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Cover: Whale Shark *Rhincodon typus* and Reef - made with poster colours. © P. Kritika.



Sauromatum horsfieldii (Araceae): a new addition to the flora of Manipur, northeastern India

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Abstract: The present paper deals with the taxon *Sauromatum horsfieldii* Miq. reported for the first time from Manipur, India. The detailed morphological description and the photographs are provided along with the artificial key to the Indian species of *Sauromatum*.

Keywords: Morpho-Taxonomic Studies, Extended Distribution.

The genus *Sauromatum* Schott belongs to the family Araceae, tribe-Araeae was recognized by Heinrich Wilhelm Schott (1832). The generic position of *Sauromatum* was unstable and differently placed under *Typhonium* or *Sauromatum* by earlier workers. However, Schott distinguished the genus *Sauromatum* from the genus *Typhonium* based on the characters of connate spathe tube, ovaries with two (rather than one) ovule, scattered staminodes, and short peduncle in *Sauromatum*. Later, Hetterscheid & Boyce (2000) reduced the generic status of *Sauromatum* and merged with *Typhonium* based on the phylogenetic analyses of character matrix of all *Typhonium* & *Sauromatum* species (62 species and 12 morphological characters). In contrast, Cusimano et al. (2010) recognized nine species of *Sauromatum*, segregating the genus from *Typhonium* based on the study of its chloroplast and nuclear DNA sequences; and

considered *Sauromatum* and *Typhonium* were not sister groups but had a genetic distinctness among the genera.

The genus *Sauromatum* Schott is mainly distributed in southeastern Asia from China–Indonesia through Nepal, Bhutan, India, Bangladesh, Myanmar, Thailand, Vietnam, and Cambodia (Talukdar et al. 2014; Odyuo et al. 2015; Nangkar & Tag 2018; Sasikala et al. 2019). Nangkar & Tag (2018) described a new species of *Sauromatum nangkarensense* from Arunachal Pradesh. But, later, (Roy, 2018) had reduced the specific status and become synonym of *S. meghalayense*, where the latter specific epithet had been accepted by Odyuo et al. (2015). A new species of *Sauromatum arunachalense* was recently described by Tiwari et al. (2021) from Arunachal Pradesh. In India, the genus *Sauromatum* is represented by six species, viz., *S. diversifolium* (Wall. ex Schott) Cusimano & Hett., *S. brevipes* (Hook.f.) N.E.Brown, *S. venosum* (Dryand. ex Aiton) Kunth, *S. meghalayense* D.K.Roy, A.D.Talukdar, B.K.Sinha & M.Dutta Choudhury, *S. arunachalense* U.L.Tiwari, R.Maity & S.S.Dash, and *S. horsfieldii* Miq. (Table 1).

During the field exploration in Mao area of Manipur, India, the authors came across an interesting aroid plant at Pudunamei Village, growing on the soil. On further

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investigation and critical examination of the specimen and also from the available literature (Hettterscheid & Boyce 2000; Cusimano et al. 2010; Talukdar et al. 2014; Odyuo et al. 2015; Nangkar & Tag 2018; Tiwari et al. 2021) and further confirmed from N Odyuo 132792, Tiwari 41100, DK Roy 130216, A Nangkar & H Tag 055, and photograph images from <https://powo.science.kew.org> (Accessed on 19 September 2021), it has been identified as *S. horsfieldii*. This species was first reported in India from the Tuensang District of Nagaland by Odyuo et al. (2015). The occurrence of *S. horsfieldii* in Manipur is an extended distribution and a new addition to the flora of Manipur. A detailed description and taxonomic treatment, habitat photos and an image (Images 1 & 2) of the morpho-parts have been provided for easy identification of the species. A key to six species of *Sauromatum* reported from India has been given.

MATERIALS AND METHODS

The collection, pressing, and preparation of herbarium specimens were done as per the conventional herbarium techniques (Jain & Rao 1976) and the herbarium specimen was deposited at Herbarium, Botany Department of D.M. College of Science, Imphal. The live plants photos were taken from Sony digital camera cyber-shot DSC-WX200. All the morphological descriptions and measurements were based on living plant specimen.

Taxonomic treatment

Sauromatum horsfieldii Miq. Fl. Ned. Ind. 3: 196, 1856 (Image 1–2)

Homotypic Synonyms: *Pedatyphonium horsfieldii* (Miq.) J. Murata & Ohi-Toma, Syst. Bot. 36: 254, 2011. *Typhonium horsfieldii* (Miq.) Steenis, Bull. Jard. Bot. Buitenzorg, sér. 3, 17: 403, 1948.

