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Studies on *Typhonium* (Araceae — Areae) of Thailand VII: A new species and a new synonym

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ABSTRACT: *Typhonium gonos* K.Z.Hein & Saensouk is described and illustrated as a species new to science, restricted to Permian limestone in Phrae Province, Northern Thailand, and compared with its probable closest congener, *T. sinhabaedyae* Hett. & A.Galloway from Tak Province. In addition, *T. pusillum* Sookch., V.D.Nguyen & Hett. is newly synonymized under *T. gagnepainii* J.Murata & Sookch.

KEY WORDS: Aroideae, heterotypic synonym, Indochina, Northern Thailand, permian limestone, plant taxonomy.

INTRODUCTION

The genus *Typhonium* Schott *sensu stricto* (Araceae: Areae), comprising about 83 species worldwide (Boyce *et al.*, 2026), is most diverse in monsoonal Indochina but is distributed from India throughout much of subtropical and tropical Asia to southern Japan, New Guinea, and Australia (Boyce and Wong, 2025), with a few species being weedy and naturalized beyond their native range in various parts of the world (Mayo *et al.*, 1997). Most species are small, seasonally dormant herbs with a hypogeal stem that is tuberous or (shortly) rhizomatous, producing anthomorphs (the spathe-and-spadix reproductive structure of Araceae; Wong *et al.*, 2026) before, simultaneously with, or after the leaves. The spadix of *Typhonium* has four distinct zones from the base upwards — namely (i) pistillate zone, (ii) sterile interstice, (iii) staminate zone, and (iv) appendix. Staminodes, covering mostly the basal part (or rarely the entire part) of the sterile interstice between the pistillate and staminate zones, are highly variable in size, shape, and colour, and are important in species identification. *Typhonium* occupies a wide range of habitats, from forest floors or humus-filled crevices on limestone or sandstone in mixed evergreen or deciduous forests, to streamsides, wet meadows, and areas near waterfalls, as well as grasslands, agricultural land, and ruderal habitats (Hetterscheid and Sookchaloem in Boyce *et al.*, 2012).

Wong and Boyce (2011) first highlighted that, among ecologically significant factors, the lithology of the bedrock underlying species' habitats is one of the least studied, least documented, and least understood aspects of Araceae. This situation is also true for the genus *Typhonium*, for which information on lithological preferences remains largely lacking, probably because most described species were based on cultivated material with little or no habitat data (Hetterscheid *et al.*, 2001; Hetterscheid and Sookchaloem in Boyce *et al.*, 2012). Nevertheless, fieldwork in Thailand since 2024, conducted as part of our ongoing revision of the genus, has placed increasing emphasis on documenting specific habitats and recording the lithology of the substrates on which these taxa occur. In previous papers in this series (Saensouk *et al.*, 2025a,b), for example, *T. brevispadix* K.Z.Hein, P.Saensouk & Saensouk, *T. cucullatum* K.Z.Hein, P.Saensouk & Saensouk, and *T. isaniorum* K.Z.Hein, P.Saensouk & Saensouk were all recorded growing on gravelly soil or in humus-filled crevices on Cretaceous sandstone. Lithological and habitat data for additional species will be included in the forthcoming revision by the first author (Hein *et al.,* in prep.).

Here we describe a new species restricted to Permian limestone in Phrae Province, Northern Thailand. The species was first discovered in 2018 by Theerasak Uttarapong, a local plant enthusiast. It was initially misidentified by the first author (KZH) as *Typhonium sinhabaedyae* Hett. & A.Galloway (Hetterscheid and Galloway, 2006), until examination of the spadix revealed clear differences from that species and all other described taxa. It is therefore recognised here as a new species. A complete taxonomic account is provided below, including a detailed morphological description, distribution, habitat, phenology, and provisional conservation status.

Furthermore, our re-examination of the type specimen, together with observations of living material in the wild at the type locality of *Typhonium pusillum* Sookch.,

V.D.Nguyen & Hett., confirmed that this species is conspecific with *T. gagnepainii* J.Murata & Sookch., another species described in the same article by Hetterscheid *et al.* (2001). Consequently, *T. pusillum* is here formally reduced to synonymy under *T. gagnepainii*.

