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DESCRIPTION

Habenaria paxamorque (Orchidaceae), a new endangered graminiform species from French Guiana, Suriname and Northern Brazil.

Guillaume Léotard / *Fondation Biotope, Matoury, French Guiana / leotardmtp@yahoo.fr*
Hervé Galliffet / *Kourou, French Guiana*
Olivier Tostain / *Matoury, French Guiana*
Maël Dewynter / *Fondation Biotope, Matoury, French Guiana*
João Aguilar Nogueira Batista / *Universidade Federal de Minas Gerais, Brazil*

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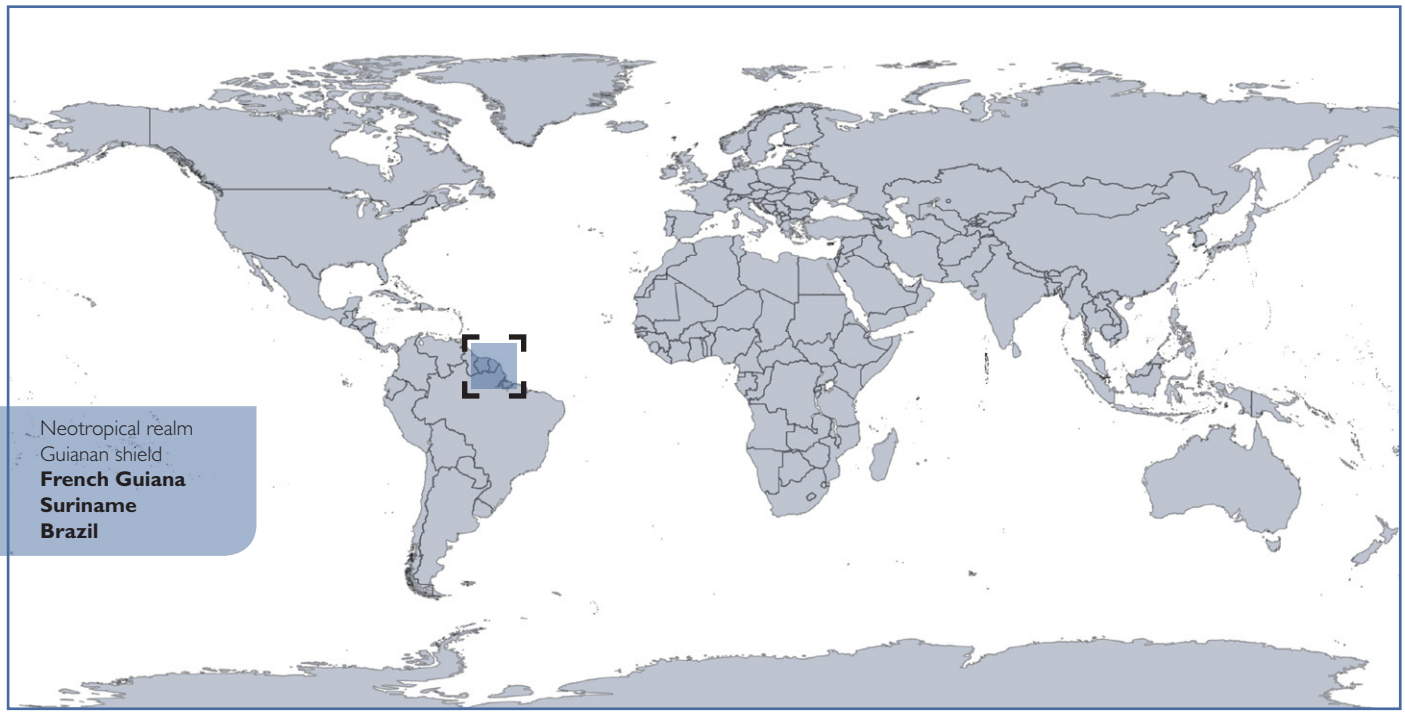
Abstract: *Habenaria paxamorque*, a new graminiform-leaved species, is described from coastal savannas of French Guiana. Herbarium specimens also attest its presence in Northern Brazil (Marajó island, Pará) and Southern Suriname (Sipaliwini). It differs from other similar species most prominently by its reduced anterior petal lobes, short spur, and subequal lip lobes, the lateral ones diverging at ca. 45°. Molecular phylogenetic analyses confirm that it is not related to any known morphologically similar species. In French Guiana its status is assessed as Critically Endangered (CR) on the basis of the IUCN evaluation methodology.

