

A new species of *Arundinella* (Poaceae) from the Nilgiri Biosphere Reserve, India

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ABSTRACT. *Arundinella mukurthiana* Murug. & Anusuba (Poaceae), a new species from the high-altitude grasslands of Mukurthi National Park, a part of Nilgiri Biosphere Reserve of the Western Ghats, Tamil Nadu, India, is described along with a detailed description, phenological information, a line drawing and photographs. A note on its conservation status is also provided.

Keywords. *Arundinella mukurthiana*, Flora of India, Mukurthi National Park, Nilgiris, Tamil Nadu, Western Ghats

Introduction

The genus *Arundinella* Raddi (Poaceae, subfamily Panicoideae, tribe Arundinelleae) has about 60 species distributed in tropical and subtropical regions of the world (Sun & Phillips, 2006; Sunil et al., 2017; Jaiswal et al., 2021) with the highest concentration of species in Asia (Clayton & Renvoize, 1986). In India, the genus is represented by 27 species (Hooker, 1896; Fischer, 1934; Bor, 1960; Sreekumar & Nair, 1991; Clayton et al., 2006; Govaerts, 2011), of which 23 are confined to the southern part of the country, including a few new species described in the last two decades by Shaju & Mohanan (2004), Kabeer & Nair (2009), Sunil & Kumar (2014) and Sunil et al. (2014, 2017). With this proposed new species, the genus is now represented by 28 species in India. According to Kabeer & Nair (2009), the genus is represented by 10 species and 4 varieties in Tamil Nadu.

In 1986 the Nilgiri Biosphere Reserve (NBR) was the first Biosphere Reserve established in India under the Man and Biosphere Programme. The Biosphere Reserve encompasses 5670 km² in three south Indian states, Tamil Nadu (2537.6 km²), Karnataka (1527.4 km²) and Kerala (1455.4 km²), and it forms an almost complete ring around the Nilgiri plateau. The Biosphere lies between 10°50'–12°16' N latitude and 76°00'–77°15' E longitude, including many protected areas and reserve forests. The NBR is home to about 3300 species of flowering plants with a high degree of endemism: a total of 132 species have been listed as strictly endemic to the NBR (UNESCO, 1974) and new species are still being described every year from the Biosphere Reserve.

The plant exploration team of the Botanical Survey of India, Southern Regional Centre, Coimbatore, Tamil Nadu undertook a botanical expedition to the Nilgiris district

of Tamil Nadu in December 2019 to comprehensively document the angiosperm flora of the NBR. During this exploration, the authors collected an interesting species of the genus *Arundinella* in two localities from Bangitappal, on the way to Earthen (Bangi Halla) Dam from Upper Bhavani, one of the high-altitude rolling grasslands in the NBR. Critical examination of the specimens collected along with examination of the pertinent literature, the study of herbarium specimens housed in CAL and MH, and the study of digital images of herbarium holdings in E, K and P, resulted in the NBR plant being found to be quite distinct from the previously described species of *Arundinella*. Therefore, it is named and described here as a new species.

Taxonomic treatment

Arundinella mukurthiana Murug. & Anusuba, **sp. nov.**

The new species is morphologically similar to *Arundinella thwaitesii* Hook.f. and the unawned form of *Arundinella laxiflora* Hook.f. (Table 1) in its long and broad leaf blades, very lax, effuse, spreading panicles, long-pedicelled glabrous spikelets, upper lemma devoid of lateral setae and awn, but it differs in its habit; ligule ciliate with a rim of hairs; spikelets ovate or oblong, 4–5 mm long, not compressed; florets both bisexual; glumes subequal, reaching only half way up the florets; lower glume broadly ovate, chartaceous with a smooth surface, slightly lobed on one side; upper glume ovate with a smooth surface and an acute apex; lemmas of two florets similar, slightly 2-keeled, prominently 7–9-veined, hairy, coriaceous; and palea lanceolate or oblong-lanceolate, obtusely acuminate at apex, without auriculate flaps, densely long-hairy on keels (contrasting characters for *Arundinella thwaitesii* and *A. laxiflora* in Table 1). – TYPE: India, Tamil Nadu, Nilgiris District, Bangitappal, on the way to Earthen (Bangi Halla) Dam from Upper Bhavani, Mukurthi National Park, 11°15'40"N 76°31'35.2"E, ± 2350 m elevation, 30 October 2019, *M. Murugesan & V. Anusuba 147779* (holotype MH; isotype CAL). (Fig. 1, 2)