MATERIALS AND METHODS

To confirm the novelty of the species presented here, relevant literature, including protologues, and specimens of *Typhonium*, including type specimens, from Thailand and neighbouring countries were examined. Herbarium acronyms conform to Index Herbariorum (Thiers, 2026, continuously updated). Material deposited in BCU, BK, BKF, CMU, CMUB, HN, KEP, KKU, KUL, QBG, SING, and SLR was examined physically by the first author (KZH), whereas material in BO was examined physically by the fourth author (TW). Specimens from A, C, E, G, GH, K, L, MO, P, US, and WAG were examined using high-resolution images accessed via the Global Biodiversity Information Facility (GBIF) (https://www.gbif.org/), while specimens from HITBC, KUN, and PE were examined using images from the Chinese Virtual Herbarium (https://www.cvh.ac.cn). Specimens at PSU and VNM were examined from images provided by J. Sangrattanaprasert and T. Boonma during their respective herbarium visits.

Measurements and morphological descriptions were based on fresh and spirit-preserved specimens. Terminology of Araceae morphology follows Mayo *et al.* (1997), with general terminology standardized according to Beentje (2016). However, instead of using the term 'inflorescence' (Mayo *et al.*, 1997), conventionally applied to the spathe-and-spadix and adopted in our previous papers in this series, here we adopt 'anthomorph' as proposed by Wong *et al.* (2026) to achieve family-specific precision, as there is considerable evidence that the spathe-and-spadix is not an inflorescence *per se*, but rather a hybrid structure with functional and structural attributes of both a flower and an inflorescence (Hay, 2019). We also avoid the term 'spathe tube' (Mayo *et al.*, 1997); instead, we follow the definition of 'spathe base' provided by Hetterscheid and Boyce (2000) as the lower portion of the spathe formed by free and convolute margins.

The provisional conservation status was assessed following the IUCN Red List guidelines (IUCN, 2024). The nomenclatural treatment follows the current edition of the International Code of Nomenclature for algae, fungi, and plants, i.e., the Madrid Code (Turland *et al.*, 2025, hereafter cited as "ICN"). Lithological information presented in this paper is based on the Bedrock Unit (1:250,000) dataset published by the Department of Mineral Resources, Thailand, accessed via the Department of Mineral Resources GIS Portal (https://gis.dmr.go.th/DMR-GIS/).

TAXONOMIC TREATMENT

New species

Typhonium gonos K.Z.Hein & Saensouk, ***sp. nov.***

Figs. 1, 2 & 3A

Type: THAILAND. Northern: Phrae Province, Long District, Ta Pha Mok Subdistrict, elev. ca. 260 m, 11 May 2026, *T. Uttarapong 001* (holotype: BKF! [spirit collection]; isotype: VMSU! [spirit collection]).

Diagnosis: *Typhonium gonos* most closely resembles *T. sinhabaedyae* Hett. & A.Galloway (Fig. 3B) in its anthomorph, but differs in having a sterile interstice bearing distantly arranged staminodes only in the middle portion, with the lower and upper portions naked (vs. tightly arranged staminodes restricted to the lower part of the sterile interstice immediately above the pistillate zone in *T. sinhabaedyae*), and a stigma narrower than the ovary narrower than the ovary (vs. wider than the ovary in *T. sinhabaedyae*).

