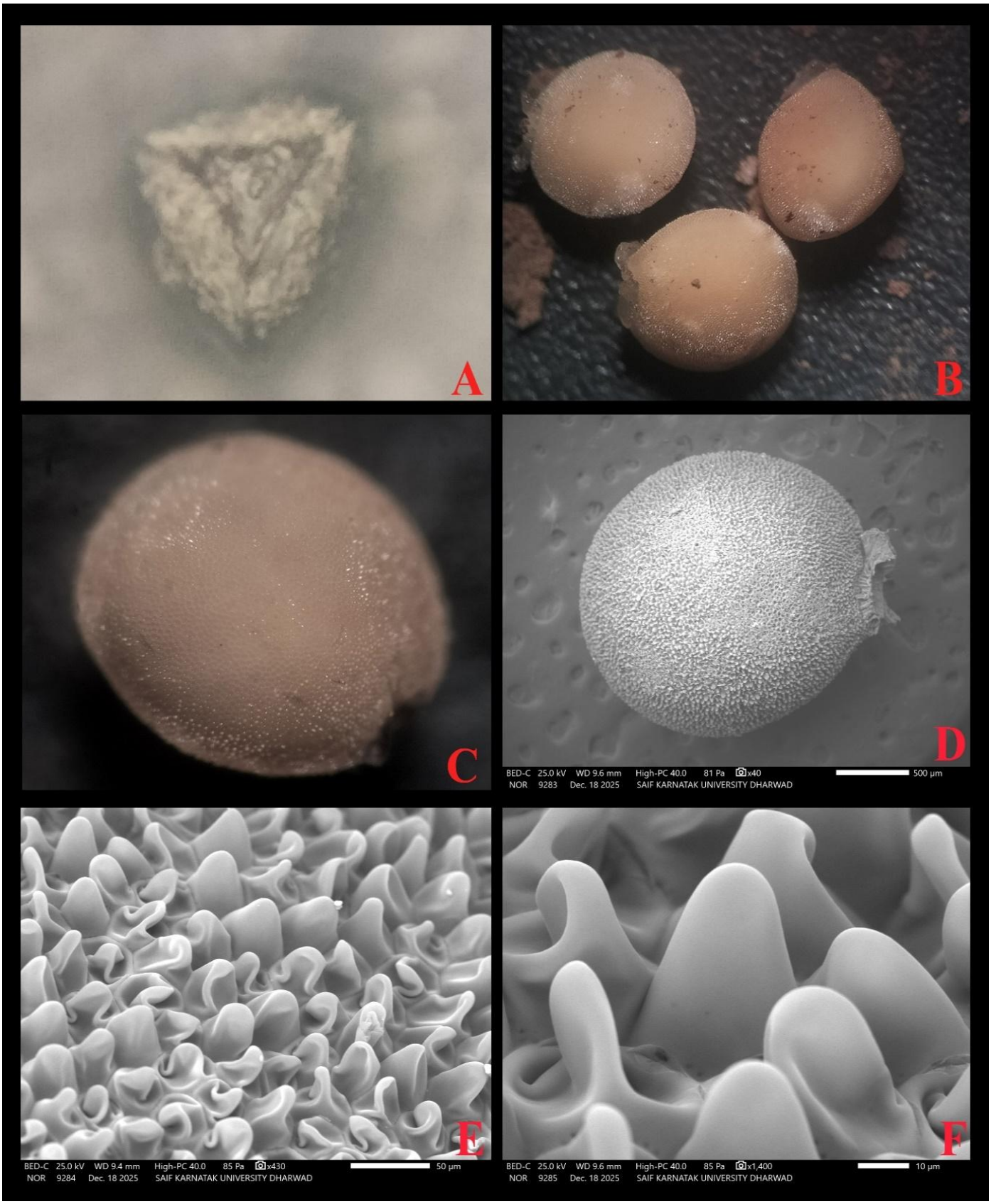


Figure 3. ***Nymphoides aurantiaca*** **A.** Pollen at 100X; **B.** Seeds; **C.** Single seed at 5x; **scanning micrographs of seed: D.** Single seed; **E.** Surface with spines; **F.** Single spine enlarged.

