

# Two new species of the genus *Benthamia* A. Rich. (Orchidaceae) from Madagascar, *B. boiteaui* Hervouet, sp. nov. and *B. bosseri* Hervouet, sp. nov.

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## ABSTRACT

Two new species of *Benthamia* A. Rich. (Orchidaceae) from Madagascar, *B. boiteaui* Hervouet, sp. nov. and *B. bosseri* Hervouet, sp. nov., are described. Both have been found at the summit of Ambondrombe (Haute Matsiatra region, near Ambalavao), and also, for *B. boiteaui* Hervouet, sp. nov. in the Ranomafana national park, and for *B. bosseri* Hervouet, sp. nov. in the Andringitra massif. The two species are represented in the Paris herbarium at the Muséum national d'Histoire naturelle (MNHN) by specimens collected in April 1941 by Pierre Boiteau and more recently, for *B. boiteaui* Hervouet, sp. nov. by specimens at K, MO and TAN, and for *B. bosseri* Hervouet, sp. nov., by specimens collected by Jean Bosser in April 1964. With linear leaves and an elliptic dorsal sepal, *B. boiteaui* Hervouet, sp. nov. can easily be distinguished from other *Benthamia* with white flowers. The non resupinated, drooping flowers and the arching spike of *B. bosseri* Hervouet, sp. nov. are very distinctive too.

## KEY WORDS

Orchidaceae,  
*Benthamia*,  
Madagascar,  
Ambondrombe,  
Andringitra,  
Ranomafana,  
new species.

## RÉSUMÉ

Deux nouvelles espèces du genre *Benthamia* A. Rich. (Orchidaceae) à Madagascar, *B. boiteaui* Hervouet, *sp. nov.* et *B. bosseri* Hervouet, *sp. nov.*

Deux nouvelles espèces de *Benthamia* A. Rich. (Orchidaceae) de Madagascar, *B. boiteaui* Hervouet, *sp. nov.* et *B. bosseri* Hervouet, *sp. nov.*, sont décrites. Les deux ont été trouvées au sommet de l'Ambondrombe (région Haute Matsiatra, près d'Ambalavao), ainsi que, pour *B. boiteaui* Hervouet, *sp. nov.*, dans le Parc national de Ranomafana, et pour *B. bosseri* Hervouet, *sp. nov.* dans le massif de l'Andringitra. Ces espèces correspondent à des spécimens anciens conservés au Muséum national d'Histoire naturelle (MNHN) et collectés en avril 1941 par Pierre Boiteau ainsi que plus récemment, pour *B. boiteaui* Hervouet, *sp. nov.*, à des spécimens conservés à K, MO et TAN, et pour *B. bosseri* Hervouet, *sp. nov.* à des spécimens collectés par Jean Bosser en avril 1964. Avec ses feuilles linéaires et son sépale dorsal elliptique *B. boiteaui* Hervouet, *sp. nov.* se distingue facilement de tous les *Benthamia* à fleurs blanches connus à ce jour. Les fleurs non résupinées et pendantes, ainsi que l'épi arqué de *B. bosseri* Hervouet, *sp. nov.* en font aussi une espèce très distincte.

## MOTS CLÉS

Orchidaceae,  
*Benthamia*,  
Madagascar,  
Ambondrombe,  
Andringitra,  
Ranomafana,  
espèces nouvelles.

## INTRODUCTION

The genus *Benthamia* A. Rich. was first described by Achille Richard in 1828, the name being a tribute to George Bentham, the British botanist. It was created to accommodate the already existing *Satyrium latifolium* Thouars (today *Benthamia chlorantha* (K. Sprengel) Garay & Romero), and *Satyrium spirale* Thouars, which is henceforth *Benthamia spiralis* (Thouars) A. Rich. The genus is characterized by the following features: terrestrial or rarely (two species) epiphytic herbs, with 2 to 7 ovoid tubers. Stem with only sheaths or 1-2 basal leaves or 2-5 cauline leaves. Inflorescence terminal, with a lax to dense spike, cylindrical, more or less secund (*i.e.* arranged on one side of the axis only), or secund. Flowers small (less than 1 cm), white, whitish, yellow, yellowish, green, greenish or reddish orange. Lip entire or, more often, trilobed, with a short spur at the base, generally scrotiform, globular or saccate, but also cylindrical or clavate. Column with parallel anther locules. Viscidia flat, oval or elliptic. Stamines well developed, subspathulate or falcate. Rostellum small, trilobed or tridentate.