Description: Small, deciduous herbs, to 20 cm tall. ***Stem*** hypogeal, tuberous; tuber depressed-globose, ca. 1.5 cm in diameter, externally pale brown. ***Roots*** filiform, 0.7–1.0 mm in diameter, white. ***Leaves*** 1–2 together; *petioles* 18–19 cm long, 0.3–0.5 cm in diameter, erect, glabrous, terete, becoming adaxially very shallowly canaliculate in the distal two-thirds, entirely green or densely marked with dark purple to brownish purple striae and spots; *petiolar sheath* ca. 2.5 cm long, ca. 1/7 of petiole length; *leaf blade* 10–16 × 11–23 cm, hastate-sagittate or hastate, weakly trilobed or more deeply 3-lobed (rarely 5-lobed), with lobes elliptic-ovate (Fig. 2B), chartaceous, adaxially medium green, abaxially pale green, glabrous on both sides; *anterior lobe* 7–10 × 3.5–8.0 cm, triangular-ovate (or narrowly ovate to elliptic-ovate in deeply 3-lobed leaf blades), apex acute or attenuate, margin entire; *posterior lobes* 7–11 × 3.0–4.5 cm, triangular-ovate (or narrowly elliptic-ovate in deeply 3-lobed leaf blades), slightly wider on their basiscopic sides, apices acute or attenuate, margins entire, bases rounded; *anterior costa* adaxially impressed, abaxially raised, rounded, ca. 2 mm wide at the base, ca. 1 mm wide at centre, then narrowing towards apex; *primary lateral veins* of anterior costa 3–4 per side, adaxially impressed, abaxially raised, diverging from the anterior costa at 23–53°, anastomosing at 3–5 mm from the margin into a submarginal (intramarginal) collective vein; *interprimary veins* inconspicuous; *higher-order venation* reticulate; *posterior costae* diverging at 75–175°, naked in the sinus for ca. 1.1 cm. ***Anthomorph*** solitary, appearing simultaneously with the leaves, emitting an odour reminiscent of seminal fluid during pistillate anthesis; *peduncle* up to 7.5 cm long, 0.2 cm in diameter, terete, glabrous, pale green or white, more or less densely marked with pale reddish-brown striae and spots; *spathe* 4.6–6.3 cm long, strongly differentiated into a spathe base and a spathe limb by a constriction; *spathe base* 1.1–1.3