An erect, perennial herb, 35–60 cm high. **Culms** solitary or tufted (1–3 culms), slender, more or less ribbed, greenish, erect with woody rootstock; rhizome usually absent; nodes glabrous or rarely with 1–3 or few long hairs. **Leaf sheaths** 5–15 cm long, usually glabrous or sometimes sparsely hairy, closely or distantly scabrid along margins, usually lower ones shorter than upper ones, shorter to sometimes longer than the internodes. **Ligule** ciliate with rim of 1–1.5 mm long hairs. **Leaf blades** linear or linear-lanceolate or lanceolate, 2.5–42 × 0.3–1.5 cm, rounded or attenuate and narrowed into a pseudo-petiole at base, involute, scabrous along margins, acute or very shortly acuminate or rarely with a pungent tip, sparsely long woolly hairy and glaucous on abaxial surface, usually glabrous or very rarely sparsely long woolly hairy and greenish on adaxial surface, veins prominent abaxially; the uppermost leaf sometimes reduced into a sheath. **Inflorescence** terminal, pyramidal, very lax, spreading branched panicles, 5–14 × 3–10.5 cm, bearing juvenile spikelets at emergence; primary branches further branched into many branchlets; branchlets

Table 1. Major differences between *Arundinella mukurthiana* Murug. & Anusuba, *A. thwaitesii* Hook.f. and the unawned form of *A. laxiflora* Hook.f.

Characters	<i>A. mukurthiana</i>	<i>A. thwaitesii</i>	<i>A. laxiflora</i> (unawned form)
Habit	Perennial	Annual	Perennial or long-lived annual
Culm node	Glabrous or rarely with 1–3 or few long hairs	Glabrous or sparsely strigose-pubescent	Glabrous
Leaf blade	2.5–42 × 1–1.5 cm, acute or very shortly acuminate with a pungent tip, woolly hairy on abaxial surface, glabrous or rarely sparsely long woolly on adaxial surface	10–20 × 0.3–0.6 cm, acuminate at apex, glabrous on both surfaces	7–15 × 0.3–0.7 cm, surface smooth, glabrous, or pilose hairy on both sides with tubercle-based hairs
Ligule	Ciliate with rim of hairs	An eciliate membrane	A ciliate membrane
Spikelets	Ovate or oblong, 4–5 mm long, not compressed	Elliptic, 3.25–3.5 mm long, laterally compressed	Lanceolate, 3–4.5 mm long, laterally compressed
Florets	Both florets bisexual, rather similar	Lower floret sterile, upper floret bisexual, dissimilar	Lower floret sterile, upper floret bisexual, dissimilar
Glumes	Subequal (upper glume is very slightly longer than lower), purplish or whitish, reaching only half way up the florets, almost thicker than fertile lemma	Clearly unequal, reaching the apex of florets, thinner than fertile lemma	Clearly unequal, exceeding the apex of florets, thinner than fertile lemma
Lower glume	Ovate or broadly ovate, 2–2.5 mm long, acute or shortly acuminate at apex, involute at margins, chartaceous, glabrous, without keel, shallowly lobed below the middle on one side, 3–5-veined, lateral veins obscure	Orbicular, c. 2 mm long, broadly acute or obtuse at apex, not lobed, prominently 3-veined, asperulous, without keel	Ovate, c. 3 mm long, narrowly acute or acuminate at apex, membranous, not lobed, 1-keeled, prominently 3-veined, scabrous, rough above
Upper glume	Broadly ovate-lanceolate, acuminate, slightly curved at apex, chartaceous, smooth, without keel, 3–7-veined, mid-vein prominent, lateral veins obscure	Elliptic or orbicular, obtuse (not curved) at apex, membranous, asperulous, 1-keeled, prominently 5-veined	Ovate, membranous, 1-keeled, prominently 5-veined, surface asperulous, rough on veins, rostrate at apex
Callus	Hairy	Glabrous	Pilose

Table 1 (continued).