Stigmas always very short. Pollinia 2. A more detailed description of the gynostemium based on *B. spiralis* (Thouars) A. Rich. and *B. cinnabarina* (Rolfé) H. Perrier is given in Szlachetko (2000). The last comprehensive treatment of the genus with full description of species dates back to Perrier's work in 1939. In 2009 Cribb and Hermans published a key and an updated list with short descriptions, in their field guide to the orchids of Madagascar. The genus nowadays comprises 30 species and six sub-species, all endemic from Madagascar and the Mascarene Islands, except *Benthamia drummondii* (Linder & Williamson) Szlachetko & Rutkowski in Zimbabwe, originally described as the only member of the genus *Oligophyton* Linder. In the list published by Cribb and Hermans we exclude *B. leandriana* H. Perrier, renamed *Cynorkis tryphioides* var. *leandriana* by Jean Bosser in 1969. We also suspect *B. bathicana* Schltr. and *B. rostrata* Schltr. to be one and the same species, and *B. exilis* Schltr. to be a *Cynorkis*, for its similarity to *C. micrantha* (Frappier) Schltr. in la Réunion.

Except the Zimbabwean species, the last three new species of *Benthamia* were described by

H. Perrier in 1951. A revision of the whole genus, along with genetic studies to verify its monophyletic origin, is much needed. A number of specimens at the Muséum national d'Histoire naturelle in Paris (MNHN) remain undetermined and are potential new species. We describe hereafter two of them, because of their prominent features that easily allow to tell them apart from other species, and because they both grow on the Ambondrombe mountain in the Haute Matsiatra region, near Ambalavao. Moreover they have been seen and photographed in the wild, in their *locus classicus*, during an expedition of the French Orchid Society (SFO) in March 2009 (Hervouet & Guérin 2011). The two species were first collected by Pierre Boiteau near the summit of Ambondrombe in April 1941. From his collections he described the following year, in the *Bulletin de l'Académie Malgache*, three new species of orchids: *Physoceras australe* Boiteau and *Cynorkis ambondrombensis* Boiteau, collected on Ambondrombe, and *Bulbophyllum ceriodorum* Boiteau from Mount Tsitondroina. *Physoceras australe* was seen again in 2009 but *Cynorkis ambondrombensis* still awaits rediscovery, it is said to be one of the most beautiful species of *Cynorkis* in Madagascar. For two species of *Benthamia* that he could not determine, Pierre Boiteau indicated on the herbarium sheets that they were potential new species and proposed possible relatives in the genus. It is these two species that we describe in this paper. In 1964, the second species was also collected by Jean Bosser in the Andringitra massif, but not described, though again considered as a new species (Jean Bosser, pers. comm.). In 1995, the first species was collected in Ranomafana national park (Phillip Cribb pers. comm.) and once again considered to be a new species.

## MATERIAL AND METHODS

We worked on the MNHN specimens listed in the next sections. Except for the collection by Jean Bosser, they are all labelled as originating from the "Herbier du jardin botanique de

Tananarive", i.e., the Tsimbazaza herbarium at Antananarivo. The collector is not mentioned but Lucile Allorge, Pierre Boiteau's daughter and also an outstanding botanist, formally identified her father's handwriting on the specimens. The Tsimbazaza collections at Antananarivo (TAN) have been extensively searched by the third author, but none of the two species have been located there among the 52 specimens of *Benthamia*, or among the close genera. Flowers in spirit have not been located either. The drawings were done by Alain Jouy after the type specimens, with the help of colour photographs taken in the wild in March 2009. No voucher was collected in 2009 and no fresh material dissected, so the descriptions are based here on rehydrated flowers of the original Boiteau and Bosser specimens, which precluded an accurate description of the very small and somewhat damaged columns.