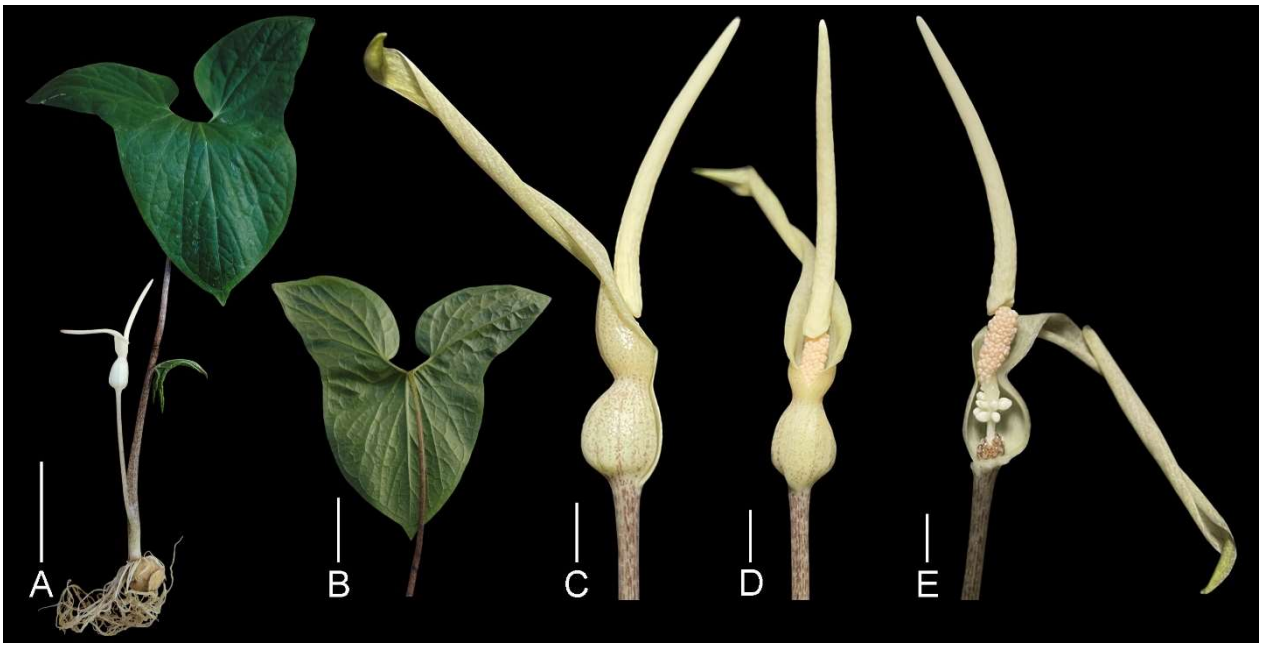

Fig. 1. ***Typhonium gonos*** sp. nov. **A.** Excavated flowering plant. **B.** Leaf blade showing abaxial surface. **C.** Side view of anthomorph at pistillate anthesis. **D.** Front view of anthomorph at pistillate anthesis. **E.** Side view of anthomorph at pistillate anthesis (nearside spathe artificially removed to expose the spadix). Scale bars: A–B.=3 cm, C–E.=5 mm. Photos by T. Sangchun and K.Z. Hein.

Fig. 2. ***Typhonium gonos*** sp. nov. **A.** Flowering individuals in habitat. **B.** Plants in habitat showing leaf blade variation within a population. Photos by T. Uttarapong.

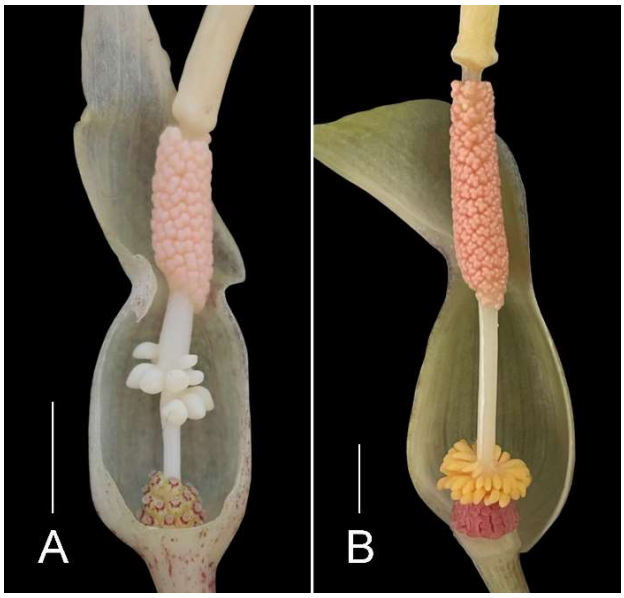

Fig. 3. Detail of the spadices, each showing pistillate zone, sterile interstice, staminate zone and base of appendix (the near side of the spathe artificially removed). **A.** ***Typhonium gonos*** sp. nov. **B.** ***T. sinhabaedyae***. Scale bars: A-B = 5 mm. Photos by T. Sangchun and K.Z. Hein.

cm long, 0.7–0.8 cm in diameter, ellipsoid-ovoid, truncate and gibbous abaxially at the base, glabrous, externally ivory, with or without a green tinge, more or less densely punctate with reddish-brown spots, especially dense along the veins and forming reddish-brown longitudinal stripes, internally white, with or without a green tinge, margins free, convolute; *spathe*

limb 3.5–5.0 cm long, 0.7–0.8 cm wide at the widest point, lanceolate, becoming reflexed at anthesis, glabrous, externally ivory, with or without a green tinge, more or less densely punctate with reddish-brown spots, internally white, margins entire and strongly revolute at anthesis. ***Spadix*** sessile, 4.2–5.2 cm long, slightly shorter than the spathe; *pistillate zone* conical, ca. 0.2–0.3 cm long, ca. 0.3 cm in diameter at the base, with 3–4 rows of congested pistils; *ovary* ca. 0.8 mm high, ca. 0.8 mm in diameter, subglobose, pale greenish-white, red at the apex, unilocular, with one basal ovule borne obliquely on a funicle attached to a basal placenta; *stigma* subsessile, discoid, ca. 0.4 mm in diameter, dull white, echinulate; *sterile interstice* between pistillate and staminate zones 0.7–0.8 cm long, ca. 0.1 cm in diameter, upper and lower portions naked, terete, glabrous, white, middle portion ca. 0.4 cm long, covered with 3–5 incomplete spirals of loosely arranged staminodes; *staminodes* fusiform to ovoid or obovoid, 1.0–1.5 mm long, 0.6–1.1 mm in diameter, pointing outwards, perpendicular to the spadix axis, free, slightly distant, glabrous, white, apex rounded to obtuse; *staminate zone* ca. 0.7 cm long, ca. 0.3 cm in diameter, cylindrical; *stamens* congested, always single, not grouped into multistaminate florets, 0.4–0.8 mm in diameter, pink; *appendix* 2.5–3.6 cm long, ca. 0.2 cm in diameter at the base, elongate-conical, erect, ivory, apex subacute, base truncate, sessile or very shortly stipitate; *stipe* ca. 0.6 mm long, ivory. ***Infructescence*** not seen.