Nymphoides hydrophyllum (Lour.) Kuntze Revis. Gen. Pl. 2: 429 (1891); *Nymphoides cristata* (Roxb.) Kuntze in Revis. Gen. Pl. 2: 429 (1891); B. D. Sharma et al., Fl. Karnataka Anal. 174. 1984; Sanjappa & Sringeswara, Fl. of Karnataka, Vol. 2 Gymno. & Angio. 504. 2019; *Limnanthemum hydrophyllum* (Lour.) Griseb. in Gen. Sp. Gent.: 348 (1839); *Menyanthes cristata* Roxb., Pl. Coromandel. 2(1): 3. t.105.1799; Villarsia cristata (Roxb.) Spreng., Syst. Veg. 1: 582.1825; *Limnanthemum cristatum* (Roxb.) Griseb., Gen. Sp. Gent. 342. 1839; **(**Figure 5)

Rhizomatous annuals or perennials; rhizome 0.5-1.5 cm thick. Primary fertile shoots many, uniphyllous, arising from the axils of scales on the rhizome. Secondary shoots zig-zag, sympodial, many-jointed, each joint bearing a single floating leaf. Leaves all fertile, floating, 6-10 cm across, ovate to orbicular, base deeply cordate, gland-dotted below, membranous; petiole to 2.5 cm long. Flowers bisexual and female, in umbellate clusters of 10-20 at the junction of the branch and petiole; pedicels 3-4 cm long. Calyx deeply 5-partite; lobes 3-5 mm long, narrowly lanceolate. Corolla white with a yellow throat; tube c. 2 mm long with a ring of glandular hairs at the throat; lobes 5, 8 x 4 mm, with flexuous, membranous wings on the margins and a similar median longitudinal crest within. Stamens 5, highly reduced in female flowers. Ovary bottle-shaped with 5, minute, orbicular, disc glands at the base; stigmas 2-lobed. Capsule to 14 mm long, oblong. Seeds 4-6 in each capsule, to 2 mm across, discoid, brown.

Ecology: The plant is located at the deep water at shallow edge of the pond. Associated with *Utricularia aurea*, *Nymphoides cristata*, *Euricaulon sp.*, *Nymphea sp*.

Collector no.: 12; **Collection date:** 11-01-2026; **Accession no.:** HKSCD21472 (Figure 8B).

Flowering and fruiting season: January-March.

Distribution: Karnataka (Belagavi, Bengaluru, Chikkamagaluru, Chitradurga, Dakshina Kannada, Davanagere, Dharwad, Hassan, Mysuru, Tumakuru, Shivamogga, Uttara Kannada), throughout plains of India; South & South-East Asia.

Pollen morphometry:

Pollen is oblate shape with 3 notches. Parallel ridges are seen on the margin of pollen. Syncolpate apertures are seen. Exactly triangle at the center (Figure 4 & 5A).

