New species and nomenclatural changes in *Angraecum* (Orchidaceae) from Madagascar

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Summary. Three new species: *Angraecum archangelicum*, *A. polyphemus* and *A. rotundifolium* are described for the first time. *Pectinariella* is evaluated; a case is made to keep it at subgeneric level and the necessary two new combinations are made. *Angraecum dasy carpum* is neotypified. Finally *A. ochraceum* and *A. setipes* are compared with the latter being reduced to a synonym of the former.

Key Words. IUCN Red List assessments, new species descriptions, *Pectinariella*, taxonomy, Vandaeae.

Introduction

Angraecum Bory (1804: t. 19) comprises around 225 species, occurring mainly in Africa, Madagascar and adjacent islands of the Indian Ocean. Madagascar has the greatest number of species, around 150, most of which are endemic (Hermans *et al.* 2007; Govaerts *et al.* 2018). Following the major work on the Madagascan angraecoid orchids by Schlechter (1918b, 1924) and Perrier de la Bâthie (henceforth Perrier) (1938, 1941), Garay (1973) produced a taxonomic revision of the genus at sectional level. Several investigations of the phylogeny and biogeography of the genus have recently been made (Michenau *et al.* 2008; Szlachetko *et al.* 2013; Andriananjanamanantsoa *et al.* 2016; Simo-Droissart *et al.* 2018a). In addition Senghas (1964, 1997), Bosser (1970, 1988, 1989a & b, 2007), Hermans & Cribb (1997, 2005), Hermans & la Croix (2001), Hermans *et al.* (2002), Cribb *et al.* (2012), Verlynde *et al.* (2016) and Hermans (2017) have all recently described novelties in the genus from the island.

Recent studies on the genus at Kew, the Missouri Botanical Garden, the University of Vienna, and PBZT Antananarivo have resulted in the recognition of a number of new species and a better understanding of their nomenclature. Three new species are described and several nomenclatural changes are outlined here.

Because of the limitations of herbarium material available for completing some of the drawings, it was not always possible to represent all the detail of the gynostemium; more detailed notes from field observations were added to the text.

IUCN Red List assessments

The conservation status of the new species given in this paper are summaries of the full IUCN Red List assessments which will be completed and submitted for review and publication by IUCN once the species names are validly published and therefore available for assessment. All the assessments have been compiled based on current knowledge of these taxa, using the IUCN *Red List Categories and Criteria* (2012, 2017).

New Species

***Angraecum archangelicum* Hermans & Sieder sp. nov.**
Type: Madagascar, Fianarantsoa prov., Antoetra, 1727 m, on granite inselberg, 15 Feb. 2015, Sieder, Perl & Andriantiana, 6871 (WU342015) (holotype WU!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77211711-1>

Pendent to semi-erect epiphytic or lithophytic *herb* up to 11 cm long. *Roots*, branched, silvery, glabrous,

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somewhat flattened, 4 – 6 mm in diam. *Stem* woody, covered with scarious bracts, c. 3 – 5 cm long, c. 1 cm in diam. with 3 – 4 leaves, the base covered with the old corrugate, brown leaf sheaths. *Leaves* glaucous, distichous, narrowly ligulate-lanceolate, somewhat falcate at the apex, 6 – 16 cm long, 0.7 – 1.5 cm wide, the base narrowing and laterally compressed into a sheath c. 2 cm long. *Inflorescences* lateral, emerging from the base of the stem, pendent to divergent at c. 45° to the stem, 5 – 7 cm long, with 1 – 2 flowers and an embryonic bud at the base, the occasional second flower on a short branch of the inflorescence. *Peduncle* thin, rigid, 6 – 8 × 2 – 4 mm, green, with 1 – 3 brownish green sterile bracts, the old ones persistent. *Floral bracts* thin-textured, enclosing the base of the pedicellate ovary, 1.6 – 2.4 × 1.2 – 1.8 mm, brownish green. *Flowers* non-resupinate with the lip uppermost, spreading, up to 20 × 12 mm, pale yellowish green, shiny, the lip and column a little paler, apex of the spur green, column white. *Pedicel* and *ovary* terete then twisted and more grooved towards the base, 7.9 – 9.2 × 0.8 – 1.2 mm, green. *Dorsal sepal* pendent, broadly lanceolate, attenuate, 9.8 – 11.5 × 4.5 – 5.5 mm, the margins recurved. *Lateral sepals* erectly spreading, broadly lanceolate, attenuate, 6.9 – 7.2 × 2.7 – 3 mm. *Petals* erect, broadly falcate, attenuate, 7.9 – 9.2 × 2.8 – 3.2 mm, recurved in the apical third. *Lip* cucullate, ovate-lanceolate, 6.7 – 7.5 × 3.8 – 4.1 mm, acuminate, with a broadly thickened longitudinal callus, the apical margins strongly incurved and partly fused at the apex; *spur* somewhat recurved, clavate, 9.8 – 10.6 × 1.2 – 2.6 mm. *Column* ovoid to globose, c. 1.5 × 2 mm, lateral lobes of the rostellum attenuate at the front, c. 1 mm long, stigma ovoid, c. 0.5 mm in diam.; *anther cap* elliptic, with a small lobule at the front, with two distinct chambers, c. 1 × 1.2 mm; *pollinia* ovoid c. 0.5 × 0.6 mm, two lorate stipes with an small triangular viscidium. Figs 1, 2.

RECOGNITION. With its sub-acaulous habit and relatively small flowers on an elongate peduncle the new species belongs in section *Boryangraecum* Schltr. (Schlechter 1925: 308). Within the section it is distinguished by the combination of its relatively large habit with long narrow leaves and its pendent, long, rigid peduncle. It can also be recognised by its non-resupinate flowers, relatively large erect petals, the broad central vein within the lip and its clavate spur. It is closest to *Angraecum aviceps* Schltr. (Schlechter 1925: 335) known from Bemarivo in the NE of Madagascar. Schlechter's description is short and the type specimen has been missing from P for many years. From the description it is clear that its leaves are shorter, the inflorescence has more flowers (3 – 5 vs 1 – 2) and is produced earlier in the year, and the flowers are a little smaller, with smaller petals and a subfiliform spur (vs clavate). It is also similar to *A. calceolus* Thouars

(1822: t. 78) but the habit and inflorescence of that species are very different, the spur is generally longer (much longer than the ovary vs about the same length), the dorsal sepal shorter (6 – 8 mm vs over 10 mm), the petals not erect and the lip of a different shape. It also shows some similarities in habit and inflorescence to *A. ochraceum* (Ridl.) Schltr. (Schlechter 1915: 436) but that species has much smaller flowers of a different shape and a spur at least 3 times longer than the ovary.

DISTRIBUTION. The new species is endemic to central Madagascar; it is known from the type specimen but also from photographs taken by Jean-Michel Hervouet and Gilles Grunenwald in Ambondrombe and Ankaratra respectively.

SPECIMEN EXAMINED. **MADAGASCAR.** Fianarantsoa prov., Antoetra, Feb. 2015, 1727 m, *Sieder, Perl & Andriantiana* 6871 (WU342015) (equivalent number *Hermans* 8091) (holotype WU!).

HABITAT. Lithophyte on granite inselberg, epiphyte on 'tapia' (*Uapaca bojeri* Baill.) dominant forest. Altitude 1600 – 1700 m.

