



Arisaema anatinum, a new species of *Arisaema* (Araceae) from NE India

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Key words

Arisaema
Arunachal Pradesh
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new species

Abstract *Arisaema anatinum*, a new species of Araceae belonging to section *Arisaema* is described from Arunachal Pradesh state in NE India, illustrated, and compared with related taxa.

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INTRODUCTION

Arunachal Pradesh is located in the most easterly part of the Indo-Himalayas. Owing to its geographic position, with Bhutan to the west, Tibet to the north and the Chinese provinces of Sichuan and Yunnan to the east, Arunachal Pradesh forms a bridge between the Indo-Himalayan and Sino-Himalayan biogeographical regions. The resulting flora shows the presence of species of both associated floras and is an important area to understand the biogeographic origins of species that inhabit the Himalayas. As part of an ongoing survey of *Arisaema* from the Indian Subcontinent the author undertook several trips to the easterly districts of Arunachal Pradesh to map the distribution ranges and variation of all *Arisaema* occurring in the state.

During two fieldtrips to the Dibang district 10 taxa of *Arisaema* were encountered, including two species from section *Arisaema* of which the identity could not be confirmed on the spot and needed to be evaluated. The first species was subsequently described in 2016 by the author as *Arisaema gracilentum* Brugg. The second taxon, owing to its broadly ovate leaves and short, rather thick protruding spadix, shows a strong similarity to a group of primarily Chinese species consisting of *Arisaema elephas* Buchet, *A. wilsonii* Engl. and *A. dilatatum* Buchet, that express strong plasticity in certain key characteristics and appear to form a species complex in which the species boundaries are often not clear. Therefore, care was required establishing that the characteristics of the unknown taxon are absent from the known variations of the other members of this species group and furthermore that the observed characteristics are stable. Fortunately, on a subsequent fieldtrip in the spring of 2014 to the peak of Riutala in Upper Siang district this undetermined taxon was again observed and it was possible to confirm the stability of the diagnostic characters. Apart from more intensified colouring and patterning of the leaves, the general morphology of the inflorescence was strikingly similar to the specimen from Dibang district. This stability could later be confirmed by pictures taken from the same taxon in West Kameng district in Arunachal Pradesh, as well as from Bhutan. After careful comparison with all related taxa it was concluded this species is new to science and its description is here given.

TAXONOMY

Arisaema anatinum Brugg., sp. nov. — Plate 1

Most closely allied to *A. elephas*, *A. wilsonii* and *A. dilatatum* but differing in having a convolute, oblong spathe blade, broadly ovate, shiny leaflets and a non-sigmoid appendix. — Type: *M. Bhaumik* 2502 (holo CAL), India, Arunachal Pradesh State, Lower Dibang District, Mayodia, 2690 m a.s.l., 21 Apr. 1999; *P. Bruggeman* PBR749 (para L, male and female in spirit, prepared from cult.)

Etymology. The species epithet, from the Latin adjective *anatinus*, of, or resembling a duck, refers to the bill-shaped spathe blade.

Seasonally dormant geophyte, up to 120 cm tall. *Subterranean stem* depressed globose tuber, up to 12 cm diam with numerous dormant offsets. *Roots* white, branching with short feeding roots. *Pseudostem* absent or inconspicuous. *Cataphylls* 2 or 3, up to 15 cm long, striated. *Leaves* 2 or 3, often with a reddish rim and strong yellow venation, dark to olive green with occasionally dark blotches that fade during the season. *Petiole* up to 80 cm long, up to 20 mm wide at base, 4–5 mm wide at the top, uniformly green, glabrous. *Blade* trifoliolate, central leaflet broad obovate, 20–30 cm long, 5–7 cm wide, sessile to subsessile. *Lateral leaflets* elliptic-ovate to broad-ovate, approximately the same length as central leaflet, to 30 cm long, 6–8 cm wide, sessile to subsessile, leaflets often overlapping each other. *Inflorescence* held beneath the leaves at anthesis. *Peduncle* 10 cm long, green, elongating up to one meter tall when fruiting. *Spathe tube* green to olive green with translucent veins, often glaucous on the outer surface, cylindrical, strongly ribbed inside, 10–15 cm long, 2.5–3 cm diam. *Margins of spathe mouth* revolute becoming strongly revolute along the spathe blade. *Spathe blade* horizontal, oblong to truncate, abruptly narrowing towards the tip into a short acumen, green to green-purple or red outside, revolute at margins. After pollination spathe remaining intact and shielding developing infructescence until berries ripen. *Spadix* unisexual. *Male spadix* fertile zone 3.5 cm long and c. 1 cm across at base, stipe 3 mm long. *Synandria* densely arranged, beige, 3- or 4-androus, thecae dehiscent by a horseshoe-shaped slit, pollen white. *Female spadix* fertile zone 4 cm long and 2 cm across. *Pistils* densely arranged. *Ovaries* ovoid, green, striped purple, 2–2.5 mm wide, stigma sessile, white, stipe 5 mm long. *Spadix appendix* 8 mm across at base, up to 25 cm long, pendent, gradually tapering, often distally contorted.

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Plate 1 *Arisaema anatinum* Brugg. a. Flowering plant in situ; b. fruiting plant in situ; c. male spadix; d. leaf top view; d. male spadix; e. underground stem; f. female spadix. — Photos by P. Bruggeman.