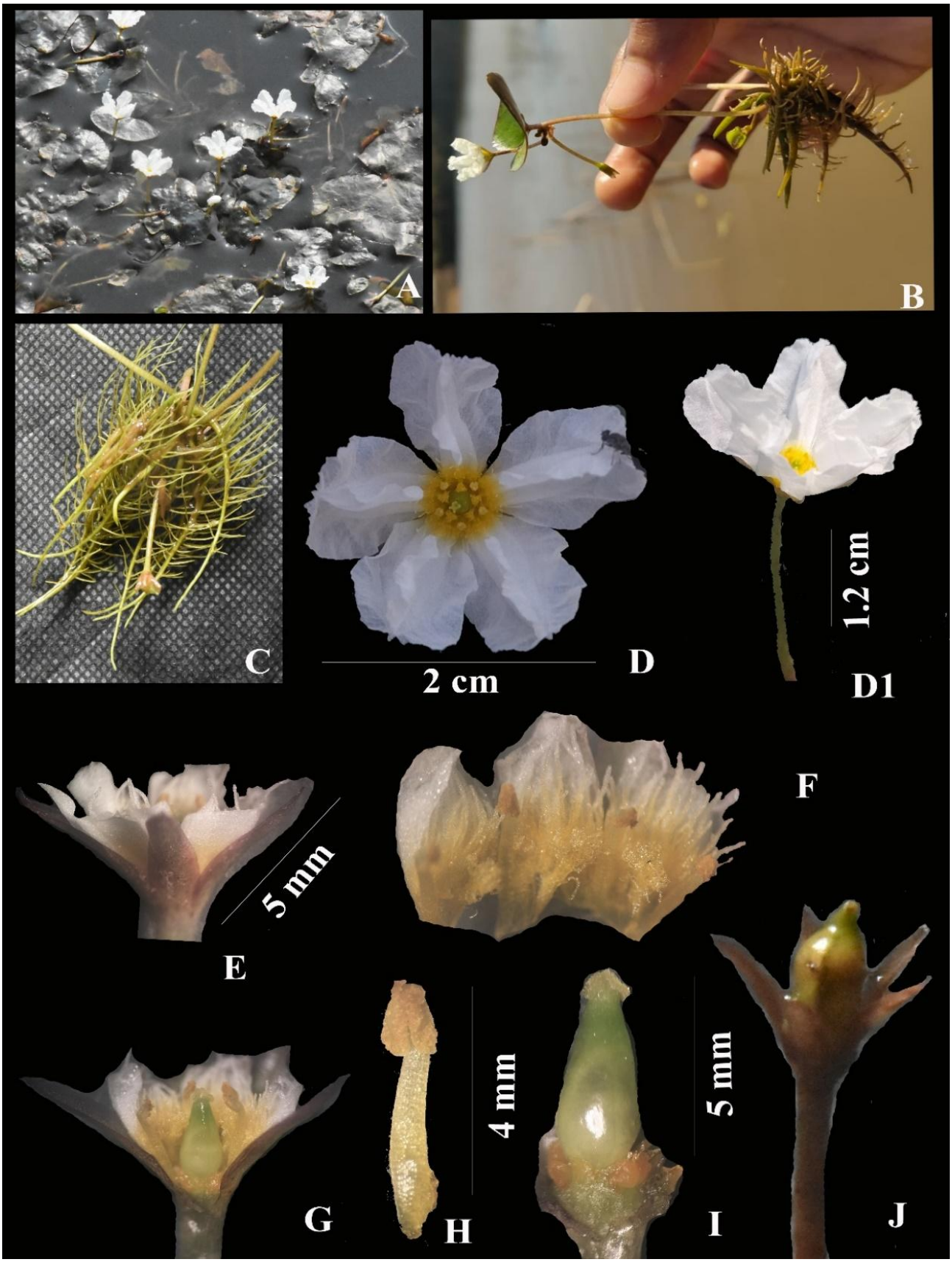


Figure 4. *Nymphoides hydrophyllum* **A.** Habitat; **B.** Single individual; **C.** Roots; **D.** Dorsal view of flower; **D1.** Side view of flower with long pedicel; **E.** Calyx; **F.** Anthers and fimbarte corolla; **G.** Cut open flower; **H.** Anther; **I.** Ovary with stigma and style; **J.** Fruit (Photography by Dr. Shreyas Betageri)

