

A new species of *Agapetes* (Ericaceae) from Bhutan Himalaya

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ABSTRACT. *Agapetes athangensis* P.Gyeltshen, a new species from the warm broad-leaved forest of Athang Block in Wangdue District, Bhutan is described and illustrated. The new species is assigned to *Agapetes* D.Don ex G.Don sect. *Agapetes* owing to its free filaments and calyx articulated at the junction with the pedicel, and to ser. *Agapetes* as it has stout stems, pseudowhorled leaves, and 5-lobed, glandular-capitate stigma. The new species is similar to *Agapetes auriculata* (Griff.) Benth. & Hook.f. in having an angular calyx and corolla, and capitate stigma, but differs by the pubescent inflorescence, longer pedicels, and tubular corolla tube. It differs from *Agapetes sikkimensis* Airy Shaw by the racemose or sub-corymbose inflorescence, longer peduncle, and calcarate stamens. Due to inadequate information on population abundance and distribution, the species is currently assessed as Data Deficient (DD).

Keywords. Athang Block, Data Deficient, ecology, taxonomy, Vaccinioideae

Introduction

The genus *Agapetes* D.Don ex G.Don (Ericaceae) belongs to the subfamily Vaccinioideae and family Ericaceae (Stevens et al., 2004), and currently comprises 113 accepted species (POWO, 2024), most of which are distributed in the Eastern Himalayas, southwest China, and Indochina to Southeast Asia (Stevens et al., 2004; Fang & Stevens, 2005; Tong, 2016). The Himalayan region is considered to be the centre of diversity of the genus, with many new species waiting to be discovered (Tong, 2016). Furthermore, no taxonomic study on the genus has been conducted in the past 32 years until the present study in Bhutan Himalaya, and it is quite plausible that there are many species yet to be described.

Airy Shaw (1959) recognised two sections in the genus: *Agapetes* sect. *Agapetes* and *Agapetes* sect. *Pseudoagapetes* Airy Shaw. Members of sect. *Agapetes* differ from sect. *Pseudoagapetes* in having the calyx articulated at the base with pedicel, stamens with free filaments, and absence of hypodermis in leaves, whereas sect. *Pseudoagapetes*, currently with only a single species, *Agapetes scortechinii* (King &

Gamble) *Sleumer*, is characterised by the calyx continuous at the base with the pedicel, connate filaments, and presence of hypodermis in leaves (Banik & Sanjappa, 2014). *Agapetes* sect. *Agapetes* is further divided into four series: ser. *Pteryganthae* Airy Shaw, ser. *Agapetes* (ser. *Robustae* in Airy Shaw (1935)), ser. *Graciles* Airy Shaw, and ser. *Longifiles* Airy Shaw (Airy Shaw, 1935, 1948; Banik & Sanjappa, 2014). Each series is morphologically separated by stout or slender stems, leaves pseudowhorled or spirally arranged, a glabrous or puberulous inflorescence, the winged or angular calyx and corolla, anthers calcarate or ecalcarate, and the stigma capitate or clavate (Airy Shaw, 1935, 1959; Banik & Sanjappa, 2014).

Long & Rae (1991) described 10 *Agapetes* species in the *Flora of Bhutan*. All the species found in Bhutan can be classified under sect. *Agapetes* in two series: ser. *Agapetes* and ser. *Pteryganthae*. More than half of the recognised species are placed in ser. *Agapetes* with a terete or angular calyx and corolla: *Agapetes auriculata* (Griff.) Benth. & Hook.f., *A. bhutanica* N.P.Balakr. & Sud.Chowdhury, *A. nuttallii* C.B.Clarke, *A. saligna* (Hook.f.) Hook.f., *A. sikkimensis* Airy Shaw, and *A. variegata* (Roxb.) D.Don ex G.Don. The remaining four species are in ser. *Pteryganthae*, and have a winged corolla: *Agapetes incurvata* (Griff.) Sleumer, *A. hookeri* (C.B.Clarke) Sleumer, *A. serpens* (Wight) Sleumer, and *A. smithiana* Sleumer. Among the six species in the ser. *Agapetes*, this undescribed species is closely related to *A. auriculata* and *A. sikkimensis*. From the morphological investigation, the species was tentatively assigned to sect. *Agapetes* in having the calyx articulated at the base with the pedicel and stamens with free filaments. A detailed description, distribution and ecology information, morphological differences, conservation status, as well as colour photographs, are provided for the identification and conservation of this rare species.