Table 1 Diagnostic differences between *Arisaema anatinum* and three most closely similar species.

Character	<i>A. elephas</i>	<i>A. wilsonii</i>	<i>A. dilatatum</i>	<i>A. anatinum</i>
Leaf number	1	1(–2)	1(–2)	1(–3)
Leaflet shape	Rhombic	Rhombic	Rhombic	Ovate
Peduncle surface	Smooth	Smooth or papillose	Verrucose, rarely smooth	Smooth
Spathe limb	Deltoid, often recurved	Ovate to broadly ovate	Ovate to broadly ovate	Oblong to truncate throughout length, aristate at apex, revolute margins
Spathe mouth margins	Straight	Straight	Straight	Revolute
Spadix appendix shape	Upright sigmoid, gradually tapering	Horizontally or upright sigmoid, gradually tapering	Horizontally sigmoid, > 1 cm thick at base, sometimes abruptly tapering halfway	Horizontal, becoming pendent, gradually tapering, often contorted at apex
Peduncle with infructescence	Below the leaves	Elongated, above the leaves	Below the leaves	Elongated, above the leaves

Phenology — Flowering: April, May; fruiting: September, October.

Distribution & Ecology — Arunachal Pradesh and Bhutan, growing in shaded, forested areas or on the edges of bamboo thickets in moist, humus rich soil at altitudes of 2300–3300 m a.s.l. In Arunachal Pradesh *Arisaema anatinum* has been observed in Lower Dibang and Upper Siang districts by the author and in West Kameng by John Roy (pers. comm.). In SE Bhutan it has been observed in the Trashigang District by Johan Nilson of Gothenburg Botanic Garden (pers. comm.). Thus far it has not been reported from Tibet but given the currently known distribution, its occurrence there cannot be excluded.

DISCUSSION

Arisaema anatinum has a tripartite leaf, an inflorescence held beneath the leaves at anthesis and a thick, protruding spadix appendix that is tapering yet never becomes filiform. It shares these characteristics with *A. elephas*, *A. wilsonii* and *A. dilatatum*, species that have a predominantly Chinese distribution range, but differs from all three by having an oblong to truncate spathe blade, broadly ovate leaflets, and a non-sigmoid spadix appendix.

The leaf blades of *A. anatinum* are shiny with the leaflets often overlapping. In E Arunachal Pradesh the blades are highly ornamental with intensely yellow veins, dark purple blotches and a reddish margin. In W Arunachal Pradesh and Bhutan, the blades are generally unmarked and more metallic green; throughout its range both peduncle and petiole are smooth. This is much in contrast to other members of the species complex of *A. elephas*, *A. wilsonii* and *A. dilatatum* that have matte green, rhombic leaflets and often a textured surface on either the peduncle or the petiole (or both).



Plate 2 *Arisaema asperatum* on Riutala mountain, Arunachal Pradesh. — Photo by P. Bruggeman.

In this species complex, the length and thickness of the spadix appendix, as well as the presence of verrucose petioles and/or peduncles (particularly in *A. elephas*), seems variable and sometimes blurs the species boundaries in extreme forms when looked at in isolation. Only in some forms of *A. elephas* and *A. wilsonii* both the peduncle and petiole can be smooth, similar to *A. anatinum*, but all species in this complex have in common a sigmoidally curved spadix appendix. In *A. anatinum* the appendix is held horizontal and becomes pendent without any obvious sigmoidal curvature. Additionally, the appendix of *A. anatinum* is often contorted distally and is considerably longer than the appendix of *A. dilatatum* and *A. wilsonii*, being at least twice as long as the spathe blade.

Of the three morphologically most closely similar species, only *A. elephas* shares part of its distribution range with *A. anatinum*, in West Kameng District of Arunachal Pradesh and Bhutan. In these areas, however, *A. elephas* always grows at higher altitude and no intermediates have been observed. *Arisaema elephas* is also an altogether much smaller species than *A. anatinum*. The only species from section *Arisaema* that shares the locality of *A. anatinum* in E Arunachal Pradesh near Riu Tala mountain in Siang District is *Arisaema asperatum* N.E.Br., a species previously considered endemic to China. *Arisaema asperatum* is very clearly different from *A. anatinum*, by an erect appendix with an obtuse apex and its observation by the author represents a new record for India, see Plate 2.

The differences between *A. anatinum* and most similar taxa are summarized in Table 1.

I have not followed the treatment of *A. dilatatum* as a synonym of *A. elephas* by Li et al. (2010) owing to the general stability of the diagnostic characteristics in the areas in China and Bhutan where both species occur simultaneously, making them relatively easy to tell apart. The combination of the thinner and longer appendix, inconspicuous stipe, smooth peduncle and predominantly purple inflorescence of *A. elephas* against the often verrucose peduncles and petioles, predominantly green inflorescences, pronounced stipe and a much thicker (but shorter) appendix of *A. dilatatum* render them clearly distinct in those areas where their distribution ranges overlap. Additionally, *A. dilatatum* occurs in forms with single and two leaves whereas *A. elephas* always produces a single leaf.

In the treatment and description of *A. elephas* by Li et al. (2010), neither 2-leaved specimens nor specimens with appendices as thick as 1.5 cm, as described by Buchet (1911) for *A. dilatatum*, are included.

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