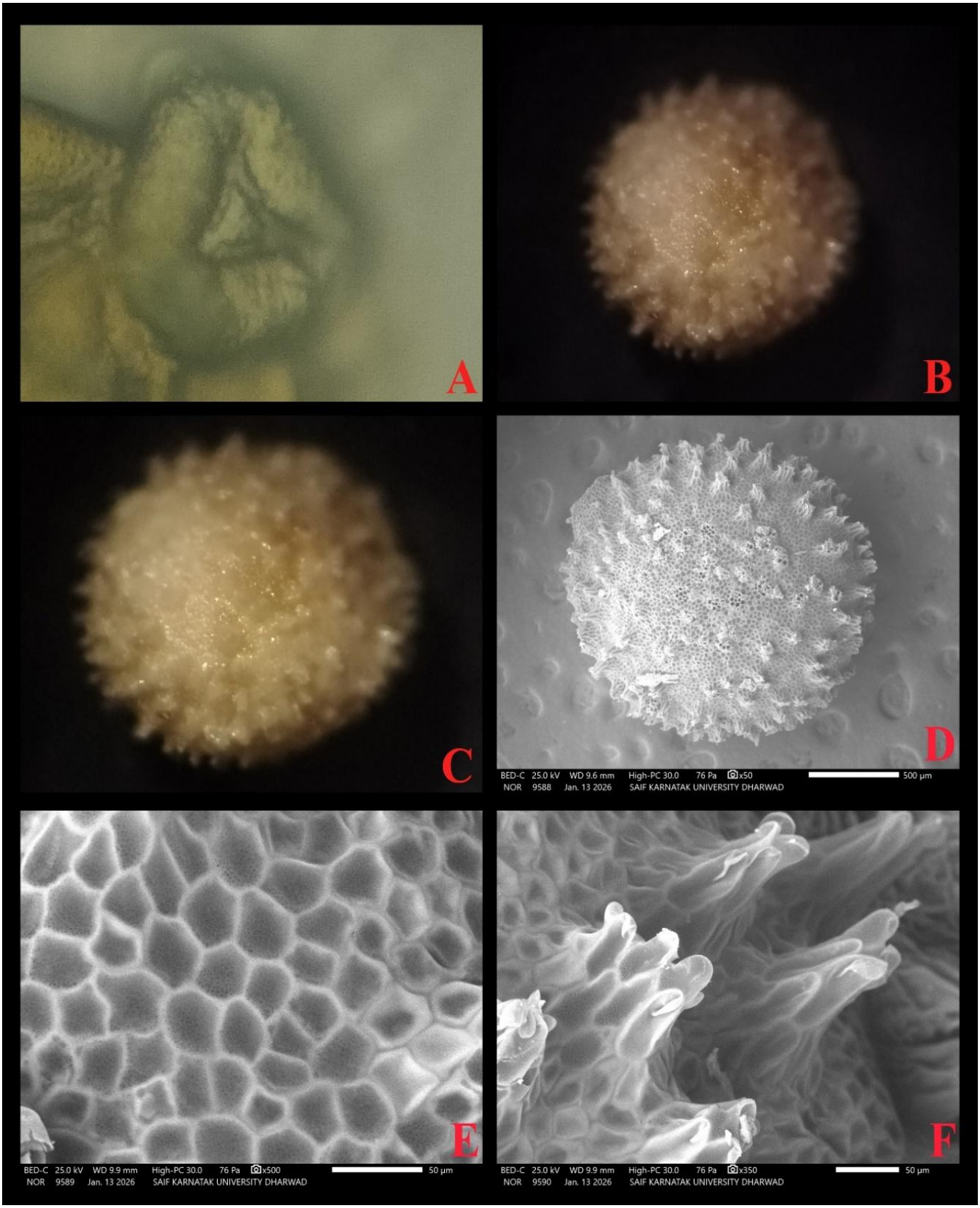


Figure 5. ***Nymphoides hydrophyllum*** **A.** Pollen at 100X; **B.** Seeds; **C.** Single seed at 5x; **scanning micrographs of seed: D.** Single seed; **E.** Surface of seed with penta and hexagonal testa cells with minute dots inside and tubercles; **F.** multiple tubercles enlarged

Nymphoides indica (L.) O. Kuntze, Rev. Gen. P1. 2: 429. 1891; Subram., Aquat. Ang. 24. 1962; Raynal, Adansonia Ser. 2: 14: 416. 1974; Cramer in Dassan. & Fosb., Rev. Handb. F1. Ceylon 3: 207. 1981; Nicols. et al., Inter- pret. Hort. Malab. 181. 1988; *Limnanthemum indicum* (L.) Griseb., Gen. Sp. Gent. 343.1838 & in DC., Prodr. 9: 139. 1845; Saladanha, Fl. Hassan. 833. 1976; Sharma *et al*., Fl. Karnataka Analysis, 174. 1984; Punekar & Lakshminarasimhan, Fl. Anshi. 465. 2014; Laxminarshimhan *et al*., Fl. Karnataka, 3: 58. 2019; Sanjappa & Sringeswara, Fl. of Karnataka, Vol. 2 Gymno. & Angio. 504. 2019; (Figure 6).

Annual or perennial, rhizomatous herbs. Rhizome 1-5 cm thick with prominent branch scars all along its length, sending out long solons which produce new plantlets. Primary fertile branches many, petiole-like, and uniphyllous, highly variable in length depending on the depth of water. Secondary branches sympodial, zig-zag, many-jointed, trailing on water surface; each joint uniphyllous; nodes often rooting. Leaves all cauline, fertile and floating, ovate-orbicular, rounded, deeply cordate at base with narrow sinuses, to about 30 cm across, glossy green above, pale and gland-dotted beneath, entire or sub-entire, thick, fleshy, brittle when dry. Petiole short, to 2 cm long. Flowers bisexual, distylous in umbellate clusters of 15-35, from the junction of the petiole and the branch, subtended by bract; bract ovate or oblong, to 8 × 5 mm. Pedicel 5-12 cm long. Calyx deeply 5 partite; lobes oblong-acute, green with hyaline margins, to 7 × 2 mm. Corolla white with a yellow throat; tube 2.5 mm; lobes 5, elliptic or oblong, acute, densely covered with long, white hairs within, to 15 × 5 mm. Stamens as many as corolla lobes, dimorphic, longer than the pistil in short-styled flowers and shorter than pistil in long-styled ones; filaments yellow. Pistil bottle-shaped; style stout, 1 mm in short-styled flowers, 3 mm in long-styled ones; stigma sinuately 4-8 lobed; hypogynous disc glands as many as stamens, orbicular. Capsules ellipsoid, torulose when ripe, as long as or shorter than the fruiting calyx. Seeds 5-10 in each capsule, brownish, discoid, surface with scattered clusters of tubercles; testa cells variously shaped, flat with thin, raised junctures.