CONSERVATION STATUS. *Angraecum archangelicum* is endemic to Madagascar, distributed in the Central Highland in Amoron'I Mania, Haute-Matsiatra and Vakinankaratra regions, Antananarivo and Fianarantsoa provinces. It occurs in three defined threat locations and is not recorded from any Protected Areas. The extent of occurrence EOO, the area of occupancy AOO and the habitat quality are currently not known but are very likely in continuing decline due to major threats such as frequent fires. Therefore, it is assessed as Endangered (EN) under criterion B1ab(i,ii,iii)+ 2ab(i,ii,iii) according to the IUCN Red List Categories and Criteria.

FLOWERING TIME. February – April.

ETYMOLOGY. Referring to the resemblance of the flowers to a group of descending archangels.

NOTES. The species was briefly described and illustrated by Guérin & Hervouet (2011: 97) and Hervouet (2018: 153) as an unidentified species (*Angraecum* sp. 2).

***Angraecum polyphemus* Hermans & Verlynde sp. nov.**
Type: Madagascar, Antsiranana prov., near Joffreville, Fontenay, c. 900 m, Jan. 1993, *Hermans* 8127 (holotype K!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77211712-1>

Semi-erect or pendent flabellate epiphytic *herb* up to 5 cm long, on a very short stem; roots wiry, cylindrical, glabrous, c. 1 mm in diam. *Stem* 3 – 8 × 2 – 4 mm, flattened, the base covered with dried leaf and peduncle sheaths. *Leaves* up to 9, distichous, twisted at the base so as to lie in a single plane containing the stem axis, conduplicate at base at the transition to the

Fig. 1. *Angraecum archangelicum*. A part of habit from photographs; B flower, dorsal view; C flower, side view; D flower ventral view; E dorsal sepal; F lateral sepal; G petal; H lip; J lip lamina opened out; K lip, column, ovary and pedicel, side view; L column, dorsal view; M column, ventral view; N anther cap. Based on *Hermans* 8091. DRAWN BY JUDI STONE.

Fig. 2. *Angraecum archangelicum*. A habit in habitat; B inflorescence; C flower, face view. PHOTOS: JEAN-MICHEL HERVOUET.

leaf sheaths, ligulate to lanceolate, $10 - 29 \times 2.5 - 6$ mm, the margins a little thinner, flat canaliculate on top, roundly keeled below with the mid-vein ending in an apicule before the attenuate unequally bilobed leaf tip, on a short $2 - 4 \times 1 - 1.2$ mm petiole. *Inflorescence* axillary, short, diverging, $10 - 15$ mm long, single or rarely 2-flowered with an embryonic bud at the apex. *Peduncle* slender, $6 - 9$ mm, flattened, capitate at the tip, persistent, peduncle sheath attenuate, $2.5 - 3.9 \times 1 - 1.5$ mm. *Floral bracts* lanceolate, $2.5 - 4 \times 1.1 - 1.8$ mm, attenuate. *Flowers* non-resupinate with the lip uppermost, $8 - 11 \times 6 - 8$ mm, white except for the apex of the spur, which is green and, the anther which has yellowish green cross-shaped bands in the middle. *Pedice*l and *ovary* obconical, incurved, glabrous, $6.5 - 8.3 \times 1 - 1.3$ mm. *Dorsal sepal* convex, obovate to elliptic-obovate, $4.8 - 5.1 \times 1.9 - 2.2$ mm, apiculate at the apex. *Lateral sepals* convex, obovate to elliptic-obovate, $4.6 - 4.9 \times 2.2 - 2.4$ mm, apiculate at the apex. *Petals* oblong-obovate, $4.5 - 5 \times 1.6 - 1.8$ mm, subapiculate at the apex. *Lip* 3-lobed with the lateral lobes erect and parallel to the column and the mid-lobe upturned, $4.9 - 5.4 \times 5.2 - 5.6$ mm, the lateral

lobes sinuate at the anterior margin, the mid-lobe sinuate to undulate at the margin, emarginate to acute at the apex, the base with a few scattered thin hairs; *spur* almost parallel to the ovary, clavate, rounded at the apex, slightly arcuate, $4.3 - 4.7 \times 1.2 - 1.9$ mm. *Column* ovoid, $2 - 2.2 \times 1.7 - 1.8$ mm, lateral lobes of the rostellum roundly lobed, c. 1.5 mm long, midlobe lobular, stigma ovoid, c. 0.8 mm in diam.; *anther cap* elliptic, produced with a long bilobed part at the front, with two distinct chambers, $1.7 - 1.9 \times 1.2 - 1.4$ mm; *pollinia* 2, ovoid, c. 1×0.7 mm, with two lorate stipes and a small angular viscidium. Figs 3, 4.

RECOGNITION. *Angraecum polyphemus* belongs in section *Pectinaria* (Benth.) Schltr. (Schlechter 1918b: 157) for its habit and usually single-flowered on a short peduncle. It is distinct by its flabellate habit on a very short stem with relatively wide ligulate to lanceolate flat leaves lacking a dorsal wing, and its comparatively large flower(s) with the lip uppermost, with broad rounded side lobes, a sinuate anterior margin with a few hairs at the base and a relatively long clavate spur and an anther with a large lobe at the front. It is

Fig. 3. *Angraecum polyphemus*. A habit; B leaf apex, dorsal view; C leaf apex, ventral view; D flower, front view; E flower, ventral view; F dorsal sepal; G lateral sepal; H petal; J lip; K lip, column, ovary and pedicel, side view; L column, front view, with anther cap in place; M column, front view, anther cap removed; N column, with anther cap, side view; P anther cap, dorsal view; Q anther cap, ventral view. Based on *Hermans* 8127. DRAWN BY JUDI STONE.

Fig. 4. *Angraecum polyphemus*. A plant in habitat; B flower, face view. PHOTOS: JOHAN HERMANS.

different in habit and flower from most of the other species in section *Pectinaria* (but there are a number of similarities with *A. edmundi* (Verlynde & Ramand.) Hermans & Verlynde, *A. pterophyllum* H.Perrier (1938: 106) and *A. scroticalcar* (Verlynde & Ramand.) Hermans & Verlynde, including the short peduncle, 1 to rarely 2 flowers, thickened apicule at the apex of petals and sepals, 3-lobed lip with hairs at the base and relatively short thickened spur. It differs from all three by its very short stem, flat ligulate-lanceolate leaves that are roundly keeled (vs thin-flattened below), the different arrangements of the leaves which are generally fewer in number, twisted at the base and arranged in one plane containing the stem axis (vs not twisted at the base and arranged in more than one plane perpendicular to the stem axis), the larger flowers (twice the size of *A. edmundi* and *A. scroticalcar*, and about a quarter larger than *A. pterophyllum*), the lateral lobes of the lip less distinct with sinuate anterior margins (vs entire (except in *A. edmundi*)), fewer hairs at the base of the lip. The spur is similar but is more elongate than the other species (almost twice the length) and more arching. Table 1.

DISTRIBUTION. *Angraecum polyphemus* is endemic to Madagascar and found in the provinces of Antananarivo, Antsiranana and Toamasina.

SPECIMENS EXAMINED. MADAGASCAR. Antsiranana prov., Diana region, near Joffreville, Fontenay, c. 900 m, Jan. 1993, *Hermans* 8127 (holotype K!); Antananarivo prov., Analamanga region, Andramasina distr., commune de Takafara, Kelilalina, Ambohimanga, 1625 m, May 2015, fl., *Antananarivo Spirit Collection*

90T6 (TAN!); same locality, Feb. 2017, fl., *Antananarivo Spirit Collection* 322T75bis (TAN!); Toamasina prov., Alaotra-Mangoro region, Moramanga distr., Ampitambe fokontany, commune rurale d'Ambohobary, between Tapimbato and Berano, 1206 m, Jan. 2005, fl., *Razanatsoa* 102 (MO, P!, TAN!); Ambatovy forest, 1134 – 1151 m, April 2012, fl., *Ambatovy Spirit Collection* 358A950 (TAN!); same locality, Feb. 2014, fl., *Ambatovy Spirit Collection* 1419VB818 (TAN!); same locality, March 2014, fl., *Ambatovy Spirit Collection* 1561VB1744 (TAN); same locality, March 2014, fl., *Ambatovy Spirit Collection* 1562VB1745 (TAN); same locality, March 2014, fl., *Ambatovy Spirit Collection* 1563VB1746 (TAN); Antsiranana region, Vatomaniry distr., commune d'Ambalabe, 770 – 780 m, April 2016, fl., *Ambalabe Spirit Collection* 59L561 (TAN).