Heterotypic Synonyms: *Arisaema submonoicum* Gagnep., Notul. Syst. (Paris) 9: 128, 1941., *Heterostalis pedata* (Schott) Schott, Ann. Mus. Bot. Lugduno-Batavi 1: 278, 1864., *Pedatyphonium calcicola* (C.Y.Wu ex H.Li, Y.Shiao & S.L.Tseng) J. Murata & Ohi-Toma, Syst. Bot. 36: 254, 2011., *Pedatyphonium kunmingense* (H.Li) J. Murata & Ohi-Toma, Syst. Bot. 36: 254, 2011., *Pedatyphonium larsenii* (S.Y.Hu) J. Murata & Ohi-Toma, Syst. Bot. 36: 254, 2011., *Pedatyphonium omeiense* (H.Li) J. Murata & Ohi-Toma, Syst. Bot. 36: 254, 2011., *Typhonium calcicola* C.Y.Wu ex H.Li, Y.Shiao & S.L.Tseng, Acta Phytotax. Sin. 15(2): 104, 1977., *Typhonium fallax* N.E.Br., J. Linn. Soc., Bot. 18: 260, 1880., *Typhonium hongyanense* Z.Y.Zhu, Acta Bot. Yunnan. 5: 277, 1983., *Typhonium kerrii* Gagnep., Bull. Soc. Bot. France 89: 11,

1942. *Typhonium kunmingense* H.Li, Acta Phytotax. Sin. 15(2): 104, 1977., *Typhonium kunmingense* var. *alatum* H. Li ex H.Peng & S.Z.He, Acta Bot. Yunnan. 19: 40, 1997. *Typhonium kunmingense* var. *cerebriforme* H.Li ex H.Peng & S.Z.He, Acta Bot. Yunnan. 19: 40, 1997., *Typhonium larsenii* S.Y.Hu, Dansk Bot. Ark. 23: 448, 1968. *Typhonium omeiense* H.Li, Acta Phytotax. Sin. 15(2): 105, 1977., *Typhonium pedatum* Schott, Oesterr. Bot. Wochenbl. 7: 262, 1857.

Morphological description

Herbs, 35–40 cm tall, tuber depressed globose, 2–3 cm high and 3–3.5 cm in diameter; roots numerous, surrounding the tuber, creamy white in colour. Petiole glabrous, with a white stripe, dark brownish green to green, 25–30 cm long and c. 1 cm in diameter. Leaf blade 9-pedatifid, green, lobes elliptic to lanceolate, margin entire, apex acuminate, central lobe 12 cm × 2.6 cm, lateral lobes gradually smaller, 4–9 × 1.3–2.5 cm. Inflorescence appears after the leaf formation, 1–2 per tuber, c. 17 cm long; peduncle subterranean, whitish-green, c. 5 × 0.3 cm. Spathe convolute at base, outside brown to dark green at basal part, light whitish-brown upper part with brown spot, upper mid-part light brown with brown spots, inside white at base, upper part light brown with brownish-purple spots, c. 12 cm long, c. 5.8 cm in diameter at base, apex pointed. Spadix shorter than spathe, c. 6.5 cm long; female zone cylindrical, 0.6 × 0.5 cm; ovary ovoid to oblong-ovoid, 1-loculate, creamy white, stigma sessile. Sterile zone 2.8 × 0.25 cm, sterile staminodes at base c. 0.4 cm long, bent upward, clavate to aristate, clavate part yellowish white, gradually reduced, become shorter, and finally become smooth. Male zone c. 0.6 × 0.3–0.4 cm wide, creamy white. Fruit zone at the spathe base, berries whitish green, 0.4–0.6 × 0.3–0.4 cm, crowded, obovoid to ellipsoid (Image 1,2).

Flowering & Fruiting: May–July.

Ecology: The plants grow in the open forests and in the kitchen garden along with many herbaceous plants like *Eupatorium* sp., *Fagopyrum* sp., *Persicaria* sp., and *Galinsoga parviflora* Cav. at an elevation of 1,800 m at Pudunamei, Mao, Manipur.

Specimen examined: India: Manipur: Senapati District, Pudunamei, 1,800 m, 25.317°N & 94.936°E, KE100021. N Odyuo 132792 (ASSAM), Tiwari 41100 (ASSAM), DK Roy 130216 (ASSAM), A Nangkar & H Tag 055 (ASSAM).