Ecology: The plant is located at the deep water at shallow edge of the pond. Associated with *Utricularia aurea*, *Nymphoides cristata*, *Euricaulon sp*., *Nymphea sp*.

Collector no.: 10; **Collection date:** 11-01-2026; **Accession no.:** HKSCD21473 (Figure 8C).

Flowering and fruiting season: September-March.

Distribution: Karnataka (Belagavi, Bengaluru, Chikkamagaluru, Chitradurga, Dakshina Kannada, Davanagere, Dharwad, Hassan, Mysuru, Tumakuru, Shivamogga, Uttara Kannada), throughout plains of India; South & South-East Asia.

Pollen morphometry:

Pollen is oblate shape with 3 notches which are obtuse ends. Parallel ridges are seen on the margin of pollen. Syncolpate apertures are seen (Figure 7A).

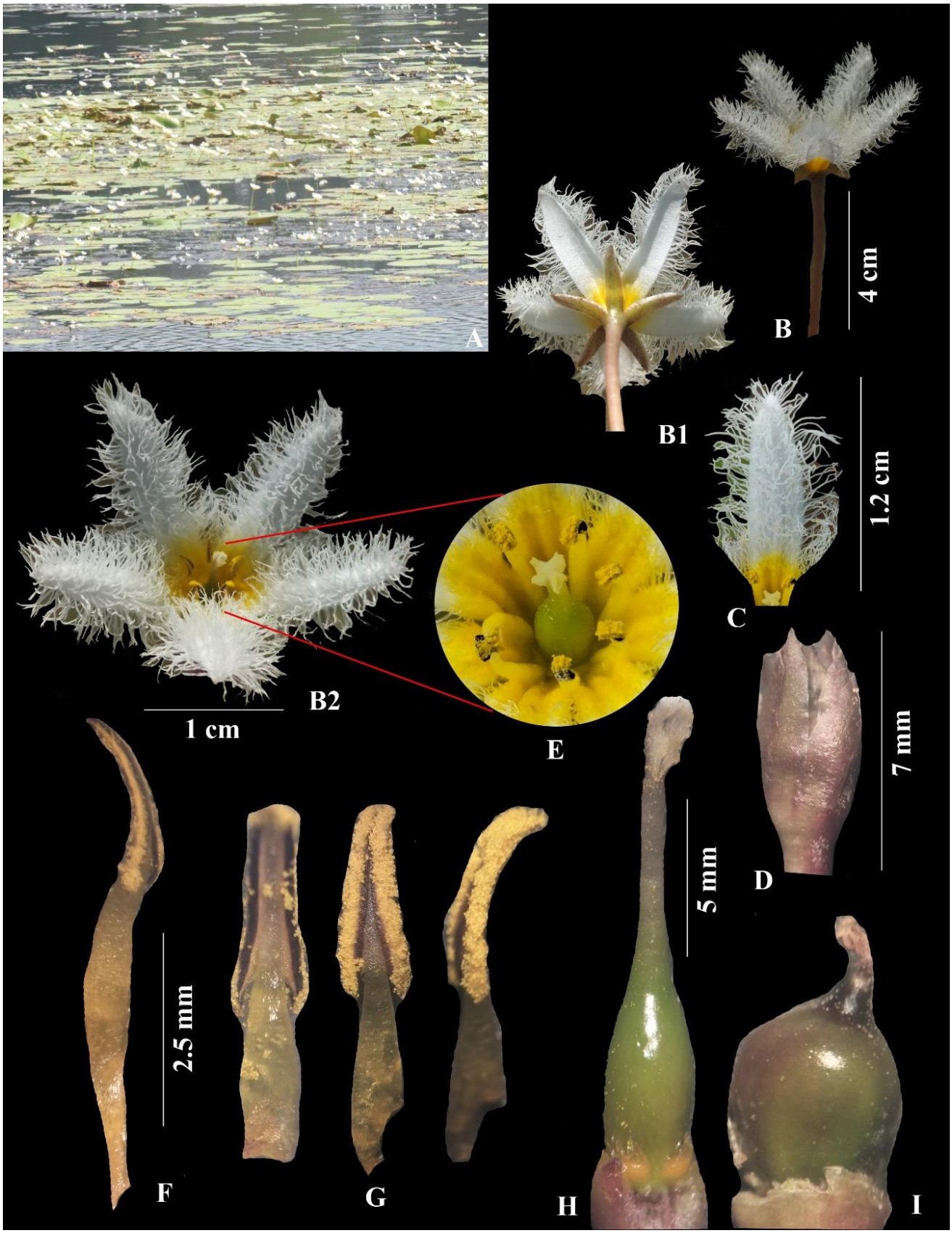


Figure 6. *Nymphoides indica* **A.** Habit; **B.** side view of flower with long pedicel; **B1.** Ventral view of flower; **B2.** Dorsal view of flower; **C.** Single corolla showing fimbrate margin; **D.** Calyx; **E.** Anthers and stigma; **F.** Anther and filament; **G.** Different sides of Anther lobe; **H.** Ovary with stigma and style; **H.** Fruit (Photography by Dr. Shreyas Betageri)

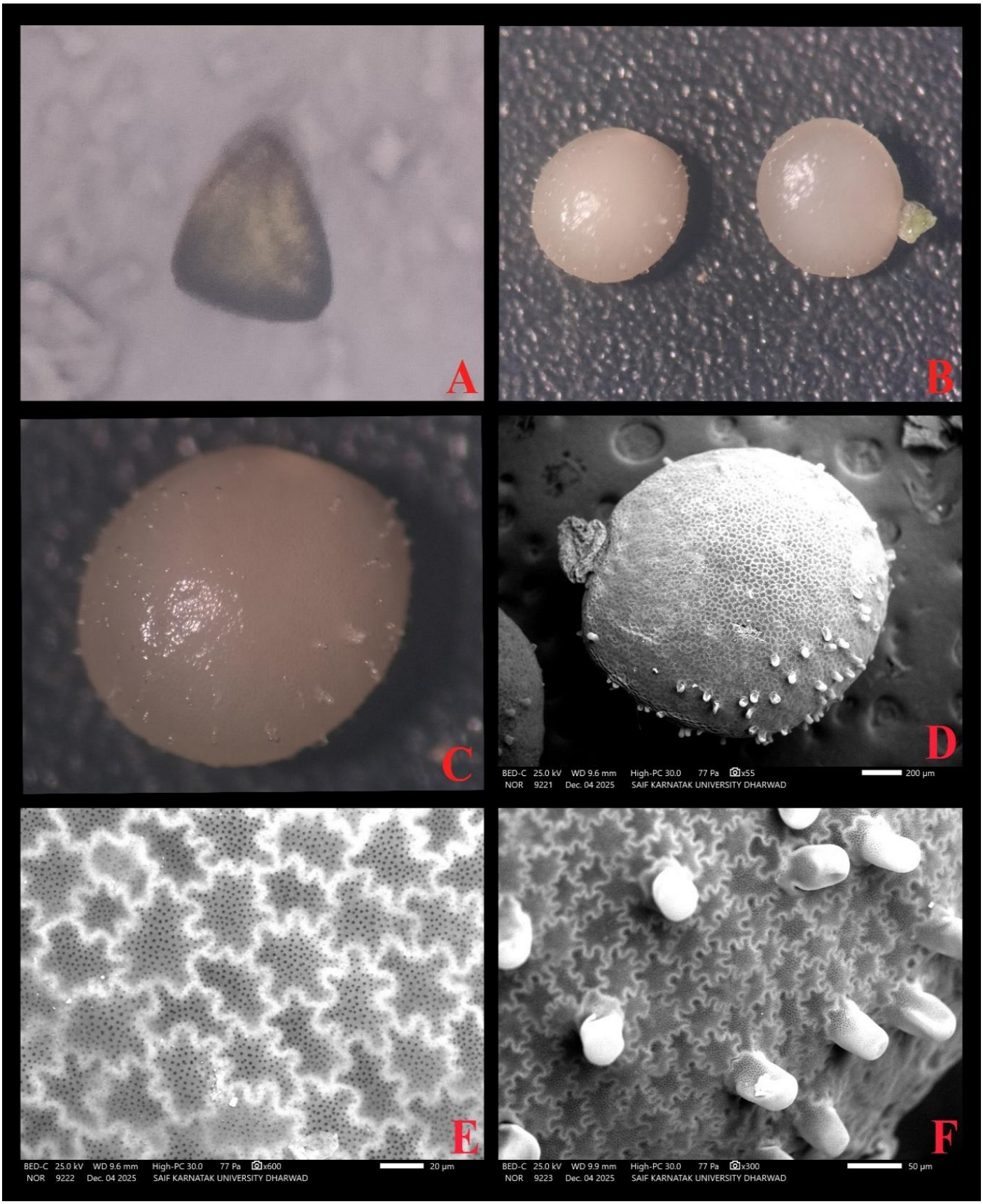


Figure 7. ***Nymphoides indica*** **A.** Pollen at 100X; **B.** Seeds; **C.** Single seed at 5x; **scanning micrographs of seed: D.** Single seed; **E.** Surface of seed with amoeboid testa cells with dots; **F.** Blunt spines enalrged**.**