HABITAT. Epiphyte in humid evergreen forest, on tree trunks, 0.5 – 1 m from the ground. Altitude 770 – 1631 m.

CONSERVATION STATUS. *Angraecum polyphemus* is endemic to Madagascar, distributed in Analamanga, Antsiranana (Joffreville), Diana and Alaotra-Mangoro regions, Antananarivo (Ambohimanga), Antsiranana and Toamasina (Moramanga) provinces. The extent of occurrence (EOO) of *A. polyphemus* is estimated to be over 24,749 km² (which exceeds the limits for Vulnerable status under criterion B1) whereas its minimal area of occupancy (AOO) is estimated to be 24 km² (which falls within the limits for Endangered status under the criterion B2). This species is known from two specimens collected in distinct protected

Table 1. Comparison of the main characteristics of *Angraecum scroticalcar*, *A. pterophyllum*, *A. edmundi* and *A. polyphemus*, the first three based on Verlynde *et al.* (2016: 228).

	<i>Angraecum scroticalcar</i>	<i>Angraecum pterophyllum</i>	<i>Angraecum edmundi</i>	<i>Angraecum polyphemus</i>
Plant	1.4 – 4 cm, erect with distinct stem	1.4 – 6.7 cm, pendent with distinct stem	2 – 4 cm, erect with distinct stem	up to 5 cm, suberect and subacaulous
Leaves	4 – 12, 6 – 18 × 1 – 2 mm, conduplicate, elliptic, fleshy, margins recurved, not twisted at the base arranged in more than one plane perpendicular to stem axis	4 – 21, 8 – 37 × 2 – 3.5 mm, conduplicate, linear, fleshy, margins recurved, not twisted at the base arranged in more than one plane perpendicular to stem axis	4 – 15, 8 – 19 × 1.5 – 3 mm, linear, fleshy canaliculate, margins recurved, not twisted at the base arranged in more than one plane perpendicular to stem axis	4 – 9, 10 – 20 × 2.5 – 6 mm, flat, lanceolate to ligulate, twisted at the base so as to lie in one plane containing the stem axis
Flowers	1 – 2, 4 mm long, segments 3-veined	Single, 5.5 – 7 mm long, segments 3-veined	1 – 2, 3.5 mm long, segments 3-veined	1 – 2, 8 – 10 mm long, segments 3-veined
Dorsal sepal	ovate, 2 × 0.8 mm	ovate, 3 – 5 × 2 – 2.5 mm	ovate, 2 × 1 – 1.5 mm	ovate, 4.8 – 5.1 × 1.9 – 2.2 mm
Lateral sepals	obovate, keeled, acuminate, 2 × 1 mm	obliquely ovate, somewhat keeled, acuminate, 4 × 3 mm	obliquely ovate, somewhat keeled, acuminate, 2.5 – 3 × 1.5 mm	ovate, 4.6 – 4.9 × 2.2 × 2.4 mm
Petals	ovate, subapiculate, 2 × 1 mm, not keeled	obovate, subapiculate, 2.5 – 4 × 1.8 – 2.3 mm, fleshy, not keeled	obovate, rounded or subacute at the tip, 1/5 – 2 × 1.2 mm, not keeled	obovate-spatulate, 4.5 – 5 × 1.6 – 1.8 mm, subacute, somewhat keeled
Lip	3-lobed, lateral lobes short 0.8 mm long and acute, mid-lobe subapiculate at the apex 1.2 × 1.5 mm, base with hyaline hairs, 1.8 mm long	3-lobed, lateral lobes oval rounded at the apex, c. 1.5 mm long not acute & erect folded against the column, mid-lobe broadly subangular, rounded and apiculate at the tip 2 × 2.2 mm, base with short hyaline hairs, 3.5 – 4.5 mm long	3-lobed, lateral lobes short erect, rounded, 0.8 mm long, mid-lobe bigger, subrectangular 1.5 × 1.5 mm, truncate and subapiculate at the tip, base with thinning hyaline hairs, 2.5 – 3 mm long	3-lobed subequal, lateral lobes rounded, mid-lobe emarginate, a few hairs at the base, not apiculate, 4.9 – 5.4 × 5.2 – 5.6 mm
Spur	cylindrical, apex scrotiform, 2.2 × 0.7 mm	clavate, 2 – 2.5 mm long, rounded at the apex	ampulliform, 1.5 – 2 mm long	clavate, 4.3 – 4.7 mm long
Column	rostellum bilobed, lobes acute, 3 mm long	rostellum bilobed, lobes acute or truncate, 0.8 – 2 mm long	rostellum bilobed, lobes truncate, 1 mm long	rostellum roundly bilobed, c. 2 mm long
Anther cap	hemispheric, 0.6 – 0.8 mm	hemispheric, 1 – 1.3 mm, with a narrow 0.5 – 1 mm lobe at the front	hemispheric, 0.5 – 0.6 mm, with a narrow c. 0.3 mm lobe at the front	ellipsoid, 1.7 – 1.9 × 1.2 – 1.4 mm with a long bilobed lobule at the front
Distribution	Toamasina prov., Eastern forest	Antananarivo, Fianarantsoa, Toamasina prov., widespread	Antananarivo prov., central	Antananarivo, Antsiranana & Toamasina prov.
Altitude (m)	0 – 1500	1000 – 1700	700 – 1700	700 – 1600
Flowering time	August	August to April	February to August	January to May

areas, one from the Parc National de la Montagne d'Ambre, and one from the Corridor Ankeniheny Zahamena. In addition to these officially protected sites, eight specimens of this species have also been collected in unprotected forests subjected to forest clearing, selective logging, timber harvesting for small-scale subsistence and tavy (slash-and-burn farming). This species is thus known from ten specimens representing three existing and one partially extirpated subpopulation. These four subpopulations represent a total of four “locations” (*sensu* IUCN 2012) with respect to the main threat of habitat destruction, falling within the limit for Endangered status. We estimate that the past loss of its habitat,

which will continue, has and will induce a strong continuous decline in habitat quality, number of subpopulations and mature individuals in the next ten years as well as a decline of its AOO. *Angraecum polyphemus* is therefore assigned a status of EN B2ab(i,ii,iii,iv,v).

FLOWERING TIME. January to May.

ETYMOLOGY. Referring to Polyphemus from Greek mythology, with the central column and anther cap resembling the eye of the monster and the club-shaped spur the weapon often carried by the same mythical creature.

NOTES. Flowering plants of this species have recently (Jan. 2017) been observed in the Montagne d'Ambre

National Park by several of the authors.