## SYSTEMATICS

### *BENTHAMIA BOITEAUI* HERVOUET, SP. NOV.

The first species is so far known only from Ambondrombe and is represented at MNHN by three specimens with a total of six individuals. It has white flowers with a green mouth of the spur. Boiteau wrote that it was either a new species or a variety of *B. melanopoda* Schltr. The key published by Cribb and Hermans leads, due to a short spur, a 3-lobed lip, more than one linear leaf and white flowers, to *Benthamia madagascariensis* (Rolfe) Schltr., but the sepals of the latter are linear, which is clearly not the case here, and the side lobes of the 3-lobed lip are not acute as in the present species. If we discard the color we alternatively get to *B. melanopoda*, but this species has side lobes of the lip much longer than the mid lobe, or we arrive at species with sepals less than 4 mm, moreover with brownish or greenish flowers. Actually *B. madagascariensis* (Rolfe) Schltr., *B. nivea* Schltr. and *B. herminioides* Schltr. were so far the only species known with white flowers. For these different reasons we clearly have here a new species with no close relative.

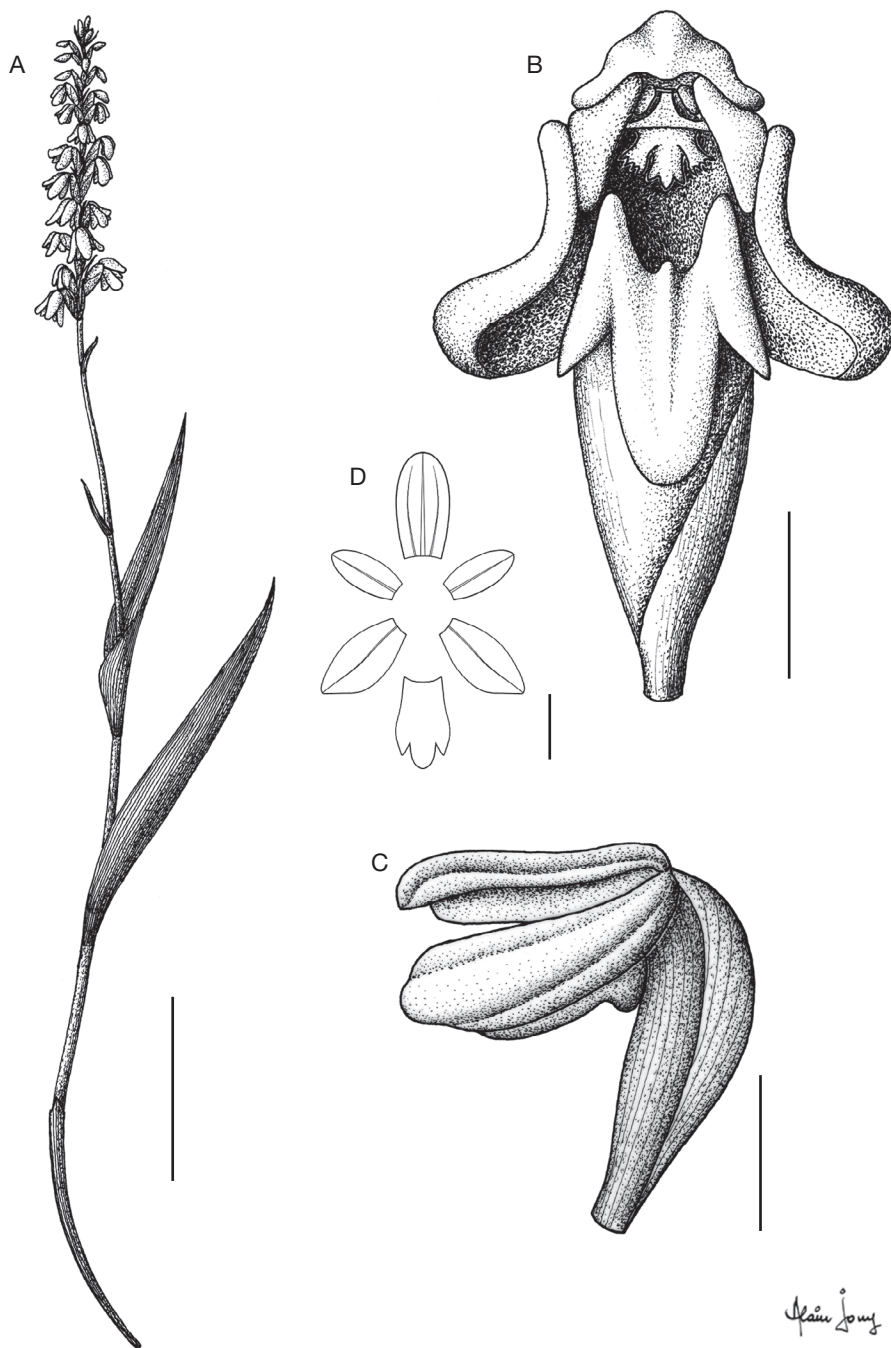


FIG. 1. — *Benthamia boiteaui* Hervouet, sp. nov.: **A**, habit (after wild specimen); **B**, flower (*Boiteau 4621*); **C**, side view of flower; **D**, exploded view of perianth. Scale bars: A, 50 mm; B, 2 mm; C, D, 3 mm. Drawing by Alain Jouy.



FIG. 2. — *Benthamia boiteaui* Hervouet, sp. nov.: spike of a wild specimen at the summit of Ambondrombe (9.III.2009). Photograph by Jean-Michel Hervouet.

*Benthamia boiteaui* Hervouet, sp. nov.  
(Figs 1; 2)