Résumé: *Habenaria paxamorque*, une nouvelle espèce à feuilles graminiformes, est décrite des savanes côtières de Guyane française. Des spécimens d'herbier témoignent également de sa présence dans le nord du Brésil (Île de Marajó, Pará) et dans le sud du Suriname (savanes de Sipaliwini). Elle diffère des autres espèces similaires essentiellement par ses lobes antérieurs des pétales réduits, son éperon court, et ses lobes du labelle subégaux, les latéraux divergeant d'environ 45°. Des analyses de phylogénie moléculaire confirment qu'elle n'est apparentée à aucune autre espèce morphologiquement similaire. Pour la Guyane française, nous proposons un statut de conservation "en danger critique d'extinction" (CR) selon la méthodologie d'évaluation de l'UICN.



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INTRODUCTION

The New World graminiform-leaved *Habenaria* forms a speciose group of iconic savanna-dwelling orchids. They are highly threatened by the current demographic explosion leading to the rapid conversion of savanna ecosystem to human activities. Traditionally neglected in favor of showier epiphytic species, the understanding of their systematic has historically been a long, slow, and confuse process. However major contributions by J.A.N. Batista and colleagues (e. g. Batista *et al*. 2011a & b) were recently published and have significantly contributed to a much better characterization of its South American members. In the last few years, knowledge about this group has tremendously increased in French Guiana due to the renewed interest of several field naturalists. Among these H. Galliffet, a pre-school teacher in Kourou, has acquired a knowledgeable experience on the local savanna flora, and on 24th April 2014, during a field survey with the keen orchid grower A. Sambin, he noticed a strange *Habenaria* unknown to him. Despite a considerable search he could not locate more than one individual. Pictures of the few still not totally withered flowers were taken and sent to J.A.N. Batista for identification. The Brazilian authority on *Habenaria* suggested the possibility of *H. amalfitana* and it was under this name that this discovery was soon published on the personal website of H. Galliffet. Next year H. Galliffet was fortunate enough to discover two more populations and the publication of detailed pictures of fresh flowers finally attracted the attention of the local botanist *G. Léotard*. Together H. Galliffet & G. Léotard then revisited all three populations during the following year, and a thorough search through all the relevant historic and modern literature ultimately revealed that this peculiar *Habenaria* was a distinctive unknown species which we here describe as new.

DESCRIPTION

***Habenaria paxamorque* Léotard & Galliffet, sp. nov.**

Habenaria belonging to sect. *Nudae*, inhabiting savannas, with linear-filiform leaves and very small greenish flowers, morphologically similar to *H. ayangannensis* Renz, *H. leprieurii* Rchb.f., *H. ludibundiciliata* J.A.N.Bat. & Bianch., *H. secundiflora* Barb.Rodr. & *H. subfiliformis* Cogn.
It differs more prominently from all these species by the reduced anterior lobe of petals, by its lip with 3 subequal lobes, the lateral ones diverging at 40-45° from the central one, and by its short spur (only slightly longer than lip midlobe), which is free from bracts and not dilated towards apex.

Type: Guyane française, commune de Kourou, savane des Pères, ca. 4,3 km S of Kourou, N of RN1, 05.119448°N, 52.645353°W, 5 m, 20/03/2016, full flowering, low seasonally inundated savanna, G. Léotard, H. Galliffet & O. Tostain 1412 (Holotype: CAY). Figures 1-7.