Distribution and habitat: *Typhonium gonos* is currently known only from its type locality in Long District, Phrae Province, Northern Thailand. It grows in humus-rich soil beneath leaf litter over Permian limestone, under a semi-open canopy in tropical mixed deciduous forest, at an elevation of approximately 260 m a.s.l.

Phenology: Flowering was observed in May in the wild, corresponding to the transition from the late hot season to the onset of the rainy season.

Etymology: The specific epithet *gonos* is derived from the Greek γόνος (*gonos*), meaning seed, semen, or seminal fluid, in allusion to the odour reminiscent of seminal fluid emitted by the anthomorph during pistillate anthesis, and is used as a noun in apposition.

Provisional conservation status: The new species is currently known only from its type locality, and as no information is available on its population size, distribution beyond the type locality, or potential threats, the species is provisionally assessed as Data Deficient (DD) following IUCN (2024).

Additional specimen examined (paratype) : Cultivated at Nakhon Sawan, Nakhon Sawan Province, 29 March 2026, *T. Sangchun s.n.* (original collection: THAILAND. Northern: Phrae Province, Long District, Ta Pha Mok Subdistrict) (VMSU! [spirit collection]).

Note: The anthomorph of *Typhonium gonos* attracts numerous beetles of the family Staphylinidae, which were observed descending into the spathe base and onto the pistillate zone. We therefore hypothesize that staphylinid beetles serve as its pollinators.

New synonym

Typhonium gagnepainii J.Murata & Sookch., Aroideana 24: 38. 2001. ***Type*****:** THAILAND. Northeastern: Mukdahan Province, Phu Manorom [Pumano], elev. ca. 200 m, 13 May 1932, *A.F.G. Kerr 21442* (holotype K-image! [barcode K000099902]; isotypes K-image! [barcode K000099901], BK! [barcode SN263868]).

Typhonium divaricatum var. *minutum* Gagnep., Fl. Indo-Chine [P.H. Lecomte *et al.*] 6: 1179. 1942, *nom. inval.* (Art. 39.1 of ICN).

Typhonium gagnepainii Nicolson ex Srib. & J.Murata, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15(4): 299. 1994, *nom. inval.* (Art. 39.1 of ICN); Thai Forest Bull. (Bot.) 23: 26. 1995, *nom. inval.* (Art. 39.1 of ICN).

= *Typhonium pusillum* Sookch., V.D.Nguyen & Hett., Aroideana 24: 46. 2001, ***syn. nov. Type*****:** THAILAND. Northeastern: Mukdahan Province, Phu Pha Thoep National Park, ca. 250 m, on the trail from the headquarters to the tourist area, 11 May 1997, *R. Pooma 1664* (holotype: BKF-image!).