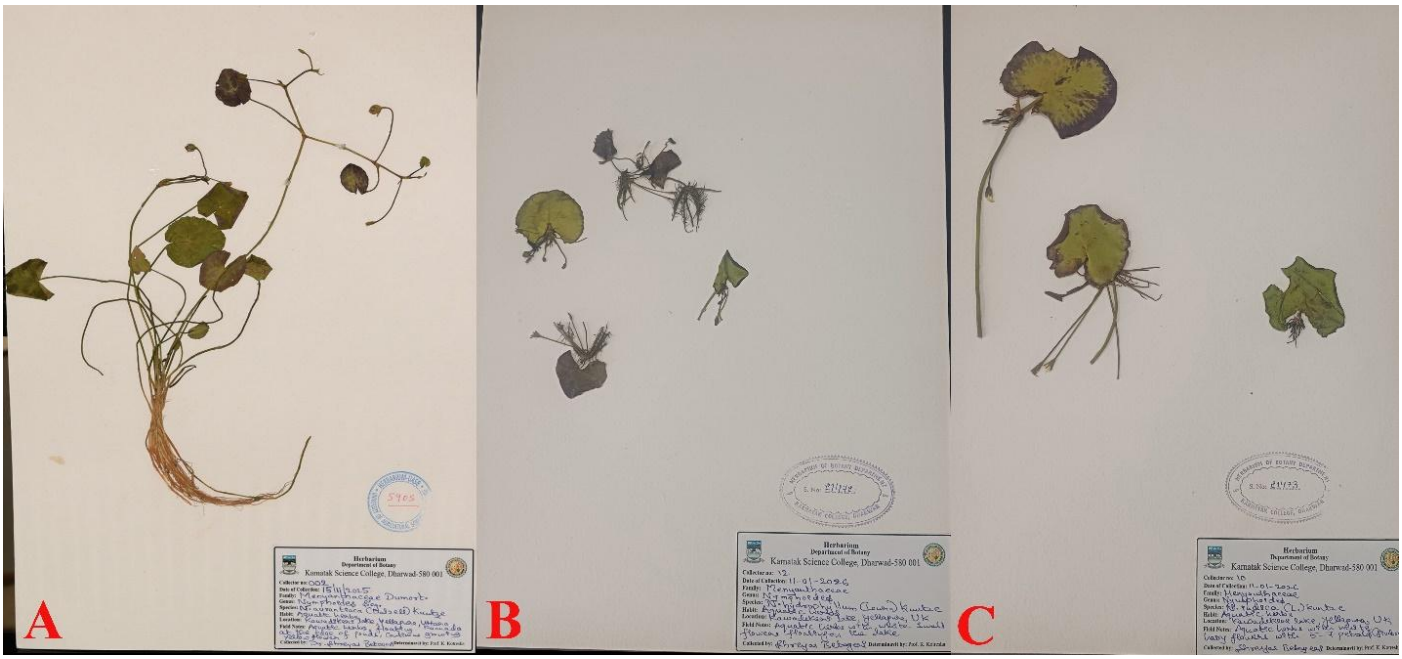


Figure 8. Herbarium deposited at University of Agricultural Science, Bangalore (*N. auranticum*- UASB5905) and Herbarium deposited at Karnatak Science College, Dharwad (*N. hydrophyllum*- HKSCD21472 & *N. indica*- HKSCD21473)

Seed morphometry of *Nymphoides* species in Karnataka:

Table 1. Parameters of seeds of *Nymphoides* species in Karnataka: Conducted seed morphometric analysis to confirm the species from the pond Kawadekeri lake with three species (Figure 3, 5, 7).