Terrestrial diminutive herb.
Tubers often two at anthesis, 6-7 x 5.5-6 mm, at tip of ca. 2 cm long stoloniform roots, buried ca. 2-4 cm under soil surface, **roots** 3-6, ca. 5-25 x 1-1.6 mm, whitish. **Stem** erect and straight, (10-)14-28(-35) cm high (including inflorescence ca. (3-)6-15 cm long), slender, ca. 1-1.5 mm diameter. **Leaves** 4-6(-7); 1-3 lowermost leaves mostly reduced to sheath, whitish with purple-black strains; well-developed leaves 2-4 (largest leaves around mid-stem), with basal part sheathing stem ca. 15-20 mm long and free part 20-75 mm long, linear-filiform, only slightly spreading at 10-25° from stem, transversal section in U (inconspicuously carinate abaxially), apex acuminate; maximal width of largest leaves ca. 1,5-2,5 mm (once spread); upper leaves often bract-like in size. **Bracts** decreasing in size towards the apex of the inflorescence, mostly lanceolate with apex caudate-acuminate, variable in development; on average the lowermost often largely exceeding pedicellate ovary and commonly up to 25 x 3 mm; the middle ones typically 9-15 mm long and about equalling pedicellate ovary; and the uppermost ones occasionally not exceeding half the length of pedicellate ovary (especially the case in the largest inflorescences). **Inflorescences** quite laxiflorous, with (4-)6-13(-23) flowers (on average more multiflorous than in relatives) disposed in spiral with about 5 flowers per 2 tours and with flowers facing all sides (not subsecund, as in most relatives). Flowers very small (8-10.5 mm between tips of lateral sepals), glabrous (without hairs, ciliae or papillae). **Pedicellate ovary** with pedicel obsolete, (6-)9-11 x 1-1,2 mm, straight and +/- closely appressed to stem, bent only at the neck-like sterile apex in order to position the flower face at straight angle from the stem. **Flower bud** ovoid, merely acute, gibbous toward the base of lateral sepals, base of dorsal sepal forming a peculiar semi-annular constricted thickening. **Flower color** overall extremely concolor and much less colored and contrasted than most relatives, essentially green and greenish-yellow; in details, and relatively to the basic green color of vegetative parts, lateral petals, lip, spur and column are yellower (especially towards their apices); on the other hand, base of lip is often markedly whitened, as are, but more inconspicuously, base of lateral petals, auricles, thecae, anther-canals, viscidia, and stigmas; pollinaria are a purer yellow.