Characters	<i>A. mukurthiana</i>	<i>A. thwaitesii</i>	<i>A. laxiflora</i> (unawned form)
Lemma	Similar in both florets, lanceolate or ovate to elliptic-lanceolate, 3.2–4 mm long, sharply acuminate at apex, prominently long-hairy on adaxial surface, densely so towards base, sparsely towards apex, slightly 2-keeled, prominently 7–9-veined, marginal veins rarely obscure, awn always absent	Dissimilar; sterile florets ovate, c. 3 mm long, acute at apex, membranous, 1-keeled, 3-veined; fertile lemma elliptic or oblong, c. 2.25 mm long, coriaceous, obtuse at apex, without keel, 3-veined, surface asperulous, awn always absent	Dissimilar; lower sterile florets lanceolate, c. 3 mm long, acute at apex, membranous, 1-keeled, 3-veined; fertile lemma oblong, c. 2 mm long, coriaceous, dentate at apex, 2-fid, without keel, 3-veined with obscure lateral veins, surface asperulous, margins involute, usually awned, sometimes unawned
Palea	Lanceolate or oblong-lanceolate, obtusely acuminate at apex, without auriculate flaps, membranous, hyaline, densely long-hairy on keels	Ovate-oblong, obtuse or slightly bilobed at apex with auriculate flaps, coriaceous, asperulous	Ovate-oblong, bilobed at apex with auriculate flaps, coriaceous, asperulous

alternate, rarely subopposite, 5–7 cm long; peduncles 4–18 cm long, greenish; pedicels 0.8–4 cm long, slender, angular, glabrous or rarely minutely scaberulous. **Spikelets** loosely arranged, oblong, 4–5 × 1.5–2 mm, unawned, rachilla slender, angular, green-purple, glabrous or rarely minutely scaberulous. **Glumes** unequal or subequal, purplish or whitish. **Lower glume** ovate or broadly ovate, 2–2.5 × 1–1.3 mm, acute or short acuminate at apex, margins involute, chartaceous, glabrous, shallowly lobed below the middle on one side, 3–5-veined, lateral veins obscure. **Upper glume** broadly ovate-lanceolate, 2.5–3 × 1–1.3 mm, acuminate, slightly curved at apex, involute at margins, chartaceous, 3–7-veined, mid-vein prominent, lateral veins obscure. **Florets** 2, both florets bisexual, almost similar; callus 0.2–0.3 mm long, hairy. **Lemmas** lanceolate or ovate to elliptic-lanceolate, 3.2–4 × 1.2–1.5 mm, sharply acuminate at apex, involute at margins, slightly 2-keeled, prominently 7–9-veined, sometimes marginal veins obscure, prominently long-hairy on adaxial surface, densely so towards base, sparsely towards apex. **Paleas** lanceolate or oblong-lanceolate, 3–3.5 × 0.7–1.2 mm, obtusely acuminate at apex, involute at margins, hyaline, 2-keeled, densely long-hairy on keels, 2-veined. **Stamens** 3, versatile; anthers linear, 1.5–2 mm long, acute at apex, purplish pink; filaments hyaline, c. 1 mm long. **Lodicules** 2, more or less triangular, 0.2–0.3 mm long, truncate, membranous, hyaline. **Ovary** ovoid, ellipsoid or globose, 0.3–0.5 mm long; style 1–1.5 mm long; stigmas 2, 1–1.2 mm long, yellowish brown, plumose. **Caryopsis** ellipsoid or oblongoid, c. 2 × 1 mm, rounded at ends, smooth, yellowish brown.