Materials and methods

The field survey was conducted during undergraduate dissertation field work at Athang Block in Wangdue Phodrang District in December 2022. Additional collections and detailed morphological observations were undertaken during a recent botanical expedition to Dekiling Block in Sarpang District in January 2024. After a review of protologues and relevant literature (Airy Shaw, 1935, 1948, 1959; Long & Rae, 1991; Fang & Steven, 2005; Banik & Sanjappa, 2014), and herbarium materials from the herbaria E, K and THIM (herbarium codes follow Thiers et al., continuously updated), the collections were confirmed to be a species new to science.

The circumscription and terminology adopted for the morphological descriptions followed Airy Shaw (1959), Banik & Sanjappa (2014), and Beentje (2016).

Measurements of the vegetative and reproductive parts were taken in-situ from 10 randomly chosen individuals of the new species using a 5 m measuring tape, a 15 cm ruler and digital Vernier calipers. Geographical data were collected using Garmin GPS (Etrex 30x), and specimens were photographed in the field using a digital camera. Microscopic images were photographed using a Z-stacking microscope at the National Biodiversity Centre, Thimphu, Bhutan. Distribution data were plotted

on a map using QGIS software v.3.16.2 (QGIS Development Team, 2024), and the collected specimens were deposited in THIM. The conservation status of the new species was evaluated according to the IUCN categories and criteria (IUCN Standards and Petitions Committee, 2024).

Taxonomic treatment

Agapetes athangensis P.Gyeltshen, **sp. nov.**

Similar to *Agapetes auriculata*, but differing in the inflorescence indumentum (puberulous vs glabrous), calyx lobes (8–11 mm long vs 3–7.5 mm long), corolla (tubular vs tubular-urceolate, constricted towards apex), stamens (calcarate vs ecalcarate), and style (23–25 mm long vs 10–18 mm long). *Agapetes athangensis* is also similar to *Agapetes sikkimensis* but differs by its inflorescence (racemose or sub-corymbose vs fascicles or short corymbose), longer peduncle (10–30 mm long vs c. 5 mm long), corolla (tubular vs tubular-urceolate), stamens (calcarate vs ecalcarate), and longer style (23–25 mm long vs 10–22 mm long). – TYPE: Bhutan, Wangdue Phodrang District, Athang Block, Ada area, 1500 m, 22 December 2022, P. Gyeltshen 75 (holotype THIM [THIM22509]; isotype THIM [THIM22510]). (Figs 1, 2).

Perennial epiphytic or terrestrial shrub, up to 3 m tall. **Lignotuber** basal, irregular in shape. **Stem** stout; twigs angular, glabrous. **Leaves** sub-opposite to pseudoverticillate, 5–30 cm apart, 2–3-leaved when pseudoverticillate; subsessile or petioles 1–2 mm long; lamina ovate-lanceolate to elliptic-lanceolate, 12–34 × 4.3–10 cm, base cordate, apex acuminate, margin crenate or entire, secondary veins 20–32 pairs, midvein raised on both surfaces, venation brochidodromous, glabrous, basal glands absent. **Inflorescence** pseudoterminal or axillary, or cauliflorous, racemose or sub-corymbose, 7–12 cm long, 3–12-flowered; peduncle 1–3 cm long, pubescent, green; rachis 3–15 mm long, semi-erect or pendulous, puberulous; bracts on the rachis minute, deltoid or subulate, 1.8–4 mm long; floral bracts at the base of pedicel small, triangular, abaxially puberulous; bracteoles basal, deltoid, c. 1 mm long, abaxially puberulous; pedicels 2.5–4 cm long, cupulate at apex, not striated, puberulous, pale green at base, reddish toward apex. **Calyx** tubular, red to pinkish red, 4–7 mm long, 5-angled; lobes narrowly lanceolate, 8–11 × 2–3 mm, distinctly separated by rounded sinuses at the base, thick, pubescent, pale reddish-orange, apex greenish-yellow. **Corolla** tubular, red (green at apex and lobes), 1.8–2.3 cm long, c. 6 mm diam., puberulous outside, angular; lobes spreading, ovate, 3.8–6 × 2.7–3 mm, apex obtuse, puberulous outside. **Stamens** 10, 2–2.2 cm long; filaments flattened, oblong, 3.7–4 × 1.5 mm, incurved, puberulous, white; anthers 1.9–2.1 cm long, spurred at base, densely verrucose, abaxially sparsely puberulous, densely at junction of anthers and filaments; thecae 5–7 mm long; tubules 10–14 mm long, sparsely verrucose proximally, calcarate. **Pistil** c. 2.5 cm long; ovary inferior, pseudo-10-locular, 4–5 mm diam.; style filiform, 2.3–2.5 cm long, white, glabrous; stigma capitate, 2.2–2.5 mm diam., 5-lobed, pale green. **Fruit** unknown.