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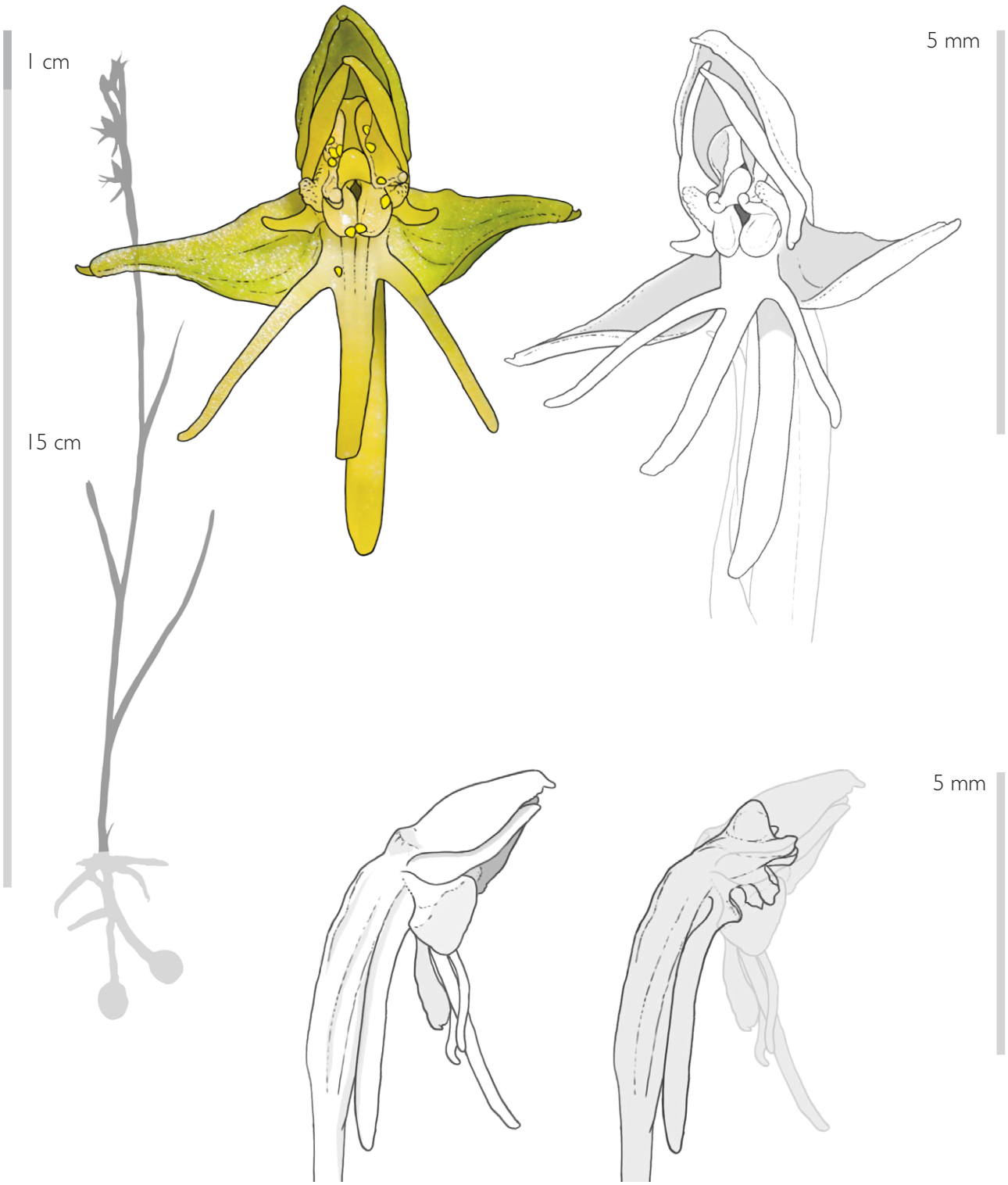

Illustrations: M. Dewynter / G. Léotard

Fig. 1: *Habenaria paxamorque*. Floral analysis.

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Sepals margins smooth, hyaline; **dorsal sepal** oriented roughly at 45°, ca. 3.8 x 2.7 mm, galeate, transversal section in U, when flattened ovate-subacuminate, 3-nerved, basal thickening conspicuous in profile view, apex bent inward, provided with a barely visible minute mucro; **lateral sepals** ca. 4.1-4,5 x 1.5-1.7 mm, triangular-acuminate, markedly assymetrical-falcate with the inferior margin strongly dilated and superior margin slightly concave, veins 3-4, strongly curved, apex inconspicuously cucullate and provided with a minute, soft and subuncinate mucro ca. 0.25 mm long; patent (and thus not reflected backward), with the basal part oriented in the same plan as the lip, and the apex slightly twisted and oriented upward. **Petals** bipartite; **posterior segment** narrowly triangular-falcate, ca. 3.2 x 0.7 mm, basal part rather poorly coalescent with dorsal sepal, apical part free from it; **anterior segment** greatly abbreviated, reduced to a horn-like narrowly triangular processus, ca. 3-5 times shorter than posterior lobe, sometimes slightly reflected. **Lip** tripartite, with all 3 lobes in the same plan, this plan being mostly vertically to very slightly upwardly oriented; **undivided base** ca. 0.8 x 0.8 mm; **midlobe** linear but somewhat attenuating towards apex, ca. 4.5 x 0.4 mm, apex rounded, slightly narrower and shorter than spur; **lateral lobes** linear-filiform, ca. 4 x 0.2 mm, forming an angle of ca. 40-45° with midlobe, usually slightly shorter than midlobe and about half its width; **spur** short, ca. 4.7-5.5 mm long, ca. 0.5-0.6 mm diameter in front view (slightly dorsiventrally flattened), pendent, gently curved and mostly appressed to the ovary, slightly exceeding lip midlobe, only slightly exceeding half length of pedicellate ovary, always totally free from bracts, and not dilated distally. **Fertile anther** reaching nearly the middle of dorsal sepal, connective slightly emarginated at tip; **thecae** ca. 0.7 mm long, ca. 1.5 longer than broad, apparently always dehisced at flower opening (with pollen massulae already released on stigmas), often well-spaced but sometimes nearly contiguous; **anther canals and rostellum arms** ca. 0.6 mm long, parallel and well-spaced, perpendicular to the thecae; **viscidia** ca. 0.2 mm diameter, whitened, spaced ca. 0.5 mm apart; **pollinaria** mostly ill-formed and soon disintegrated; **staminodes** ca. 1 mm long, tip ca. 0.3 mm wide, fleshy-verrucose, whitened. **Rostellum midlobe** in front view deltoid and nearly reaching the middle of connective in front view, fleshy, apex slightly protruding beyond thecae in lateral view; **stigmas** two, ca. 0.9 mm long (including hidden base) and 0.5 mm wide at apex, curved and surrounding spur entrance, apical receptive parts spoon-like in form, parallel, lying on the undivided base of lip. **Fruits** 7-11 x 2-3 mm.
Note: all measurements taken from fresh, living plants.