*Herba terrestris 33–38 cm alta, Benthamiae melanopodae Schltr. similis, sed floribus albis, non galbinis differt. Benthamiae madagascariensi (Rolfe) Schltr. habitu vicina, sed ab forma florum distat, cum sepalo dorsalo elliptico, non lineare. Benthamiae herminioide floribus latioribus differt.*

TYPUS. — Madagascar. Fianarantsoa Province, Haute Matsiatra Region, Near summit of Ambondrombe, among wet rocks, 1900 m [approximate coordinates: 21°52'29"S, 47°15'37"E], fl., 11.IV.1941, *Boiteau 4621* (holo-, P[P00692438], 2 individuals)].

PARATYPES. — Madagascar. Fianarantsoa Province, Haute Matsiatra Region, Ambondrombe, mossy forest around 1700 m, fl., 11.IV.1941, *Boiteau 4637* (P[P00692439], 1 individual; P00692440!, 3 individuals)]; Ranomafana National Park, vicinity of Ampasina, 1150 m [approximate coordinates 21°11'S, 47°25'E], fl., 10.III.1995, *Turk, Randrianasolo & Rajoma 722* (K!, MO, TAN).

*Description*

Terrestrial herb with erect, cylindrical, and green stems 33–38 cm long, 0.2 cm in diameter. One or two sheaths at the stem base, 2 to 3 leaves in the lower  $\frac{2}{3}$  of the stem length. Leaves sheathing, thin, flexible, linear, acute, 50–130 × 5–8 mm. One or two sterile bracts in upper part of stem, linear, acute, 15–30 × 2–3 mm. Inflorescence terminal, erect, 17–33 flowered. Rachis 5–8 cm long. Bracts acicular, longer than ovary, 6–11 × 2 mm. Flowers white, resupinate. Dorsal sepal elliptic, obtuse with slightly concave rounded apex, 3–5 mm long, 2–3 mm wide. Lateral sepals elliptic, 4–5 × 2–3 mm, with one visible vein, slightly keeled dorsally, slightly ventrally concave, apex rounded or subacute, margin smooth. Petals elliptic, 3–4 × 2 mm, with one visible vein, apex rounded or subacute, margin smooth or slightly irregular. Lip 3-lobed, 3–4 × 2.5–3.0 mm, side