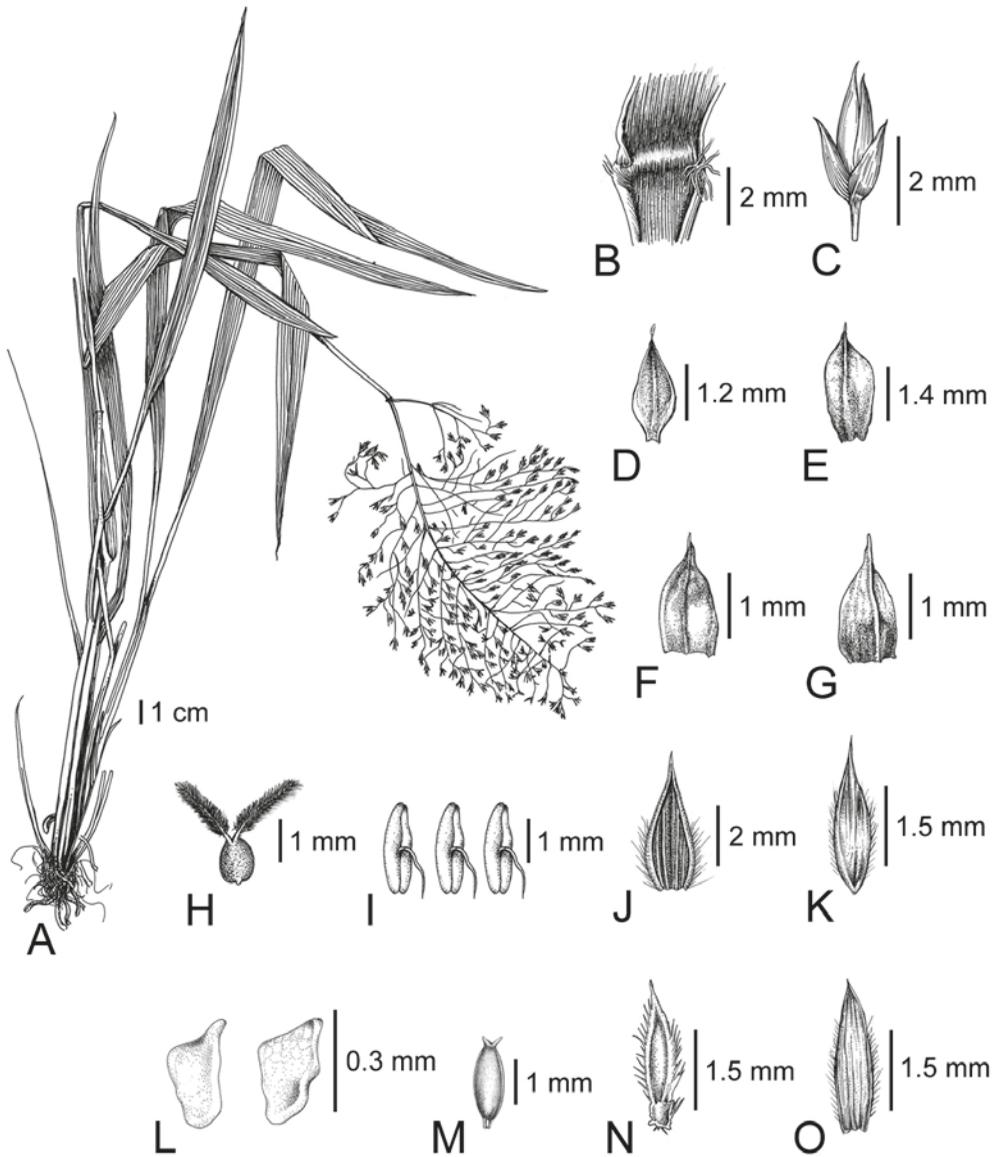


Fig. 1. *Arundinella mukurthiana* Murug. & Anusuba. **A.** Habit. **B.** Ligule. **C.** Spikelet. **D.** Lower glume (ventral view). **E.** Lower glume (dorsal view). **F.** Upper glume (ventral view). **G.** Upper glume (dorsal view). **H.** Ovary. **I.** Anthers. **J.** Lemma (ventral view). **K.** Lemma (dorsal view). **L.** Lodicules. **M.** Caryopsis. **N.** Palea (ventral view). **O.** Palea (dorsal view). Drawn by R. Suresh.



Fig. 2. *Arundinella mukurthiana* Murug. & Anusuba. **A, B.** Habit in field. (Photos: V. Anusuba)

Distribution. So far known only from Bangitappal, on way to Earthen (Bangi halla) Dam from Upper Bhavani, a part of Mukurthi National Park, Nilgiris District, Tamil Nadu, India.

Ecology. Rare on the high-altitude grassland slopes at an altitudinal range between 2200 and 2350 m above sea level. The species grows in association with *Eulalia phaeothrix* (Hack.) Kuntze, *Isachne* spp., *Anaphalis* spp., *Eriocaulon* spp., *Arundinella purpurea* Hochst. ex Steud. and *Ischaemum* spp.

Phenology. Flowering and fruiting: August to December.

Etymology. The new species is named after the type locality, Mukurthi National Park, Nilgiri hills, Tamil Nadu, India.

Provisional IUCN conservation assessment. The new species is currently known only from the type locality. During the study, eighteen small clumps in two localities in Bangitappal with not more than 45 mature individuals in an area of 2 km² were observed. However, the present investigation has not been sufficient to understand the exact range of its occurrence. Therefore, the threat status of this new species is provisionally assessed here as Data Deficient (DD) following the IUCN Standards and Petitions Committee (2022). It is suggested that further extensive exploration should be conducted in similar habitats and micro-environments in other parts of Nilgiris District to gain a better understanding of its population size, area of occupancy and extent of occurrence and threats, if any, to assess the appropriate threat category for the species.

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