Scientific name	Shape of seed	Color of seed	L (mm)	B(mm)	L/B(mm)	Shape of testa cell	L (µm)	B(µm)	L/B(mm)	Spines	L (µm)	B(µm)	L/B(mm)
N. aurantiacum	Spherical	Cream-Orange	1.9	2.1	0.9	Spines	43.13	27	1.59	Present	-	-	-
N. cristata	Spherical	Cream-white	1.8	1.7	1.0	Tubercles with penta and hexagonal cells with dots	31.07	39.66	0.78	Tubercles	157.7	55.1	2.86
N. indica	Spherical	White	1.4	1.5	0.93	Amoeboid shape with edge spines	40.2	18.32	2.19	Marginal spines	69.41	39.51	1.75

Key to species of *Nymphoides* based on seed morphology:

1a	Spines present all over the seeds	***N. aurantiaca***
1b	Spines/tubercles	**2**
2a	Marginal spines with amoeboid testa cells	***N. indica***
2b	Tubercles all over seed with penta/hexagonal testa cells	***N. hydrophyllum***

Seed morphology of Indian species of *Nymphoides* reported *N. indica* has full blunt tubercles. *N. wightianum* has marginal single tubercles (Table 1). *N. parvifolium* has full tubercles all over the seed. *N. hydrophylla* shows tubercleas with blunt apex in clumps (3-4). *N. macrospermum* shows full of tubercles with aculate surface. *N. auranticum* shows spiny surface with broad based spine with obtuse apex (Sivarajan & Joseph, 1993). As per present study *N. aurantiacum* reports spherical shape (Cream Orange) and 1.9×2.1 (Length and Breadth). *N. cristata* reports spherical shape (Cream white) and 1.8×1.7 (Length and Breadth). *N. indica* reports spherical shape (white) and 1.4×1.5 (Length and Breadth).

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Conflict of Interest

The authors declare that they have no conflicts of interests, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Informed consent

Not applicable.

Ethical approval & declaration

In this article, as per the plant regulations followed in the J.S.S Banashankari Arts, Commerce and Shantikumar Gubbi Science College, Vidyagiri, Dharwad, Karnataka, India & Taxonomy and Floristic Laboratory, Department of UG, PG & Research in Botany, Karnatak University, Karnataka Science College, Dharwad-580001, Karnataka, India; the authors collected & observed an aquatic plant identified as *Nymphoides* species, after analysis of the plant parts identified as *Nymphoides aurantiaca* (Dalz.) O. Kuntze, which was rediscovered in the state Karnataka after many years. The ethical guidelines for plants & plant materials are followed in the study for species observation, identification & experimentation.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES

1. Deshi S, Betageri S, Patgar VG, Kotresha K. Achene morphology of some genera of Cyperaceae Juss. in Karnataka. *Species* 2025;26(78):e41s3181. doi: 10.54905/disssi.v26i78.e41s3181.
2. Dey M, Mallika M, Sarkar AK. New Record of a rare and little-known Aquatic Plant *Nymphoides aurantiaca* (Dalzell) Kuntze from Jalpaiguri District of West Bengal, India. *Indian Forester*. 2019;145(1):89-90.
3. Nayar TS, Rasiya Beegam, Sibi AM. *Flowering Plants of Western Ghats, India*. Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Kerala. 2014;1106.
4. Paul P, Dhar S, Das, Chowdhury DM. Light and scanning electron microscopic characterization of pollen grains of some wetland angiosperms from India. *Microscopy Research Technique*. 2022;85:2628–2650.
5. POWO "Plants of the World Online", 2025. Facilitated by the Royal Botanic Gardens, Kew. Published on the internet: https://powo.science.kew.org//. [Retrieved 2 August 2025].
6. Ravikumar K, Tangavelou AC, Page N. *Seed Plants of Karnataka, India: A Concise Dictionary*. FRLHT-TDU. Bangalore. 2021;114-115.
7. Shreyas B, Kotresha K. Orchids of Yellapur taluk, Uttara Kannada district, Karnataka. *Journal of Non-Timber Forest Products*. 2022;29(4):185-192.
8. Sivarajan VV, Joseph KT. The genus Nymphoides Seguier (Menyanthaceae) in India. *Aquatic Botany*, 1993;45:145-170.
9. Sivarajan VV, Chaw Shu-M, Joseph KT. Seed Coat Mircomorphology of Indian species of Nymophoides (Menyanthaceae). *Botany Bulleitn Acadamia Sinica*. 1993;30:275-283.
10. Sanjappa M, Sringeswara AN. Flora of Karnataka, a Checklist. Vol. II. Gymnosperms and Angiosperms. Karnataka Biodiversity Board, Bangalore. 2019; 504-505.