LOCALITIES VISITED & STUDIED VOUCHERS

(1) Suriname, distr. Nickerie, Nature Reserve Sipaliwini [ca. 02.00°N, 56.07°W, 300 m], savanna, 06/1972, fl., leg. G.F. Mees s.n. [as M. Teunissen & P. Teunissen 1259] (U-0218252! [Photocopy and analyses: RENZ-15249 p.p.!]).
This collect was identified as *Habenaria culmiformis* Schltr. by L.Y.T. Westra (1975), by J.H. Snuverink (07/1978), and as *H. leprieurii* by J. Renz (27/04/1989). It was cited and illustrated as *H. culmiformis* by Snuverink & Westra (1983, p. 573, fig. 4 a & b), and as *H. leprieurii* by Renz (1992, p. 496). Note that this collect was initially mixed with a specimen of *H. subfiliformis* subsequently separated under n. 1259a by J. Renz in 1989.

(2) Guyane française, commune de Macouria, route Cayenne-Kourou, savane Bordelaise [ca. 04.970523°N, 52.481569°W, 10 m], 10/05/1975, terrestre, fleurs verdâtres, C. Sastre, F. Sastre & C. Moretti 4184 (P00408664!, *Habenaria leprieurii,* det. G.F.J. Pabst 19/12/1975, J. Renz 10/1984, *H. amalfitana* Kraenzl., det. J.A.N. Batista 10/2014).
Same locality, à proximité de la mare au fond de la savane, 04/05/1979, Y. Veyret 1616 (CAY!, sub *Habenaria culmiformis*, det. J.H. Snuverink 12/12/1979; *H. leprieurii*, det. J. Renz 1992; *H. subfiliformis,* det. G. Léotard 2011).
At the same site were also collected *Cleistes tenuis* (Rchb.f. ex Griseb.) Schltr., *Cyrtopodium parviflorum* Lindl., *Habenaria leprieuri*, *H. sprucei* Cogn. and *H. trifida* Kunth.

(3) Guyane française, commune de Kourou, savane des Pères [05.119448°N, 52.645353°W, 5 m].
The population from which types were collected was visited on multiple occasions by H. Galliffet (in 2015: 14/04, 18/04, 23/05; in 2016: 15/03 [with G. Léotard & O. Gaubert], 20/03 [with G. Léotard, O. Tostain & G. Martinerie]). On 20/03/2016, 25 individuals were counted (Figure 7).
Habenaria paxamorque was found growing along with *H. leprieurii*. In the same savanna *H. schwackei* Barb.Rodr., *H. spathulifera* Cogn., *H. sprucei*, *H. macilenta* (Lindl.) Rchb.f., *Cleistes tenuis* and *Galeandra stylomisantha* (Vell.) Hoehne, were also present.