lobes acute, 0.5 mm, middle lobe slightly inflated, 1.0-1.3 mm long, spur green, very short and obtuse, touching the ovary. Ovary 6-7 mm long, 2-3 mm in diameter. Pollinia 2.

#### *Habitat and distribution*

This species seems restricted to high altitude areas with patches of prairies among granite or gneiss outcrops, interspersed with ericoid shrubs and small trees, or mossy forest. It is known so far only from the higher altitudes of the Ambondrombe Mountain (Haute Matsiatra region) from 1700 to 1900 m, on wet rocks in full sun or in more shaded areas in the mossy forest. We give hereafter a translation of Boiteau's own description of the habitat: "The visited region is especially interesting because it has been preserved by the bad reputation of Ambondrombe. This vegetation is mostly composed of mossy forest with herbaceous understorey, typical of middle altitudes. From 1800 m on, on parts with poorer soil, lichen-rich forest gradually settles, then come ericaceous shrubs on rocks in the summit. On western slopes, today nearly fully barren, once was a typical woodland formation with many deciduous trees. Some remnants intergrading towards this kind of vegetation can still be found, with austral affinities such as the Proteaceae (*Faurea forficuloides* [sic]), mixed with typically indo-malayan plants such as *Myrica*: *M. dentulata*. If the western slopes woodlands have nearly disappeared today, being the most flammable, the mossy forest with herbaceous understorey is also gradually receding. It is first replaced by the savoka with *Philippia* scrub, then very rapidly by grassland, as species-poor as on the plateaux".

#### *Phenology*

*Benthamia boiteaui* Hervouet, sp. nov. flowers in March and April, with *Benthamia herminioides* Schltr. In Ambondrombe in the same area the terrestrial *Disa brevicornis* (Lindley) Bolus and the epiphytic *Eulophiella galbana* (Ridley) Bosser & Morat flower in January (Guérin & Hervouet 2013), *Jumellea ibityana* Schltr. flowers in March (Guérin & Hervouet 2011).

#### *Etymology*

This species is dedicated to Pierre Boiteau (1911-1980), collector of the type. He was a professor, botanist and director of the Tsimbazaza botanical and zoological garden in Antananarivo, from 1935 to 1947. As a whole he produced about 700 articles and ten books. During the month of April 1941, he did a 10-day field survey of Betsileo country, Mount Tsitondroina and Mount Ambondrombe. More than 700 herbarium specimens and 250 living plants were brought back to Tsimbazaza.

#### *Conservation*

The species is known only from Ranomafana National Park and from the top of Ambondrombe. Being considered as the sacred mountain of the Dead by the Betsileo people, this latter site is so far relatively safe, and is still covered by dense tropical forests. However there is no official protection status of this area. In a 4-day survey in the forest around the mountain in 2011, we chanced upon an illegal settler who slashed the forest to create a rice field. Host of more than 100 species of orchids, the Ambondrombe massif is an important link between north and south along the eastern

#### KEY TO SPECIES OF *BENTHAMIA* A.RICH. WITH WHITE FLOWERS

If we follow the Cribb & Hermans (2009) key, all these species first share the following features: spur very short, lip 3-lobed, leaves 2 or more. Then they can be identified with the following key:

1. Leaves linear ..... 2  
— Leaves oblong-lanceolate, elliptic-lanceolate or lanceolate ..... 3
2. Dorsal sepal linear ..... *B. madagascariensis* (Rolfe) Schltr.  
— Dorsal sepal elliptic ..... *B. boiteaui* Hervouet, sp. nov.
3. Lip 2-3 mm ..... *B. herminioides* Schltr.  
— Lip 8-9 mm ..... *B. nivea* Schltr.