Angraecum rotundifolium Hermans *sp. nov.* Type: Madagascar, Toamasina prov., Andasibe, edge of Mantadia forest near Vakôna lodge, 1060 m, May 2001, *Hermans* 5573 (holotype K!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77211713-1>

Small scrambling epiphytic *herb* up to 15 cm long, appressed to the substrate; with a few branched roots along the stem, wiry, a little verrucose, c. 1 mm in diam. *Stem* branching and sub-branching, up to 13 cm long, a little flattened, the base covered by old corrugate leaf sheaths. *Leaves* coriaceous, alternate-distichous along the stem, the mature ones appressed against the substrate, elliptic to oblong, 6 – 6.5 × 3.5 – 3.8 mm, flat with a rounded mid-vein underneath, obtuse to rounded at the base, unequally bilobed at the apex, pale to dark green, the surface foveolate. *Inflorescence* divaricate, very short, single-flowered, leaf-opposed, with an embryonic flower bud at the base. *Peduncle* short, angular in cross-section, c. 4 – 5 × 1 mm, covered by 2 – 3 thin sterile bracts. *Floral bracts* ovate, conduplicate, dorsally ridged, 1.8 – 2.2 × 1 – 1.3 mm, creamy-white. *Flowers* passively resupinate, overall 6 – 7 × 5 – 7 mm, crystalline white, the anther and pollen yellowish. *Pedicel* and *ovary* fusiform, 3 – 5 × 0.9 – 2 mm, echinate to shortly hirsute, pale ochre with the thorny hairs brown especially along the longitudinal furrows. *Dorsal sepal* broadly lanceolate, 4 – 5.1 × 1.8 – 2 mm, obtuse, a little recurved at the apex. *Lateral sepals* lanceolate acute, 4.2 – 6 × 1.8 – 2.1 mm, spreading, recurved. *Petals* broadly lanceolate, 3.3 – 4.2 × 0.8 – 1.2 mm, acute, spreading, recurved. *Lip* ovate when flattened, 4 – 5 × 2.5 – 3.8 mm, obtuse to acute, with rounded lobes in the basal third, anterior margin often involute, *spur* opening narrow, cylindrical towards the base then scrotiform and flattened, 2.2 – 4 × 1 – 2.1 mm. *Column* very short, rounded, with distinct falciform lateral rostellum lobes folded in front, apex of rostellum deeply emarginate with a small subulate central lobe, 1 – 1.2 × 1 – 1.2 mm, stigma oval, c. 1 mm in diam. *Anther cap* semi-globose with a raised rounded lobe, 0.9 – 1.2 × 0.8 – 1 mm; *pollinia* 2, obovoid, c. 0.2 × 0.4 mm, with strap-like stipes and a small viscidium c. 0.3 mm long. Figs 5, 6.

RECOGNITION. A small branching plant, lying flat on the substrate, and with small elliptic to oblong leathery leaves, a short single-flowered inflorescence, and small flowers with an echinate to shortly hirsute ovary, an ovate lip roundly lobed at the base, a spur that is cylindrical towards the base, then scrotiform and flattened, and a column with falciform rostellum lobes

folded at the apex. With its habit and solitary small flower on a short peduncle *Angraecum rotundifolium* is placed in section *Pectinaria* of the genus. Its flowers are somewhat similar to those of *A. pectinatum* Thouars (1822: t. 51) and *A. humblotianum* (Finet) Schltr. (Schlechter 1915: 434) but its habit is very different with broad, rounded leaves (vs elongate-linear or almost terete) and flowers with a spur that is also a little shorter and scrotiform (vs cylindrical). With its branching leafy stem and small flower it has frequently been confused with the superficially similar *A. dasycarpum* Schltr. (Schlechter 1918a: 337) circumscribed below, but it is different in several characteristics which are not always obvious in herbarium materials: the plant grows flat against the substrate (vs the somewhat erect growth of *A. dasycarpum*), and has flat, elliptic to oblong leaves (vs ovate-lanceolate slightly divergent to the stem), tepals that are consistently around half the size, a scrotiform spur (vs cylindrical narrowing towards the tip), an echinate to shortly hirsute ovary (vs longly hirsute) and a column with prominent angular ribs (vs rounded). Its distribution is also different, with *A. rotundifolium* recorded only from the eastern forest near Andasibe in Toamasina province at c. 600 – 1000 m where it flowers from February to May, whereas *A. dasycarpum* is found in north-eastern Madagascar in lower elevation forest where it flowers from August to November. Table 2.

DISTRIBUTION. Endemic to Toamasina province in eastern Madagascar.

SPECIMENS EXAMINED. MADAGASCAR. Toamasina prov., Andasibe, edge of Mantadia near Vakôna, May 2001, 1060 m, *Hermans* 5573 (holotype K!); Toamasina Alaotra-Mangoro, c. 22 km NE of Moramanga, Ambohibary, 1006 m, March 2005, *Rakotovo* 1635 (TAN!); Toamasina, Antsinanana, Andrangato R., 638 m, March 2011, *Antilahimena* 7583 (MO, TAN!); Toamasina, Antsinanana, Andrangato R., 1582 m, March 2011, *Antilahimena* & *Randrimantsoa* 7591 (TAN!); Toamasina, Ambatovy, 2013, 995 – 1005 m, *Ambatovy Shade House* 2293 (BRLU, K!, MO, P!, TAN!); Toamasina, Ambatovy, Feb. 2013, 995 – 1005 m, *Ambatovy Spirit Collection* 1485A2293/2 & *Collection* 3106A2335/1 (MO, TAN!); Hort. Malala Orchidées, ex Hill, 2015, *Hermans* 7037 (K!); Ambavaniasy, 907 m, Feb. 2015, 2016, A. & C. Sieder, Pertl. & *Andriantiana* SKA 6756 (= *Hermans* 8079) (K!, WU!); Toamasina, Ambatovy: Région Alaotra Mangoro, 995 m, Feb. 2016, *Ambatovy Spirit Collection* 2853A2293/6 (TAN).

HABITAT. Humid evergreen forest, in dense *Pandanus* forest and on *Uapaca*. Altitude 600 – 1000 m.

CONSERVATION STATUS. *Angraecum rotundifolium* is endemic to Madagascar, distributed in Alaotra-Mangoro and Antsinana regions, Toamasina province. It occurs in the Andasibe-Mantadia and Ambatovy Protected Areas. The area of occupancy AOO is estimated to be

Fig. 5. *Angraecum rotundifolium*. A flower, face view; B dorsal sepal; C petal; D lateral sepal; E lip & proximal region of spur, flattened spur cut along dorsal mid-line; F distal portion of spur, flattened, spur cut along dorsal mid-line; G T.S. spur at *; H column and lip, lateral view; J column, ventral view; K anther cap, dorsal view; L pollinia; M flower, lateral view; N T.S. ovary; P habit, whole plant; Q habit, portion of flowering plant; R leaf, T.S.; S adaxial surface of leaf. From Hermans 5573, spirit material. DRAWN BY ANDREW BROWN.

Fig. 6. *Angraecum rotundifolium*. A plant in habitat; B flower, face view; C flower, lateral view. PHOTOS: J. HERMANS.

less than 500 km², the extent of occurrence EOO less than 5,000 km² and three threat locations defined. The species is threatened by habitat destruction due to

logging forest and shifting agriculture that cause the continuing decline in the EOO, AOO and the habitat quality. This species is therefore assessed as

Table 2. Comparison of *Angraecum dasycarpum* and *A. rotundifolium*.

