

# The new species *Aristea farafangana* Goldblatt & Phillipson, sp. nov. (Iridaceae) from Madagascar, biogeographic notes on *Aristea* Aiton in Madagascar and a revised key to the genus

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Goldblatt P., Phillipson P. B. & Manning J. C. 2013. — The new species *Aristea farafangana* Goldblatt & Phillipson, sp. nov. (Iridaceae) from Madagascar, biogeographic notes on *Aristea* Aiton in Madagascar and a revised key to the genus. *Adansonia*, sér. 3, 35 (1): 47-53. <http://dx.doi.org/10.5252/a2013n1a4>

## ABSTRACT

The new species, *Aristea farafangana* Goldblatt & Phillipson, sp. nov., known from a single collection from southeastern Madagascar, has soft textured leaves, a flattened, few-branched stem, and inflorescences (binate rhipidia) consisting of up to ten flowers, borne on pedicels *c.* 4 mm long. The inflorescence spathes and floral bracts are distinctive in being short, narrow at the base and attenuate. The species may be most closely related to *A. cladocarpa* Baker, which has up to four flowers per binate rhipidium and larger floral bracts that conceal the 3-4 mm long pedicels. A morphology-based phylogeny suggests that *Aristea* in Madagascar may have colonized the Island from Africa at least four times, resulting in the presence there of eight species, seven of them endemic.

## KEY WORDS

Iridaceae,  
Aristeoideae,  
*Aristea*,  
phylogeny,  
Madagascar,  
endemism,  
new species.

## RÉSUMÉ

La nouvelle espèce *Aristea farafangana* Goldblatt & Phillipson, *sp. nov.* (Iridaceae) de Madagascar, notes biogéographiques sur le genre *Aristea* Aiton à Madagascar et clé révisée du genre.

La nouvelle espèce, *Aristea farafangana* Goldblatt & Phillipson, *sp. nov.*, connue par une seule collection du sud-est de Madagascar, possède des feuilles flexibles, une tige aplatie et peu ramifiée, ainsi que des grappes de fleurs (les rhipidiums binés) composées d'un maximum de dix fleurs, portées sur un pédoncule d'environ 4 mm de long. Les spathes et bractées florales sont caractéristiques, étant courtes, étroites à la base et atténuées. L'espèce est peut-être le plus étroitement liée à *A. cladocarpa* Baker, qui possède jusqu'à quatre fleurs dans chaque rhipidium, des bractées florales de 3-4 mm de long qui cachent les pédicelles, plus grands que ceux de la nouvelle espèce. Une phylogénie basée sur la morphologie suggère que le genre *Aristea* Aiton a probablement colonisé l'île de Madagascar en provenance du continent africain au moins quatre fois, entraînant la présence de huit espèces, dont sept sont endémiques.

## MOTS CLÉS

Iridaceae,  
Aristeoideae,  
*Aristea*,  
phylogénie,  
Madagascar,  
endémisme,  
espèce nouvelle.

## INTRODUCTION

*Aristea* Aiton (Iridaceae), the only genus of Aristeoideae Vines (Goldblatt *et al.* 2008), comprises some 60 species of sub-Saharan Africa and Madagascar (Goldblatt *et al.* 2004 and pers. data). Three subgenera have been proposed (Goldblatt in press), *Aristea* and *Pseudaristea* (Pax) Goldblatt, both restricted to the southern African winter-rainfall zone, and *Eucapsulares* (Goldblatt) Goldblatt, which is widespread in sub-Saharan Africa and is the only subgenus represented in Madagascar (Goldblatt & Le Thomas 1997).

Currently seven species of *Aristea* are recognized in Madagascar (Goldblatt 1991, 1995a), six endemic and one now treated as a synonym of *A. goetzei* Harms, described from the eastern arc mountains of Tanzania (Goldblatt 1995b, 1996). In the course of reviewing the species and the available material for the Catalogue of Vascular Plants of Madagascar (<http://www.efloras.org/madagascar>), we discovered a single specimen that clearly represented an undescribed species. The new species appears to be most closely allied to *A. cladocarpa* Baker (1883) based on general aspect,