Distribution: India (Kashmir, Maharashtra, Uttarakhand, Uttar Pradesh, Mizoram, Meghalaya, Nagaland, Assam, and Manipur), Assam to southern China and Indo-China, Sumatra to Lesser Sunda Is. (Bali),



Image 1. *Sauromatum horsfieldii* Miq.: a—Plant with inflorescence in its natural habitat | b—Plant showing leaf arrangement | c—Lower half of plant | d—Tuber with many adventitious roots. © Kazhuhrii Eshuo.

Key to the Indian species of *Sauromatum*
(Six species of *Sauromatum* are reported from India)

- 1a. Plant pedatifid; leaflets (1) 3–7 2
- 1b. Plant pedatisect; leaflets 7–12 (–17) 3
- 2a. Leaf blade diversifid (often in one plant) from simple to pedatisect *S. diversifolium*
- 2b. Leaf blade oblanceolate, pedatisect, 5–7 leaflets *S. arunachalense*
- 3a. Spathe tube connate; one type of staminode present 4
- 3b. Spathe tube convolute; two types of staminode present 5
- 4a. Inflorescence appears before leaves; spathe tube dark purple inside *S. venosum*
- 4b. Inflorescence appears alongside first developing leaf; spathe tube greenish to white *S. brevipes*
- 5a. Peduncle greenish white; spathe tube brownish-green outside, inside with white at the basal region; upper light brown with deep brown spots *S. horsfieldii*
- 5b. Peduncle purplish brown; spathe tube purplish-brown to dark brown outside; inside purple but creamy to white on margin and toward the limp inside *S. meghalayense*