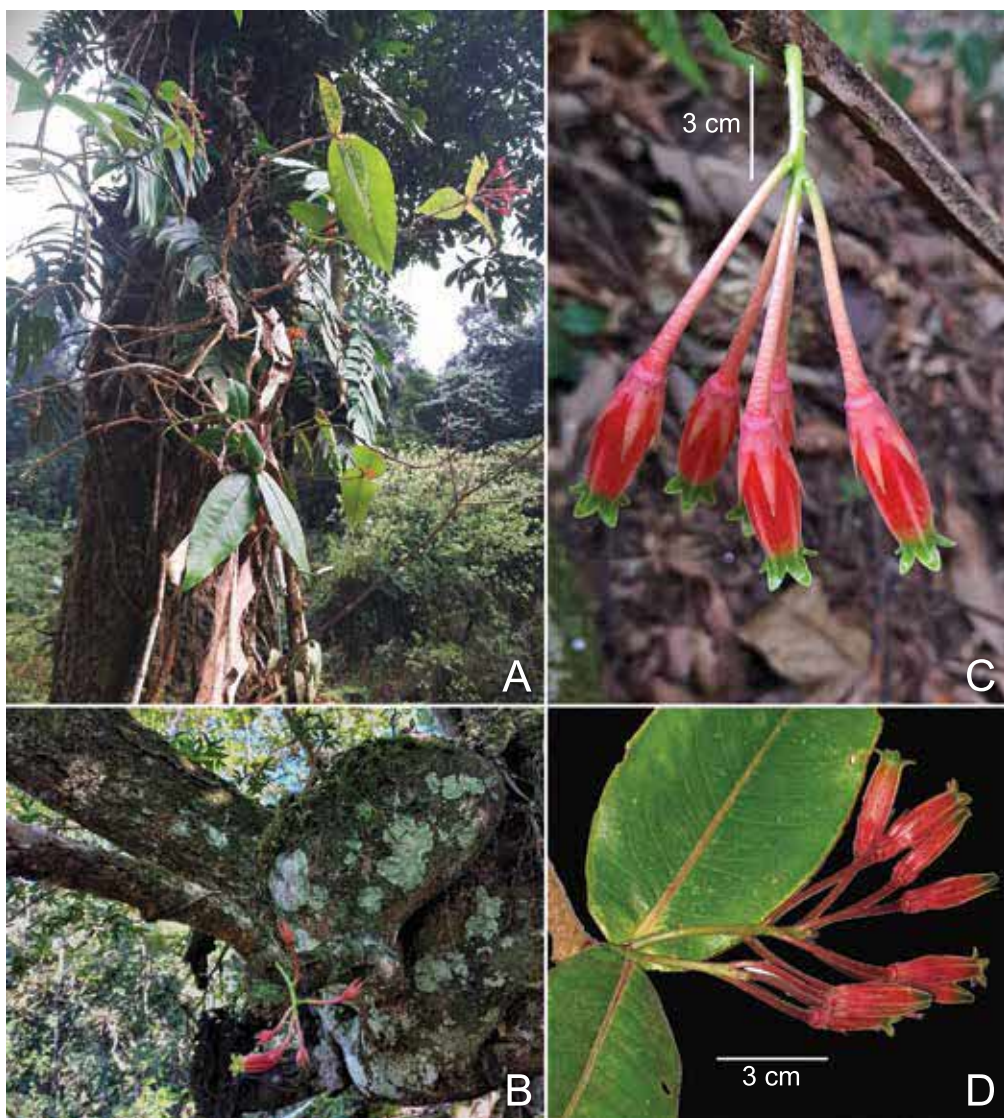


Fig. 1. *Agapetes athangensis* P.Gyeltshen. **A.** Habit. **B.** Lignotuber with inflorescence. **C.** Inflorescence attached to stem. **D.** Flowering branch showing dichotomously branched inflorescence. (Photos: P. Gyeltshen)

Distribution. *Agapetes athangensis* is endemic to Bhutan and currently known from two localities: Ada area under Athang Block in Wandgue Phodrang District, and Ranibagan and Retei areas under Dekiling and Jigmecholing Blocks in Sarpang District in Bhutan (Fig. 3).