in particular the soft-textured leaves, compressed stems, relatively low stature and texture of the spathes (inflorescence bracts) and floral bracts. The only known collection was included in that species by Weimarck (1940) in his monograph of the genus. Neither Perrier de la Bâthie (1946) nor Goldblatt (1991) saw the single specimen of this plant, thus it was not cited in their accounts of *Aristea* in the *Flore de Madagascar et des Comores*. Close examination of the inflorescence and flowers of the single plant that comprises the type collection, however, shows that it differs from the fairly widespread *A. cladocarpa* in several important characters. The most taxonomically influential features of *A. cladocarpa* are the narrowly oblong-cylindric ovary that is longer than the pedicel, cylindric-trigonous capsules and the broad, membranous, translucent-brown spathes and floral bracts that are about as long as the pedicels. In contrast, *A. farafangana* *sp. nov.* has a more or less ovoid ovary shorter than the pedicels, which are  $\pm$  4 mm long and more or less twice as long as the slender, attenuate inflorescence spathes. The inflorescences of *A. farafangana* *sp. nov.* bear up to ten flowers whereas



Fig 1. — Type specimen of *Aristea farafangana* Goldblatt & Phillipson, sp. nov., Decary 5166 (P00037065).

those of *A. cladocarpa* have no more than four, and sometimes only two flowers. Details of the flowers are of *A. farafangana* sp. nov. cannot be accurately assessed due to the condition of the type collection but were described by the collector as dark blue, and although relatively small, are slightly larger than those of *A. cladocarpa*. Capsules and seeds are not known.

The only other Madagascan or tropical African species of *Aristea* that bears a passing resemblance to *A. farafangana* sp. nov. is *A. goetzei* (syn. *A. nitida* Weim.). Also a species of forested habitats, *A. goetzei* has a cluster of several basal leaves, fairly soft in texture, a compressed stem, but is readily distinguished by the subsessile ovary, floral bracts 4–5 mm long in Madagascar (and sometimes longer in Tanzania), and ovoid capsules on pedicels no more than 1.5 mm long.

## SYSTEMATICS

### *Aristea farafangana*

Goldblatt & Phillipson, sp. nov.

(Fig. 1)

*Plantae ad 38 cm altae, caule compresso ± 2 mm latis 2–3-ramoso, foliis 8–10 mm latis, inflorescentibus ad 10 florum, spatheis bracteisque siccis membranaceis ± 2 mm longis, linearo-attenuatis, floribus [manifeste] caeruleis, pedicellibus prominentibus ± 4 mm longis; tepalis ± 8 mm longis; antheris ± 1.5 mm longis; ovario ovoideo ± 3 mm longis, stylo ± 4 mm longo.*

TYPUS. — Madagascar. Prov. Fianarantsoa, Ifandana, near Farafangana, [22°49'S, 47°07'E], fl., 8.IX.1926, R. Decary 5166 (holo-, P[P00037065]!).

PHENOLOGY. — Flowering time: September, probably also October.

### DESCRIPTION

Plants 38 cm high, with creeping rhizome; stem flattened and 2-winged, ± 3 mm wide, usually with two or three primary branches. Leaves sword-shaped, shortly exceeding the stem, mostly 8–10 mm wide, relatively soft-textured. Flower clusters several, both terminal and sessile at upper nodes, 8–10-flowered; spathes and bracts dry, membranous, ± 2 mm long, linear-attenuate, less than 1 mm wide at base. Flow-

ers on pedicels ± 4 mm long, deep blue (described as *bleu violacé*), tepals ± 8 mm long. Filaments ± 2.5 mm long; anthers ± 1.5 mm long. Ovary ± ovoid, to 3 mm long, style ± 4 mm long, 3-lobed. Capsules and seeds unknown.

### DISTRIBUTION AND ECOLOGY

*Aristea farafangana* sp. nov. is known from a single collection from Ifandana in the Farafangana region of central, southeastern Madagascar, in moist forest at an elevation of about 600 m within the general range of the closely-related *A. cladocarpa* (Fig. 2). The co-ordinates provided in the protologue are an estimate based on available maps and databased collection localities, and should be regarded as highly approximate.