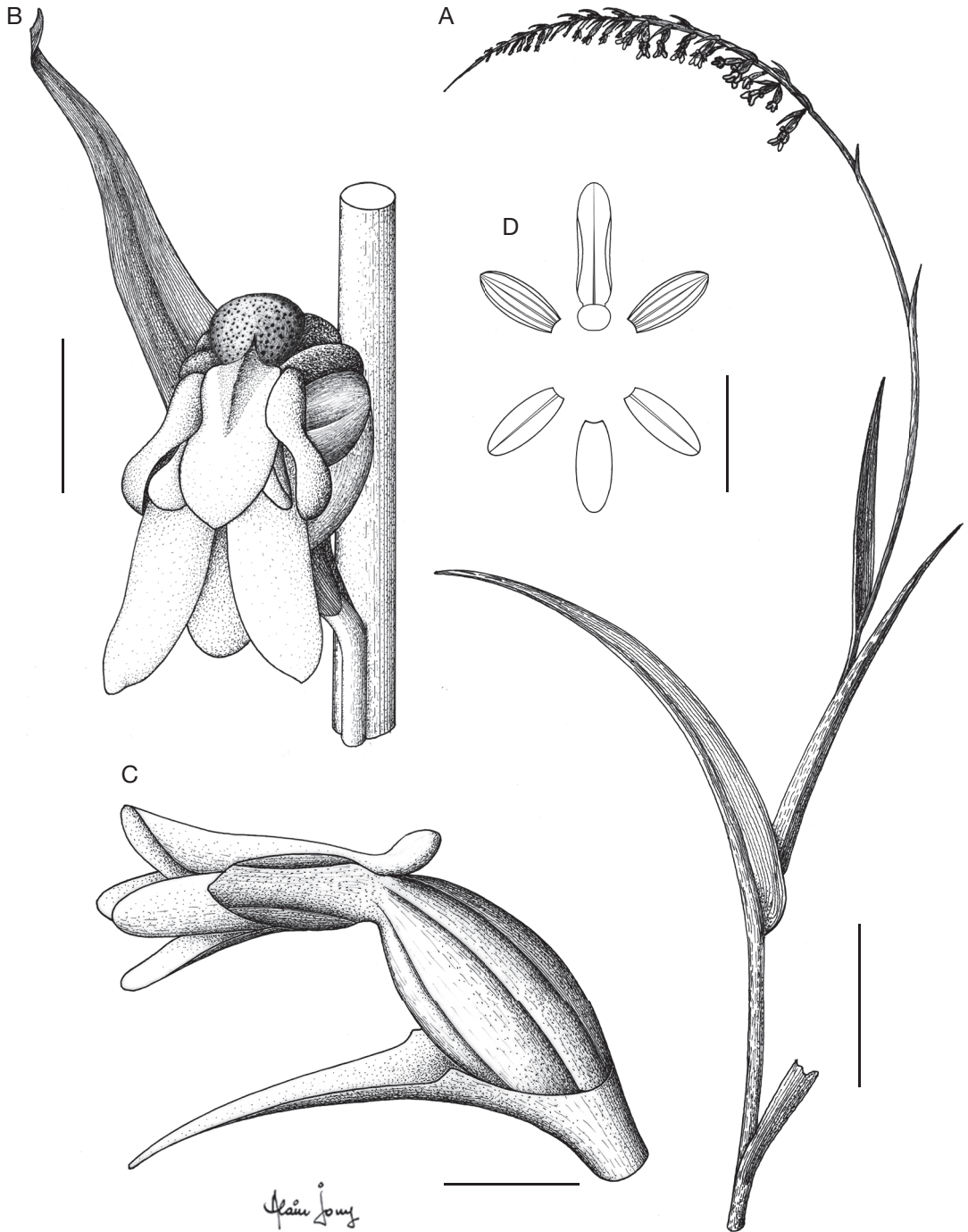


FIG. 3. — *Benthamia bosseri* Hervouet, sp. nov.: **A**, habit (after wild specimen); **B**, flower (*Boiteau 4634*); **C**, side view of flower; **D**, exploded view of perianth. Scale bars: A, 50 mm; B, 3 mm; C, 2 mm; D, 4 mm. Drawing by Alain Jouy.