	<i>Angraecum dasycarpum</i>	<i>Angraecum rotundifolium</i>
Plant	10 – 15 cm long, branching	7 – 10 cm long, branching
Leaves	horizontal or slightly divergent to the stem, ovate-lanceolate, 7 – 1 × 4.7 – 6 mm	flat against the substrate, elliptic to oblong, 1.8 – 2.2 × 1 – 1.3 mm
Ovary	5 – 7 × 1.1 – 1.9 mm, with soft pubescent hairs	3 – 5 × 0.9 – 2 mm, echinate to shortly hirsute
Floral bracts	5 – 7 × 2 – 3 mm	1.8 – 2.2 × 1 – 1.3 mm
Dorsal sepal	7 – 8.3 × 2 – 4.1 mm	4 – 5 × 1.8 – 2 mm
Lateral sepals	7 – 10 × 2 – 4 mm	4.2 – 6 × 1.8 – 2 mm
Petals	6 – 8.5 × 1.2 – 3 mm	3.3 – 4.2 × 0.8 – 1.2 mm
Lip	5.5 – 10 × 2 – 3.6 mm	4 – 5 × 2.5 – 3.8 mm
Spur	3 – 4 × 0.8 – 1 mm, cylindrical, slightly narrowing towards the obtuse apex	1 – 1.2 × 1 – 1.2 mm, cylindrical towards the base then flattened scrotiform at the apex
Column	1 – 1.2 × 1 – 1.2 mm with distinct falciform lateral lobes of the rostellum folded in front of the rostellum, small subulate central lobe	1.1 – 2 × 1.1 – 1.3 mm, short rounded lateral lobes of the rostellum, small obtuse central lobe
Distribution	N E Madagascar	E & Central Madagascar
Altitude (m)	0 – 300	600 – 1000
Flowering time	August to November	February to May

Endangered (EN) under criterion B1ab(i,ii,iii)+2ab(i,ii,iii).

FLOWERING TIME. February to May.

ETYMOLOGY. The epithet name refers to the typical rounded leaves.

Evaluation of *Pectinariella*

The genus *Pectinariella* was created by Szlachetko *et al.* (2013: 18) and is broadly based on Benthams *Mystacidium* Lindl. (Lindley 1837: 205) section *Pectinaria* Benth. (Benthams 1883: 585) with *Angraecum pectinatum* Thouars (1822: t.51) as the type species. Cordemoy (1899: 412) considered it a genus in its own right, but *Pectinaria* cannot be used again at genus level because of its previous use in other plant families (Bernhardi 1800 in Apiaceae; Hawthorth 1819 in Apocynaceae and Hackel 1887 in Poaceae). Schumann (1901: 467) placed *A. pectinatum* in *Ctenorchis* and Kuntze (1903: 200) in *Epidorchis* sect. *Pectinaria*. Garay (1973: 499) in his review of the genus *Angraecum* defined section *Pectinaria*, based on Benthams characteristics as follows: “stem elongate, loosely leafy, leaves alternate, fleshy, elongate, linear or with distinct blade, but never equitant, inflorescence one-flowered, peduncle very short or scarcely developed, sessile, flowers small”. Micheneau *et al.* (2008) in their analysis of the angraecoid orchids, using a limited number of samples, concluded that the section does not appear to be natural and is represented in two clades. Cribb in Pridgeon *et al.* (2014: 362), based on Micheneau *et al.* (2008), also concluded that the section may be separated from *Angraecum sensu stricto* when further information became available. Szlachetko *et al.* (2013) in their re-classification of the *Angraecum*-alliance picked up on the comments by previous authors to describe four new genera and elevated the section *Pectinaria* to generic rank as the new genus *Pectinariella* (misspelled as ‘*Pectianriella*’ in the abstract), together with another ten sections of *Angraecum*. All the species placed in the section *Pectinaria* by Garay were transferred without substantiation to *Pectinariella*. *Angraecum pterophyllum* H.Perrier (1938: 106) was not considered by Szlachetko *et al.* (2013), probably because it was listed as a synonym of *A. hermannii* (Cordem.) Schltr. (Schlechter 1915: 424) by Garay. Accordingly the same authors did not acknowledge that *A. hermannii* was transferred to section *Lemurangis* Garay (1973: 501) by Micheneau *et al.* (2008: 915) and that *A. pterophyllum* was recognised as a valid species by them. Szlachetko *et al.* (2013: 18) stated that the new genus is “easily distinguishable from all other Angraecinae by its peculiar habit that is fleshy leaves, basally twisted with almost sessile flowers forming single-flowered inflorescence and ecallose lip”. In the accompanying key the leaves are said to be conduplicate, the spur filiform and mostly longer than the ovary, whilst in the description the spur is said by the same authors to be predominantly subequal in length to the ovary and the leaves linear to linear-lanceolate. These characters do not apply to several

species that were included in *Pectinariella*: the leaves of *A. dasycarpum* are flat, ovate-lanceolate and not conduplicate, linear to linear-lanceolate; the spur of *A. gabonense* Summerh. (Summerhayes 1954: 587) and *A. dasycarpum* are about equal to the length of the ovary; *A. subulatum* Lindl. (Lindley 1837: 206) and several other recently described ‘*Pectinariella*’ have two-flowered inflorescences (vs single-flowered) (Verlynde *et al.* 2016: 228). In addition, the definition could apply to a number of species traditionally assigned to other sections, including *A. baronii* (Finet) Schltr. (Schlechter 1915: 431). It is also puzzling that Szlachetko *et al.* (2013) included *A. dasycarpum* in their new genus despite the evidence presented in their cladogram (2013: 6) placing it amongst a group of morphologically very different species in section *Perrierangraecum* Schltr. (Schlechter 1925: 309). This could be due to an error in identification. No voucher information is provided for the specimens used in the research to account for possible misidentifications.

Simo-Droissart *et al.* (2013) confirmed the polyphyly of *Angraecum* section *Pectinaria* and found the continental African species to be closely related to section *Dolabrifolia* (Pfitzer) Garay (1973: 499). Verlynde *et al.* (2016) provided a detailed account of *Pectinariella*, recognising six species from Madagascar and the Mascarenes of which two were newly described and one was transferred from *Angraecum* as *Pectinaria pterophylla* (H.Perrier) Verlynde & Ramand. Verlynde *et al.* (2016) did not include *A. panicifolium* H.Perrier (1938: 105) in their study even though Simo-Droissart *et al.* (2013: 303) found it to be close to *Pectinariella pectinata* (Thouars) Szlach., Mytnik & Grochocka. More recently, Simo-Droissart (2018a) reconfirmed that *Pectinariella* is polyphyletic and advocated that the continental African species should be moved to a different genus. The newly established genus *Afropectinariella* M.Simo & Stévant was later published to accommodate these findings (Simo-Droissart 2018b: 82).

The acceptance of *Pectinariella* is here brought into doubt by a number of factors: the flawed delimitation of *Pectinariella*; the lack of voucher specimens cited in some of the research outlined above; the doubt over some identifications; the limited number of species included in the analyses; the lack of consistency of the morphological features cited; and the distribution of the different species included in the genus. It is likely that some of the species of *Pectinariella* belong in different sections or genera. In combination with this lack of evidence, we consider that it is desirable to maintain the large genus *Angraecum*, instead of a number of small genera with overlapping morphologies, especially as the phylogenetic analysis of *Angraecum s.l.* is still incomplete. Several new species have been added recently to the section and the relationship between the continental African species and those from Madagascar and surrounding islands, and therefore with the type species, is still unclear. It is

therefore prudent to maintain section *Pectinaria* of *Angraecum*, excluding the species recently transferred to *Afropectinariella*, for the time being. In agreement with this treatment the necessary new combinations are made below.

It is likely that further research will show that the species allied to *Angraecum pterophyllum* with an uppermost lip, an inflorescence with one or two flowers and an anther cap with a lobular extension, need to be separated from those allied to *A. pectinatum* with single flowers and a lip similar to the petals and sepals.

Angraecum sect. **Pectinaria** (Benth.) Schltr. (Schlechter 1918b: 157).

Mystacidium sect. *Pectinaria* Benth. in Benth. & Hook.f. (Bentham 1883: 585).