### REMARKS

*Aristea farafangana* sp. nov. is readily distinguished among the species of Madagascar by the flattened, two-winged stem, broad leaves shortly overtopping the stem, and flower clusters bearing up to ten flowers. The flowers are borne on pedicels ± 4 mm long, about twice as long as the narrow, attenuate spathes and bracts about 2 mm long. The relatively soft leaf texture recalls in particular *A. cladocarpa* but that species has larger floral bracts, ± 4 mm long, often as long as the pedicels, 3–4 mm long, and a more or less oblong-cylindric ovary and elongate capsules. This contrasts with the short spathes and bracts and ovoid ovary of *A. farafangana* sp. nov. The capsules and seeds of *A. farafangana* sp. nov., often important in taxonomic considerations in *Aristea* (Goldblatt *et al.* 2004), are not known. The flowering time, September–October, is also unusual, other species of *Aristea* in Madagascar, including *A. cladocarpa*, typically flower later, November through February. *Aristea cladocarpa* has occasionally been collected in bloom as early as August and September.

### CONSERVATION STATUS

With only one collection made over 80 years ago representing a single subpopulation not situated within the protected area network, from an area that has certainly undergone considerable deforestation during the intervening period, the

possibility exists that the species may be Extinct. However, the fact that the region from which the type was made has never been the subject of intensive inventory, and, judging by satellite imagery, some forest patches do remain intact, suggests that *A. farafangana* sp. nov. may still persist. The available data indicate that the species certainly has a highly restricted EOO and a maximum AOO unlikely to exceed 10 km<sup>2</sup> and occurs in a habitat that is expected to experience further reduction and degradation in the future, it is therefore assigned a preliminary status of Critically Endangered [CR B1ab(iii)B2ab(iii)] (IUCN 2001).

#### RELATIONSHIPS OF THE MADAGASCAN SPECIES

Although all Madagascan species of *Aristea* have been assigned to subgenus *Eucapsulares*, phylogenetic analysis using traditional morphological characters as well as pollen features (Goldblatt & Le Thomas 1997; Goldblatt *et al.* 2004) indicates that they do not belong to the same clade. *Aristea goetzei*, which also occurs in the eastern arc mountains of Tanzania, was retrieved as sister to a clade of several African and Madagascan species; *A. angustifolia* Baker as sister to a second clade of largely African species, also including *A. cladocarpa*; and *A. cladocarpa* itself was sister to an African clade consisting of *A. ecklonii* Baker, *A. ensifolia* Muir and *A. pusilla* (Thunb.) Ker Gawl. which share with *A. cladocarpa* elongate, deeply 3-lobed capsules. The remaining species from Madagascar, *A. humbertii* H.Perrier, *A. kitchingii* Baker, *A. madagascariensis* Baker and *A. ranomafana* Goldblatt, comprise a clade, notably sharing apically dehiscent, porose anthers, unique in the genus. Where *A. farafangana* sp. nov. falls in the phylogeny is uncertain but it seems likely, based only on comparative morphology, that it is most closely allied to *A. cladocarpa*.

It follows that *Aristea* in Madagascar has a complex biogeographic history involving at least three and perhaps four colonizing events from different African ancestral stock. Using a molecular clock hypothesis, Goldblatt *et al.* (2008) concluded that *Aristea* diverged at least 48 mya from its closest

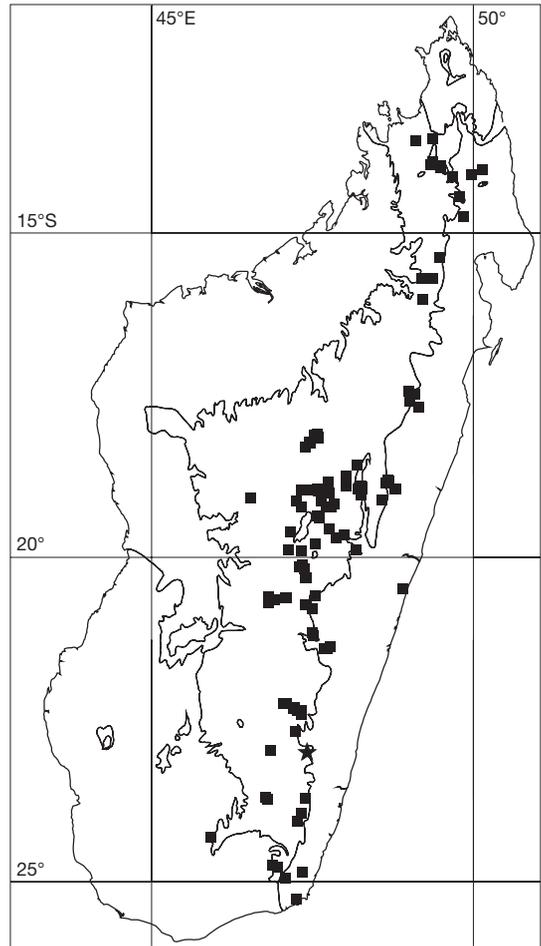


FIG. 2. — Map of Madagascar showing the five main bioclimatic regions (after Schatz 2000), and the distributions of *Aristea farafangana* Goldblatt & Phillipson, sp. nov. (★) and *A. cladocarpa* Baker (■).