FIG. 4. — *Benthamia bosseri* Hervouet, sp. nov.: typical arched spike with pendent second flowers. Summit of Ambondrombe (9.III.2009). Photograph by Jean-Michel Hervouet.

Malagasy escarpment and would deserve a specific protection status.

For the time being we quote the species as Near Threatened (NT), for its very small number of known locations.

*BENTHAMIA BOSSERI* HERVOUET, SP. NOV.

The second species is represented at MNHN by five specimens and eleven plants, all from Ambondrombe except one herbarium sheet with three plants collected in Andringitra by Jean Bosser in April 1964. This species has two outstanding features: the yellow flowers are non-resupinate (this is so far unique in *Benthamia*) and second, the spike is rather strongly and rigidly arching so that, in the wild, the flowers are facing downwards. Pierre Boiteau labelled the specimens “*Benthamia verecunda?*”, but *B. verecunda* flowers are green-

ish and resupinate, the leaves are broader and the spike is not arching. The combination of short spur, 3-lobed lip, more than one linear leaf, and flowers yellow with side lobes of the lip shorter than the mid lobe leads in the key to *B. procera* Schltr., the latter with a shorter ovary, a straight and less unilateral spike, and resupinate flowers. Jean Bosser gave us the following description: “Épi unilatéral, un peu courbé, fleurs inversées, bractées, ovaires et sépales lavés de rougeâtre. Pétales et labelle jaunâtres”, which is: “unilateral spike, slightly arching, flowers non-resupinate, bracts, ovary and sepals reddishly tinted. Petals and lip yellowish”. In fact the spike is often strongly arching, so as to form a semi-circular arch, *e.g.* the plant on the left on Bosser’s specimens, the other two being obviously somewhat artificially straightened during mounting.





FIG. 5. — Vegetation and granite outcrops near the summit of Ambondrombe (9.III.2009). Photograph by Jean-Michel Hervouet.

*Benthamia bosseri* Hervouet, sp. nov.  
(Figs 3, 4; Table 1)

*Herba terrestris 20 cm usque ad 70 cm alta, Benthamiae cinnabariniae (Rolle) H. Perrier et Benthamiae verecundae Schltr. vicina, sed rachide valde arcuata et labello non resupinato praecipue differt. Quoque Benthamiae procerae Schltr. similis, sed non solum labello non resupinato differt, sed etiam forma calcaris, disciformi et non dilatata ad apicem.*

**TYPUS.** — **Madagascar.** Fianarantsoa Province, Haute Matsiatra Region, Ambondrombe, among wet rocks, 1700 m, fl., 11.IV.1941, *Boiteau 4634* (holo-, P[P00692301!]; iso-, P[P00692302!], 3 individuals)).

**PARATYPES.** — **Madagascar.** Fianarantsoa Province, Haute Matsiatra Region, Ambondrombe, among wet rocks, 1700 m, fl., 11.IV.1941, *Boiteau 4634* (P[P00692302!], 3 individuals)); marsh with mosses near summit of Ambondrombe, 1900 m, fl., 11.IV.1941, *Boiteau 4598* (P[P00692299!], 2 individuals), P[P00692300!], 2 individuals)); Andringitra National Park, among vegetation in altitude [approximate coordinates: 22°13'22"S, 46°55'45"E], fl., IV.1964, *Bosser 19648* (P[P00692265!], 3 individuals)).