Pectinaria (Benth.) Cordem. (Cordemoy 1899: 412) *nom. illeg.*

Epidorchis sect. *Pectinaria* (Benth.) Kuntze (1903: 200).

Pectinariella Szlachetko *et al.* (2013: 18) **synon. nov.**

Angraecum edmundi (Bosser ex Verlynde & Ramand.) Hermans & Verlynde **comb. nov.** Type: Madagascar, Antananarivo, Analamanga, Ankazobe, Tampoketsa d'Ankazobe, 1110 m, March 1962, Bosser & Peyrot 15441 (holotype P!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77211714-1>

Pectinariella edmundi Bosser ex Verlynde & Ramand., *Adansonia* 38: 226 (in Verlynde *et al.* 2016) **synon. nov.**

Angraecum scroticalcar (Verlynde & Ramand.) Hermans & Verlynde **comb. nov.** Type: Madagascar, Toamasina, Aloatra-Mangoro, Moramanga, Ambatovy forest, 1057 – 1115 m, Aug. 2012, *Ambatovy Spirit Collection* 414A45/2 (holotype BRLU!; isotype TAN!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77211715-1>

Pectinariella scroticalcar Verlynde & Ramand., *Adansonia* 38: 221 (in Verlynde *et al.* 2016) **synon. nov.**

The identity of *Angraecum dasycarpum*

Angraecum dasycarpum Schltr. (Schlechter 1918a: 337; Schlechter (1932: icon t. 88 nr 352; Fig. 7); Perrier (1941: 238); Hillerman & Holst (1986: 246); Senghas (1986: 944); Bechtel *et al.* (1992: 59); Stewart *et al.* (2006: 127); Hermans *et al.* (2007: 39); Cribb & Hermans (2009: 326); Bosser & Lecoufle (2011: 127). Type: Madagascar, Laggiara s.n. (holo. B†). **Neotype**

designated here: Madagascar, Forêt côtière N de Fénérive [Fenoarivo], Avril 1963, Bosser 17546 (P00098461) (neotype P!).

Pectinariella dasycarpa (Schltr.) Szlach., Mytnik & Grochocka (Szlachetko *et al.* 2013: 18) **synon. nov.**

Erect, caespitose, epiphytic or lithophytic *herb*, up to 14 cm high, on a short branching stem; roots wiry, branching, greyish-white, puberulent, 0.5 – 1 mm in diam. *Stem* somewhat fleshy, branching, up to 12 cm × 3 – 4 mm, flattened, the margins winged, carrying up to 20 leaves, pale green. *Leaves* fleshy, alternate, distichous, horizontal or slightly divergent to the stem, ovate-lanceolate, 7 – 10 × 2.3 mm, flat with an indistinct mid-vein, with a central ridge underneath, almost sessile at the base, unequally bilobed at the tip, pale green, faveolate with dark pits on the upper and lower surface and a darker mid-vein. *Inflorescence* single-flowered, leaf-opposed, almost sessile with a 1.5 – 3 mm peduncle. *Sheaths* 1 to rarely 2, amplexicaul, lanceolate, 5 – 7 × 2 – 3 mm, compressed, brown. *Flowers* stellate, 16 – 21 × 13 – 20 mm, pure white with the column and anther yellowing with age. *Pedicel* and *ovary* fusiform, 5 – 7 × 1.1 – 1.9 mm, densely pubescent (appearing shortly hirsute in dried specimens). *Dorsal sepal* lanceolate, acute, 7 – 8.3 × 2 – 4.1 mm, recurved toward the tip. *Lateral sepals* oblong, acute, 7 – 10 × 2 – 4 mm, divergent. *Petals* ligulate, 5 – 8.5 × 1.2 – 3 mm, recurved toward the tip, slightly concave. *Lip* narrowly elliptic, 5.5 – 10 × 2 – 3.6 mm, slightly narrowed in the middle, with long narrow wings towards the base, apex acute and a little recurved; *spur* parallel to the ovary, cylindrical, slightly narrowing towards the obtuse apex, 3.1 – 4 × 0.8 – 1 mm. *Column* very short, rounded, 1.1 – 2 × 1.1 – 1.3 mm, with indistinct rounded lateral rostellum lobes, apex of rostellum deeply emarginate with a small subulate central lobe, stigma oval, c. 0.7 mm in diam. *Anther cap* semi-globose with a raised median ridge, 1 – 1.3 × 0.8 – 1.2 mm; *pollinia* 2, ovoid, c. 0.3 × 0.4 mm, inserted directly on two contiguous strap-like stipes, distinct but partly fused by a small viscidium on each, c. 0.5 mm long. *Seed capsule* pubescent, oval, c. 3 × 2 mm. Figs 7, 8.

DISTRIBUTION. NE Madagascar, Toamasina province.

SPECIMENS EXAMINED. MADAGASCAR. Without exact provenance, Laggiara s.n. (holotype B†); Île Sainte Marie, 1847 – 1852, Boivin 1693 (P!); Toamasina prov., Soanierana-Ivongo, Manompana, 9 Sept. 1959, *Rauh* M211 (HEID250201!) & *Rauh* M210a (HEID250201!) (HEID 250167!); Toamasina prov., Maroantsetra, 12 Sept. 1959, *Rauh* M254 (HEID250201!) (HEID250202!); Toamasina prov., towards Fenoarivo, 19 Sept. 1959, *Rauh* M417 (HEID250201!) (HEID250203!); N of Fenoarivo, 1963, Bosser 17546 (neotype P!); Maroantsetra, Bosser 14653 (TAN!); Maroantsetra, Herb. Jard. Bot. Tana, Lambert 451 (P!).

Fig. 7. *Angraecum dasycarpum* in Schlechter (1932).

HABITAT. Lowland evergreen coastal forest, on rocks covered in moss, on *Philippia*, in shade. Altitude 0 – 300 m.

CONSERVATION STATUS. *Angraecum dasycarpum* is endemic to Madagascar, distributed in Analanjirofo region, Toamasina province. It does not occur in any Protected Area. The area of occupancy AOO is estimated to be less than 500 km², the extent of occurrence EOO less than 5,000 km² and three threat locations defined. The species is threatened by habitat destruction due to logging forest and shifting agriculture that cause the continuing decline in the EOO, AOO and the habitat quality. This species is therefore assessed as Endangered (EN) under criterion B1ab(i,ii,iii)+ 2ab(i,ii,iii).

FLOWERING TIME. August to November.

ETYMOLOGY. Referring to the rough-pubescent seed capsule/ovary.

NOTES. *Angraecum dasycarpum*, in section *Pectinaria*, is characterised by its caespitose branching plant with fleshy ovate-lanceolate distichous leaves, its stellate flowers that are relatively large for the section, with a pubescent ovary covered with soft hairs, an elliptic lip, a cylindrical spur

narrowed towards the apex and a short column with an obtuse central lobe. It is a low-elevation species from the more tropical north-east of Madagascar. The flowers are similar to those of *A. pectinatum* and *A. humblotianum* but it has a different habit with broader and rounder leaves, and a distinct lip and spur shape. Other differences are discussed above under *A. rotundifolium* and shown in Table 2.

Angraecum dasycarpum was described by Schlechter (1918a) together with a group of other orchids from Madagascar collected by Laggiara. Although he was involved in describing almost half of the orchid flora of Madagascar, Schlechter never visited the island. He relied on other explorers for his material; mostly from the Frenchman Henri Perrier de la Bâthie but also from a few others. One of these was Dr Paolo Ferko, an Italian orchid grower and occasional importer who in turn received orchids collected in Madagascar by a Mr Laggiara. Not much is known about the collector apart from the fact that he collected in north-eastern Madagascar at the beginning of the 20th century (Dorr 1997: 251). Very little of the Schlechter herbarium has survived in Berlin (B) and the holotype specimen of

Fig. 8. *Angraecum dasycarpum*, flower. PHOTO J. HERMANS.