Habitat and ecology. *Agapetes athangensis* is epiphytic on *Schima wallichii* (DC.) Korth. in the warm broad-leaved forest at 1000–1590 m elevation. Other associated

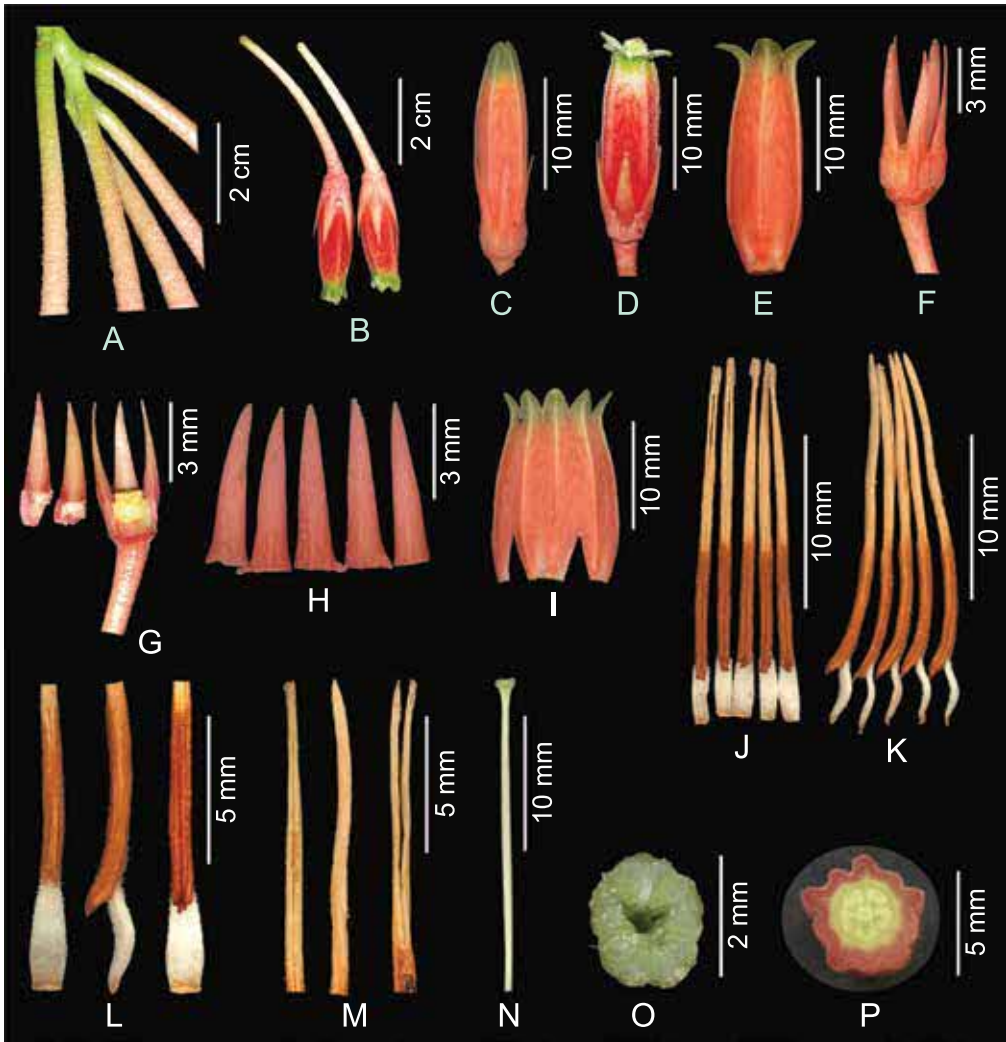


Fig. 2. *Agapetes athangensis* P.Gyeltshen. **A.** Part of peduncle and pedicels. **B.** Flowers. **C.** Flower bud. **D.** Full bloom flower. **E.** Corolla tube. **F.** Calyx (lateral view). **G.** Calyx (adaxial surface). **H.** Calyx (abaxial surface). **I.** Flattened corolla (abaxial surface). **J.** Stamens (adaxial surface). **K.** Stamens (lateral view). **L.** Anthers and filaments (abaxial, lateral and adaxial surface views). **M.** Tubules (abaxial, lateral and adaxial surface views). **N.** Pistil. **O.** Stigma (top view). **P.** Transverse section of ovary. (Photos: P. Gyeltshen)

trees include *Castanopsis tribuloides* (Sm.) A.DC. and *Quercus griffithii* Hook.f. & Thomson ex Miq. The species flowers from November to January; fruits are currently unknown.