*Description*

Terrestrial herb with erect cylindrical stems 21-71 cm long, green or purple (on same plant), 2-5 mm in diameter. One or two sheaths at base of the stem, 2 to 3 leaves in the lower part of the stem. Leaves sheathing at their base, thin, flexible, linear, acute, 50-140 × 5-10 mm. Two to three sterile bracts in upper part of stem, linear, acute, 13-25 × 2-3 mm. Inflorescence terminal, arching, 20-50 flowered. Rachis 7-19 cm long. Floral bracts decurrent, acicular, reddish, as long as ovary + flower, 7-12 × 2 mm. Flowers secund, yellow and reddish, not resupinate, drooping downward, seemingly semipeloric. Sepals similar, reddish, linear, concave, 3-3.5 × 1 mm, with a central vein, dorsally slightly keeled. Petals linear, yellow, similar to sepals but slightly narrower, slightly thickened at apex, 3-3.5 × 0.8-1 mm. Lip 3-lobed (a feature hardly visible on rehydrated material), 3-4 × 0.8-1 mm, mid lobe thickened at apex, 1 mm long, side lobes slightly

TABLE 1. — Main differences between *Benthamia bosseri*, Hervouet sp. nov. and close species.

	Flowers	spike	spur	leaves	fl. period
<i>B. bosseri</i> sp. nov.	yellow, secund, not resupinate	arcuate, dense	discoïd	linear	March-April
<i>B. cinnabarina</i>	yellow, in a spiral resupinate	erect intermediate	scrotiform	linear lanceolate	February-May
<i>B. procera</i>	yellowish, secund resupinate	erect intermediate	purse shaped	linear lanceolate	Oct.-Dec.
<i>B. verecunda</i>	greenish, secund resupinate	nearly erect dense	almost globular	lanceolate	April

shorter than mid lobe, thickened on fresh material, flat and folded on lip when dried, spur very short (1 mm), somewhat discoïd. Ovary greenish or reddish, 3 mm long (fresh flower) to 10 mm (fruit), 1-2 mm in diameter. Column terete, very short (0.9-1 mm). Pollinia 2.

#### *Habitat and distribution*

This species was found growing in the same habitat as *B. boiteaui* Hervouet, sp. nov. on Ambondrombe massif (Fig. 5), but has also been collected in Andringitra National Park (about 60 km from Ambondrombe in the south-west direction) with a similar habitat on large prairies and rocks. It was still observed in both locations during the SFO field trip in 2009, so it is probably not very rare.

#### *Etymology*

This species is dedicated to Jean Bosser, who collected it in the Andringitra massif and advised us to publish its description. Jean Bosser, from the year 1960 on, described, mostly in this journal, around 120 new species of orchids from the Madagascar-Mascarene area and was thus very instrumental in the advancement of our current knowledge of Orchidaceae in this region. Jean Bosser sadly passed away on 6<sup>th</sup> December 2013, during the review process of this paper.

#### *Conservation*

This species is probably not presently endangered as it grows both in Ambondrombe and in Andringitra National Park. However due to its little number of locations we give it the IUCN quotation NT (Near Threatened).

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We kindly thank Alain Jouy for his care in drawing the plants and his patience with us, and Thierry Pain who corrected and improved greatly the latin diagnosis. We owe a lot to the generous hospitality of MNHN in the herbarium, namely Marc Pignal and Germinal Rouhan for help, technical discussions and advice, Lucile Allorge for kindly providing key data on her father Pierre Boiteau, and Thierry Deroïn for his useful guidance and review of the article. We are also indebted to France Rakotondrainibe for her suggestions on the manuscript, and Johan Hermans for his judicious advice and remarks and generally speaking for fruitful and open exchanges of data. We warmly thank Phillip Cribb for kindly reviewing the paper and sending us his own drawings and photographs of the Ranomafana specimen of *Benthamia boiteaui* Hervouet, sp. nov. Lastly we duly thank Jean-Claude Guérin, president of the SFO Poitou-Charentes-Vendée, for his organisation of a number of SFO field trips to Madagascar.

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