ancestor, the Madagascan *Geosiris* (2 or 3 spp.: Goldblatt & Manning 2008, 2010), the only genus of Geosiridaceae. At this time Madagascar laid close to its present position alongside south-eastern Africa (Scotese 1997, 2004), close enough to Africa to have allowed multiple exchanges between to two floras during this extended time, despite the apparent low vagility of the passively dispersed seeds of subgenus *Eucapsulares*, which are relatively large and lack fleshy appendages or wings (Goldblatt & Le Thomas 1997; Goldblatt & Manning 2008).

KEY TO THE GENUS *ARISTEA* AITON IN MADAGASCAR

1. Stem compressed, 2-sided and 2-winged; leaves fairly thin-textured; anthers longitudinally dehiscent ..... 2
- Stem  $\pm$  terete or slightly compressed but not 2-sided, occasionally slightly 2-winged; leaves firm and rigid; anthers longitudinally or apically dehiscent ..... 4
2. Spathes and floral bracts linear-attenuate, to 2 mm long, dry with dark keels; pedicels  $\pm$  4 mm long; flowers up to 10 per flower cluster ..... *A. farafangana* Goldblatt & Phillipson, sp. nov.
- Spathes and floral bracts ovate, 3-6 mm long, dry and brown-membranous with dark keels; pedicels vestigial to 3(-4) mm long; flowers up to 6 per flower cluster ..... 3
3. Flowers with pedicels 3(4) mm long; ovary oblong, 3-5 mm long; capsules oblong-cylindric and trigonous, (6-)8-15 mm long ..... *A. cladocarpa* Baker
- Flowers with pedicels vestigial, less than 1 mm long; ovary ovoid,  $\pm$  2 mm long; capsules ovoid, 6-7 mm long ..... 4. *A. goetzei* Harms
4. Stem dichotomously branched; flowers subsessile or on well developed pedicels ..... 5
- Stem simple or with short lateral branches and main axis dominant; flowers  $\pm$  sessile or with pedicels up to 1 mm long ..... 6
5. Flowers with well developed pedicels at least 4 mm long; capsules borne on pedicels 5-8 mm long; inflorescence spathes and bracts  $\pm$  filiform, up to 3.5 mm long ..... *A. humbertii* H. Perrier
- Flowers subsessile; capsules borne on pedicels 1-1.5 mm long; inflorescence spathes and bracts ovate, 3-4 mm long ..... *A. ranomafana* Goldblatt
6. Leaves linear to  $\pm$  subulate, 0.8-1.8 mm wide; leaf margins not hyaline; anthers up to 2 mm long, dehiscing longitudinally ..... *A. angustifolia* Baker
- Leaves mostly linear or sword-shaped, (2-)3-12 mm wide; leaf margins hyaline; anthers 3-5 mm long, dehiscing through apical slits ..... 7
7. Leaves 2-3.5(-5) mm wide; inflorescence spathes and bracts 4-7 mm long, enclosing ovaries of the flowers; plants relatively slender and 20-50(-75) cm high ..... *A. madagascariensis* Baker
- Leaves (3-)4-8 mm wide; inflorescence spathes and bracts 4-5 mm long, not completely enclosing ovaries of the flowers; plants robust and 70-120 cm high ..... *A. kitchingii* Baker

**Acknowledgements**

We wish to thank the Director of Collections, Muséum national d'Histoire naturelle, for access to herbarium material, and for permission to reproduce the scanned image of the type specimen. We also thank the reviewers of this article, Martin Callmander, Pete Lowry and Valéry Malécot, for suggesting improvements.

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Submitted on 20 January 2012;  
accepted on 10 September 2012;  
published on 28 June 2013.