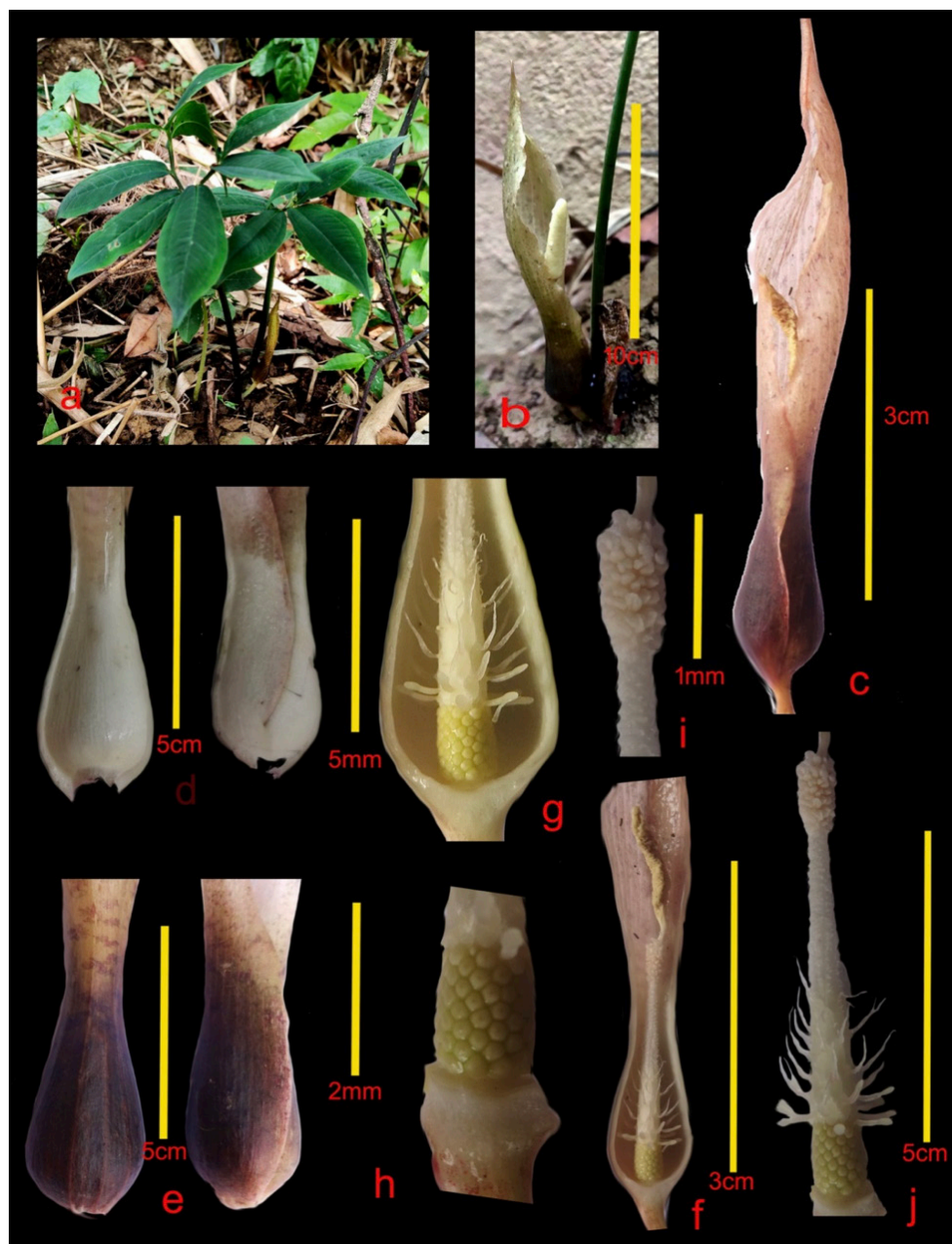


Image 2. *Sauromatum horsfieldii* Miq.: a—Plant showing habit and habitat | b—Close up view of inflorescence | c—Inflorescence | d—L.S. of spathe tube in ventral view | e—L.S. of spathe in dorsal view | f—Longitudinally opened spathe | g—L.S. of lower region of spathe | h—Fruiting zone | i—Male flowering zone | j—Inflorescence in part showing fruiting zone and sterile zone of staminodes. © Kazuhrii Eshuo.

Table 1. Distribution of *Sauromatum* species in India (Sasikala et al. 2019).

	Name of the species	Distribution
1	<i>S. diversifolium</i>	Himachal Pradesh, Maharashtra, Uttar Pradesh, Sikkim, Assam, and Arunachal Pradesh.
2	<i>S. brevipes</i>	Sikkim, Uttar Pradesh, and West Bengal
3	<i>S. venosum</i>	Bihar, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, and Uttar Pradesh.
4	<i>S. meghalayense</i>	Meghalaya, Arunachal Pradesh
5	<i>S. arunachalense</i>	Arunachal Pradesh
6	<i>S. horsfieldii</i>	Kashmir, Maharashtra, Uttarakhand, Uttar Pradesh, Mizoram, Meghalaya, Nagaland, Assam, and Manipur

Myanmar, Thailand, Vietnam, Cambodia, Laos, and Indonesia (Table 1).

REFERENCES

- Cusimano, N., M.D. Barrett, W.L.A. Hetterscheid & S. Renner (2010). A phylogeny of the Areae (Araceae) implies that *Typhonium*, *Sauromatum*, and the Australian species of *Typhonium* are distinct clades. *Taxon* 59(2): 439–447.
- Hetterscheid, W.L.A. & P.C. Boyce (2000). A reclassification of *Sauromatum* Schott and new species of *Typhonium* Schott (Araceae). *Aroideana* 23: 48–55.
- Jain, S.K. & R.R. Rao (1976). *A Handbook of Field and Herbarium Methods*. Today & Tomorrow's Printers and Publishers, New Delhi, 158 pp.
- Nangkar, A. & H. Tag (2018). *Sauromatum nangkarensense* (Araceae: Areae)-a new species from Arunachal Himalaya. *Pleione* 12(1): 87–93. <https://doi.org/10.26679/Pleione.13.1.2019.192-197>
- Odyuo, N., D.K. Roy, S. Dey & A.A. Mao (2015). *Sauromatum horsfieldii* (Araceae-Araeae): an addition to the Flora of India. *Telopea* 18: 227–232. <https://doi.org/10.7751/telopea8886>
- Roy, D.K. (2018). Note on the correct identity of *Sauromatum nangkarensense* (Araceae). *Nelumbo*. 60(2): 162. <https://doi.org/10.20324/nelumbo/v60/2018/138095>
- Sasikala, K., E. Vajravelu & P. Daniel (2019). *Araceae*, pp. 289–299. In: Nair, V.J. & P. Singh (eds.). *Fascicles of Flora of India, Fascicle 29*. Botanical Survey of India, Kolkata, 357 pp.
- Schott, H.W. (1832). *Araceae*, pp. 16–22. In: Schott, H.W. & S. Endlicher (eds.). *Meletemata Botanica*. Gerold, Vienna, 48 pp.
- Talukdar, A.D., D.K. Roy, B.K. Sinha & M.D. Choudhury (2014). *Sauromatum meghalayense* (Araceae; Tribe: Areae), a new species from Meghalaya, India. *NeBIO* 5(3): 1–3.
- Tiwari, U.L., R. Maity & S.S. Dash (2021). A new species of *Sauromatum* (Araceae) from North-East India. *Nelumbo* 63(1): 1–5. <https://doi.org/10.20324/nelumbo/v63/2021/164397>



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