Taxonomic notes: In the Flora of Thailand account of *Typhonium* (Hetterscheid and Sookchaloem in Boyce *et al.*, 2012), *T. gagnepainii* and *T. pusillum* were still recognized as distinct species sharing most morphological characters, differing mainly in the shape of the staminodes (clavate in *T. gagnepainii* vs. spathulate in *T. pusillum*) and in the presence (*T. pusillum*) or absence (*T. gagnepainii*) of a cataphyll surrounding the peduncle. However, our recent observations of living material from the type locality of *T. pusillum* revealed that the staminodes are highly variable in shape, ranging from oblong-clavate with a rounded apex (Fig. 4A) to clavate with an acute apex pointing upwards or curved outwards (Fig. 4B), to fusiform-sickle-shaped with the acute apex curved outwards (Fig. 4C). The ‘spathulate’ staminodes described in the protologue of *T. pusillum* likely resulted from the interpretation of dried and pressed herbarium material. Furthermore, in *Typhonium*, cataphylls surrounding the peduncle are short-lived and variable in size, and may be either prominent or concealed between successive petiolar sheaths, rendering them difficult to observe in dried herbarium specimens (KZH, pers. obs.). As there are no significant morphological differences between *T. gagnepainii* and *T. pusillum*, and their type localities are only 11 km apart within the same mountain range, we conclude that they are conspecific. As both names were published in the same article (Hetterscheid *et al.*, 2001), they have equal priority under Art. 11.5 of the ICN. We here choose *T. gagnepainii* over *T. pusillum*, based on the better quality of the type collection, which is represented by two duplicates deposited in different herbaria (K and BK).

Distribution and habitat: Hetterscheid and Sookchaloem (loc. cit.) reported *Typhonium gagnepainii* from Mukdahan Province in Northeastern Thailand, Kanchanaburi Province in Southwestern Thailand, and Cambodia. However, our re-examination of the specimen from Kanchanaburi Province, *K. Larsen et al. 1533* (BKF! [barcode SN092600]), cited by Hetterscheid and Sookchaloem (loc. cit.), showed that it represents *T. varians*

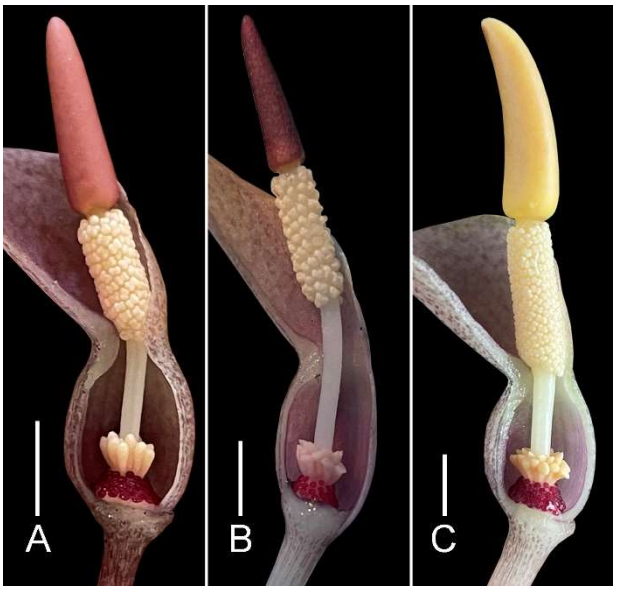

Fig. 4. Details of the spadices of ***Typhonium gagnepainii*** showing variation in the shape of the staminodes (A.–C. All specimens originally collected from the same locality). Scale bars: A-C = 5 mm. Photos by K.Z. Hein.

Hett. & Sookch., while the Cambodian paratype, *P. Couderc s.n.* (P-image! [barcode P00733234]), cited in the protologue (Hetterscheid *et al.*, 2001), is not conspecific with *T. gagnepainii* and instead represents an undescribed taxon.

T. gagnepainii is therefore endemic to Thailand and is currently known only from Mukdahan Province in Northeastern Thailand, where it grows in humus-filled crevices or gravelly soil over Cretaceous sandstone, either in full sun or under a semi-open canopy in tropical mixed deciduous forest, at elevations of 175–210 m.

***Phenology*:** Flowering was observed in May in the wild, corresponding to the transition from the late hot season to the onset of the rainy season.

***Additional specimen examined*:** Cultivated in the greenhouse of Mahasarakham University, 26 April 2026, *K.Z. Hein K159* (original collection: THAILAND. Northeastern: Mukdahan Province, Mueang Mukdahan District, *K.Z. Hein s.n.*) (VMSU! [spirit collection]).

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