Etymology. The specific epithet refers to the type locality Athang Block in Wangdue Phodrang District in Bhutan.

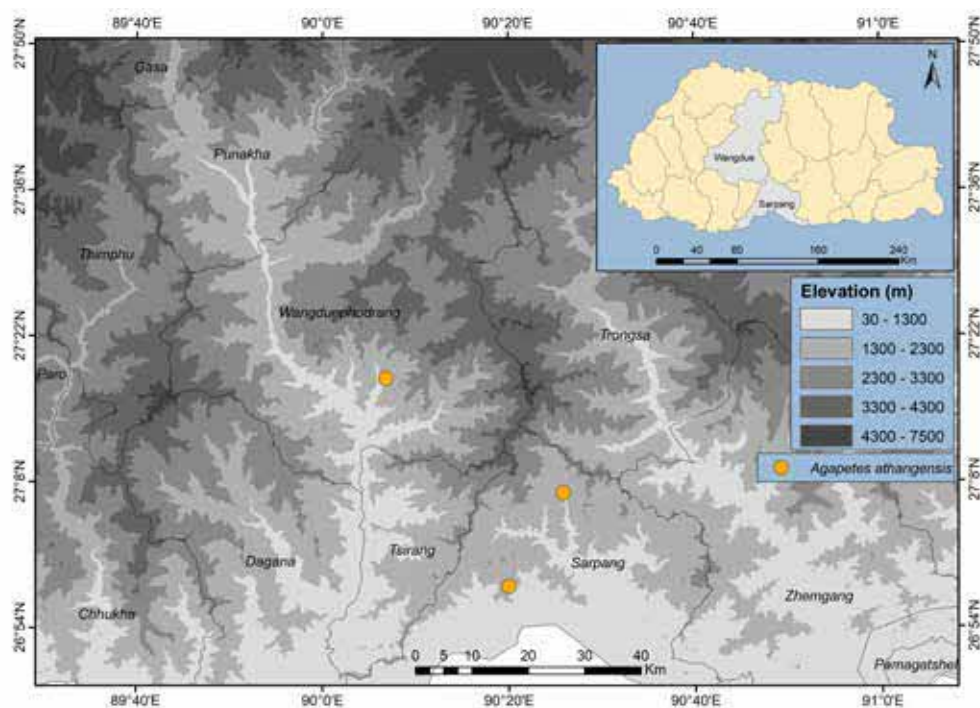


Fig. 3. Distribution map of *Agapetes athangensis* in Bhutan.

Provisional IUCN conservation assessment. *Agapetes athangensis* is known from three locations: Ada area under Athang Block in Wandgüe Phodrang District, and Ranibagan and Reteý areas under Dekiling and Jigmecholing Blocks in Sarpang District in Bhutan, with five mature individuals. All three habitats are situated along footpaths and road, and are likely to be destroyed by human activities and road expansion in the future. No new populations were found in the adjacent areas of the existing habitats. However, further assessments and surveys are needed to gather information on the species' abundance and distribution in similar habitats throughout the country to accurately determine its conservation status. Due to insufficient information, the species is currently assessed as Data Deficient (DD) in accordance with the IUCN Red List Categories and Criteria (2024).

Additional specimens examined. BHUTAN: **Sarpang District:** Dekiling Block, Ranibagan area, 26°57'58.7"N 90°20'00.6"E, 1100 m, 18 Jan. 2024, *Gyeltshen & Phuentsho* 234 (THIM [THIM22813, THIM22814, THIM22815, THIM22816]); Jigmecholing Block, Reteý area, 1258 m, 4 Dec. 2019, *Phuentsho* BTN128 (THIM [THIM18480]).

Notes. *Agapetes athangensis* is assigned to *Agapetes* sect. *Agapetes* ser. *Agapetes*, which is characterised by sub-opposite to pseudowhorled, coriaceous leaves, entire or crenate margin, calyx articulated at the base with the pedicel, free filaments, and 5-lobed, glandular-capitate stigma. *Agapetes* ser. *Agapetes* is further divided into two

subseries: subser. *Agapetes* and subser. *Minutiflorae* D.Banik & Sanjappa. According to Banik & Sanjappa (2014), subser. *Agapetes* differs from subser. *Minutiflorae* in its coriaceous leaves, with an entire or crenate margin when the corolla is more than 2 cm long, but with a serrate or dentate margin when the corolla is less than 2 cm long. However, the present study found that the leaf margin is entire or obscurely crenate when the corolla is less than 2 cm long.

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