A. dasycarpum must therefore be considered destroyed in the 1943 fire (Butzin 1978, 1981); no Laggiara specimens have been found in other herbaria. The only surviving material associated with the type is the small illustration by Schlechter (1932: t. 88 no 352): the drawing is not detailed but it does show the main characteristics of the flower. It is possible that the illustration was based on material associated with the type but there is no direct evidence of this, furthermore, it was published well after the protologue and for these reasons cannot be considered as a lectotype. Schlechter's 1918a description is also limited in detail but, combined with the illustration, does provide sufficient information to identify the species with some certainty. A specimen collected by Bosser in 1963 (*Bosser* 17546 in P!) is designated here as the neotype of *A. dasycarpum* because it is well-documented, consists of several complete plants and flowers showing all the typical characteristics of the species. Other complete specimens were collected by Walter Rauh in northern Madagascar (*Rauh* M211 (HEID-spirit)) and illustrated in Senghas (1997: 103).

Szlachetko *et al.* (2013) transferred the species to their new genus *Pectinariella*, which is here placed back in *Angraecum*; the reasons for this are discussed above under the evaluation of the status of *Pectinariella*.

The identity of *Angraecum ochraceum*

Angraecum ochraceum (Ridl.) Schltr. (Schlechter 1915: 436; 1918b: 163); Perrier (1941: 221); Hillerman &

Holst (1986: 259); Bechtel *et al.* (1992: 61); Stewart *et al.* (2006: 107); Hermans *et al.* (2007: 53); Cribb & Hermans (2009: 372); Bosser & Lecoufle (2011: 150); Hervouet (2018: 128). Type: Madagascar, Ankafina (S. Betsileo), *Deans Cowan* s.n. BM000539207! (holotype BM); **epitype** designated here: illustration by Cowan (1880: 4) watercolour number 7; Fig. 9.

Mystacidium ochraceum Ridl. (Ridley 1885: 488).

Epidorchis ochracea (Ridl.) Kuntze (1891: 660).

Macroplectrum ochraceum (Ridl.) Finet (1907: 26).

Boryangraecum ochraceum (Schltr.) Szlach., Mytnik & Grochocka (Szlachetko *et al.* 2013: 12).

Angraecum setipes Schltr. (Schlechter 1925: 340);

Perrier (1941: 223); Hillerman & Holst (1986: 246);

Stewart *et al.* (2006: 107); Hermans *et al.* (2007: 63);

Cribb & Hermans (2009: 326); Bosser & Lecoufle

(2011: 164); Hervouet (2018: 144). Type: Madagas-

car, Mt Tsiafajavona (Ankaratra), *H. Perrier* 13988

P00541580! (holotype P), **synon. nov.**

Hermansia setipes (Schltr.) Szlach., Mytnik & Grochocka (Szlachetko *et al.* 2013: 15), **synon. nov.**

Slender epiphytic *herb* up to 14 cm high, roots glabrous to slightly verrucose, silvery white 2 – 3 mm in diam.; *stem* short, 1 – 3 cm long, c. 1 cm in diam., completely covered by the greenish brown corrugate leaf sheaths, with 3 – 7 leaves forming a broad fan. *Leaves* ligulate, 4 – 11 × 0.5 – 1 cm, narrowed and conduplicate at the base, with a central groove a little revolute at the margins, unequally roundly bilobed at the apex, pale to dark green. *Inflorescence* erect to erectly spreading, filiform, up to 11 cm, with 1 – 2 short tubular sheaths, with 1 or rarely 2 flowers. *Floral bract* thin-textured, ovate, acuminate, 2 – 2.5 × 1 – 1.5 mm, brown. *Flowers* with the lip uppermost, 22 – 32 × 10 – 14 mm, yellowish green to ochre yellow, somewhat lustrous. *Pedice*l and *ovary* subcylindrical, 4 – 9 × 0.5 – 1 mm, yellowish, strongly twisted, grooved, often with a some black scales within the grooves. *Dorsal sepal* broadly lanceolate, acute, 4.5 – 7 × 1.8 – 3.1 mm. *Lateral sepals* ovate, 4.8 – 7 × 1.9 – 3 mm, spreading, attenuate. *Petals* lanceolate, 3.1 – 6.5 × 1.2 – 2 mm, spreading, attenuate. *Lip* ovate to rhombic, obtuse to shortly acuminate at the tip, 5.2 – 6.8 × 2.5 – 3.5 mm, strongly concave to navicular, rarely with a few thin hairs towards the base; *spur* generally pendent but sometimes horizontal, 14 – 22 × 0.6 – 2 mm, subfiliform-cylindrical apex more or less thickened, sometimes with 3 elongate lobules. *Column* short, rounded, 1.5 – 2 × 1.3 – 1.8 mm, with short angular lateral rostellum wings, stigma oval, c. 1 mm in diam. *Anther cap* oblate, 1 – 1.5 × 1 – 1.2 mm; *pollinia* 2, subglobose, c. 0.5 mm in diam., distinct, with a small viscidium on each, c. 0.5 mm long. Figs 9 – 11.

DISTRIBUTION. MADAGASCAR. Widespread, in Antananarivo, Antsiranana Fianarantsoa, Toamasina and Toliara provinces.

SPECIMENS EXAMINED. MADAGASCAR. Ankafina (S. Betsileo), *Deans Cowan* s.n. BM000539207! (holotype

Fig. 9. *Angraecum ochraceum*, epitype. Watercolour 7 by Deans Cowan (1880). © The Trustees of the Natural History Museum, London.

Fig. 10. *Angraecum ochraceum*. A flower, face view; B dorsal sepal; C petal; D lateral sepal; E lip & proximal region of spur, flattened spur cut along dorsal mid-line; F T.S. spur at *; G column and lip, lateral view; H view of column, showing wings; I anther cap, dorsal view; J anther; K pollinia; L T.S. ovary; M habit. From *DuPuy et al.* M867. DRAWN BY ANDREW BROWN.

Fig. 11. *Angraecum ochraceum* flower. PHOTO: J. HERMANS.

BM); Deans Cowan (1880: 4) watercolour number 7 (epitype BM!); Mt Tsiafajavona (Ankaratra), *H. Perrier* 13988, P00541580! (holotype P!); *Scott-Elliot* April 1890 (K!); Toamasina, Akanin'ny Nofy, 80 m, Nov. 1997, *Hermans* 4257 (K!); Andasibe forest, Onive basin, Feb. 1925, c. 1000 m, *Perrier* 17225, P1841419! (P); Andranomadihloha, Vohiary, 20 m, Nov. 1954, *Rakotovae* 637, P06168497! (P); Tampoketsa d'Ankazobe, *Bosser* 1078, P06168502! (P); Antsiranana, Montagne d'Ambre, *Bosser* 1261, (P!); Tampoketsa d'Ankazobe, *Bosser* 13276, P06168456! (P); Antananarivo, Angavokely Forest Reserve, 1700 m, March 1992, *Peterson & Nilsson* 583 (UPS!); Toamasina, Lake Aloatra, Manohilahy forest, 1300 m, Jan. 1995, *D. DuPuy et al.* M821 (K!, TAN!); NW of Taolanaro, edge of Andohahela reserve, 610 m, Feb. 1995, *D. DuPuy et al.* M867 (K!); Antsiranana prov., Montagne d'Ambre, 1997, *Hermans* 8126 (K!); Antananarivo prov., road to Anjozorobe, 1550 – 1600 m, Jan. 2000, *Hermans* 5201 (K!); Fianarantsoa prov., near Ambatolahy, 1046 m, May 2001, *Hermans* 5567 (K!); Ranomafana NP, 1100 – 1250 m, *Turk et al.* 337 (MO!); Antananarivo, Analamanga Ambohitantely, 1570 m, Nov. 2003, *Lowry et al.* 6266 (MO!); Toamasina, Aloatra-Mangoro, Menalamba, Ambatovy forest, 1180 m, March 2005, *Antilahimena et al.* 3704 (G!, MO!, P!, TAN!); Fianarantsoa Vatovavy-Fitovinany, Mananjary, Jan. 2007, 15 m, *Sieder et al.* 4060 (WU!); Ambatovy:

Région Alaotra-Mangoro, 1130 – 1133 m, Feb. 2012, *Ambatovy spirit collection* 230A563/3 (TAN!); Analamanga, Anjozorobe, Ambohitsaratany, 1644 m, March 2013, *Ravololomanana et al.* 279 (MO, P!, TAN!); Toamasina, Alaotra-Mangoro, Ambatovy: Région Alaotra-Mangoro, Jan. 2013, *Ambatovy Spirit Collection* 687A563/3 (BRLU, K!); Alaotra-Mangoro, Ambatovy, 1130 m, Jan. 2014, *Ambatovy Spirit Collection* 1312A563/3 (BRLU); Toamasina, Alaotra-Mangoro, Ambatovy: Région Alaotra-Mangoro, 1134 – 1151 m, Feb. 2015, *Ambatovy Spirit Collection* 2339A1277 (MO); Toamasina, Atsinanana, Vatomandry, 538 – 584 m, March 2016, *Ambalabe Spirit Collection* 102L92/7 (TAN!); Toamasina, Atsinanana, Ambalabe, piste vers Tsitondroina – Antenanala, 603 – 677 m, Feb. 2016, *Ambalabe Spirit Collection*, 82L54/4 (MO); Toamasina, Atsinanana, Ambalabe, piste vers Tsitondroina – Antenanala, June 2017, 603 – 677 m, *Ambalabe Spirit Collection*, 191L54/4 (TAN!).

HABITAT. In humid evergreen forest, montane forest, on trees in moss. Altitude 538 – 2010 m.

CONSERVATION STATUS. *Angraecum ochraceum* is endemic to Madagascar, has a large distribution range and is widespread in Antananarivo, Antsiranana, Fianarantsoa, Toamasina and Toliara provinces. It occurs in some Protected Areas such as Ambatovy, Ambohitantely, Andasibe-Mantadia, Andohahela, Montagne d'Ambre and Ranomafana. This species is therefore assessed as Least Concern (LC).

FLOWERING TIME. September to March but mainly in February.

ETYMOLOGY. The epithet *ochraceum* refers to the ochre colour of the flowers; *setipes* presumably refers to the thin bristle-like inflorescence.

NOTES. The species is recognised by the almost stemless medium-sized plant with thin ligulate leaves arranged into a fan, long filiform inflorescence with 1 (rarely 2) flowers, the strongly concave lip and long spur thickened towards the apex.

Angraecum ochraceum (as *Mystacidium ochraceum*) was placed by Ridley (1885: 488) in *Mystacidium* sect. *Gomphocentrum* Benth. (Bentham 1881: 337), whereas Schlechter (1918b: 163) transferred it into *Angraecum* section *Lepervenchea* Cordem. (Cordemoy 1899: 415). When describing *A. setipes*, Schlechter (1925: 341) placed it in his new section *Boryangraecum* Schltr. (Schlechter 1925: 308). Perrier (1941: 221, 223) put both *A. ochraceum* and *A. setipes* in the same group of section *Boryangraecum*. Garay created a new section *Acaulia* Garay (1973: 498) for acaulous species with a single flower, including *A. setipes* in it, while keeping *A. ochraceum* in section *Boryangraecum*. Szlachetko *et al.* (2013: 12, 15), when they split up the genus *Angraecum*, placed *A. ochraceum* in their new genus *Boryangraecum* (Schltr.) Szlach., Mytnik & Grochocka and *A. setipes* in their new genus *Hermansia* Szlach., Mytnik & Grochocka. Until a more comprehensive

assessment of *Angraecum s.l.* is published it is perhaps best to leave the species unplaced at sub-generic level.

The thin single flowered-inflorescence and flower shape are similar to that of *Angraecum rhynchoglossum* Schltr. (Schlechter 1925: 339) but in that species the leaves are consistently shorter, smaller and oblong (vs ligulate), and the flowers are about a third larger. Other stemless species with long narrow leaves, a long thin peduncle and a single (rarely two) flower include: *A. andasibeense* H.Perrier (1938: 124), which has thinner and shorter, linear leaves (vs ligulate), flowers that are a third smaller with an ovate, acuminate lip (vs ovate-rhombic) and an anther cap with a well-developed lobe at the front (vs entire); *A. brachyrhopalon* Schltr. (Schlechter 1925: 336) which is a slightly shorter plant, with narrowly linear leaves (vs ligulate), flowers that are a third smaller and have an incurved clavate spur (vs straight and slightly thickened at the end); and *A. pumilio* Schltr. (Schlechter 1916: 33) which is smaller by a third in all aspects and the 7 mm long spur is around half the size (vs at least 14 mm long).

Mystacidium ochraceum was described by Henry Ridley in 1885, based on a collection by the Rev. William Deans Cowan from 'Ankafana' in Madagascar. Ankafana is a general name for the missionary post in the Fianarantsoa area of Madagascar (Christenson 1932: 9). The type specimen at BM is sterile with an indication of a flower in spirit but this has not been located and presumed lost. However, a watercolour ('no 7') can be found in Deans Cowan's sketchbook at the London Natural History Museum, London (Cowan 1880: 7) (Fig. 9), showing a flowering plant of the species which corresponds well with one of the plants on the herbarium sheet, it is annotated '*Mystacidium ochraceum* Ridley' in Ridley's hand. On the type specimen Ridley also indicated the number '7', referring to Deans Cowan's watercolour, it can therefore be considered part of the type material used by Ridley especially as it complements the limited herbarium material and description; the illustration is therefore designated here as an epitype. In 1907 Finet placed the species in the genus *Macroplectrum* but based it on a Baron specimen donated by K to P. Schlechter (1918b) transferred the species to *Angraecum*. It is unlikely that Schlechter (1925) was familiar with the Deans Cowan specimen, let alone the watercolour, when he described *Angraecum setipes*, based on a Perrier specimen from the Ankaratra mountains in central Madagascar. When comparing the two taxa there is no doubt that they are conspecific, with the name *A. ochraceum* having precedence. In the broad range of specimens examined, it was found that the lip shape is a little variable with some flowers having a more deeply concave lip with a more pronounced acuminate apex but this variation occurred in different flowers on the same plant and may be dependent on the maturity of the flowers. The length of the spur too was found to be variable ranging from 14 – 22 mm: this was dependent

on the stage of development of the flowers and also some variants consistently had a shorter spur but also smaller flowers. This variation is not unusual in other *Angraecum* species: on examination of over 25 specimens of the similar *A. rhynchoglossum* it was found that spur length ranged from 15 – 28 mm while in *A. calceolus* Thouars (1822: t. 78) the range was 10 – 18 mm. The thickening towards the end of the spur was also found to be variable but it was consistently present. Considering this variability it seems reasonable to treat *A. setipes* as a synonym of a widespread and variable *A. ochraceum*.

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