(4) Guyane française, commune de Sinnamary, savane Garré-Rocheau [05.381253°N, 53.056226°W, 7 m].
After its initial discovery by H. Galliffet on 17/05/2015, this population was then visited again on 24/05/2015 by H. Galliffet, G. Léotard, S. Sant, M. Boudrie, M. Virevaire & M. Dietsch. A minimum of five individuals were detected (Figure 6).
Habenaria paxamorque was found growing along with *H. schwackei* & *H. sprucei*. In the same savanna *H. leprieurii*, *H. trifida* & *Galeandra stylomisantha* were also present.

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Fig. 2: *Habenaria paxamorque*.
Scale 1/1

ISSN 2495-2540

(5) Guyane française, commune d'Iracoubo, Roche Gabriel [05.444557°N, 53.187509°W, 18 m].
After its initial discovery by H. Galliffet & A. Sambin on 24/04/2014, this population was then visited again on 04/05/2014 by H. Galliffet, A. Sambin & E. Ravet, and on 25/03/2016 by H. Galliffet, G. Léotard & O. Gaubert. A maximum of about 20 individuals were detected on 04/05/2014 (Figure 5).
In close proximity were also found to grow *Habenaria leprieurii, H. macilenta*, *H. schwackei* and *H. trifida*. Moreover, *H. longipedicellata* Hoehne, *H. obtusa* Lindl., *H. secundiflora, H. sprucei, H. spathulifera, H. subfiliformis, Galeandra stylomisantha, Cleistes rosea* Lindl. and *C. tenuis* inhabit the savanna Mal-Ventre, just North of Roche Gabriel.

(6) Brasil, Pará, Ilha de Marajó, Mun. Salvaterra, Distr. Condeixa, Rio Camará [ca. 0.88°S 48.66°W, 10 m], Fazenda Santa Rita, campina, 08/07/1950, ervinha rara. G.A. Black 50-9994 (IAN-54824, sub *Habenaria subfiliformis*, det. G.F.J. Pabst 04/04/1953, *H. mitomorpha* Kraenzl., det. J.A.N. Batista 09/2005).
We re-identified this specimen on the basis of measurements [on low-resolution picture: dorsal sepal ca. 3 mm, spur ca. 4 mm] which would not fit any other known species. Moreover this specimen was cited as *Habenaria subfiliformis* (Pabst 1955), but Pabst already wondered about the shortness of its anterior petal lobes. Ultimately, its identity would still require a full confirmation by studying the actual specimen.

DISTRIBUTION (Figure 3)

Only known from savannas of coastal French Guiana, Southern Suriname (Sipaliwini) and Northern Brazil (Ilha de Marajó). Its presence is also highly expected in the state of Amapá and in the coastal savannas of Suriname and Guyana.

ECOLOGY

Habenaria paxamorque was found growing in seasonally inundated savannas, always with other graminiform-leaved *Habenaria*, most often with *H. leprieurii*, *H. schwackei* and *H. sprucei*. Other typical savanna-dwelling terrestrial orchids frequently observed with *H. paxamorque* included *Cleistes rosea, C. tenuis, Cyrtopodium parviflorum, Galeandra stylomisantha, H. longipedicellata, H. macilenta, H. obtusa, H. secundiflora, H. spathulifera, H. subfiliformis, H. trifida*. Because of its tiny habit, it is mostly confined to areas with lower grassy vegetation.

PHENOLOGY

In French Guiana flowering is mostly centered on April (at the heart of the rainy season), but from year to year, and probably depending on the rainfall, flowering may begin around mid-March and lasts until the end of June. In Northern Brazil, it has been recorded as late as July. In the graminiform-leaved *Habenaria*, the succession of flowering in French Guianan savannas is as follows: *H. schwackei*, *H. leprieurii*, *H. sprucei*, *H. secundiflora*, *H. paxamorque*, *H. subfiliformis*.

ETYMOLOGY

From Latin ***pax*** (peace), ***amor*** (love) and ***-que*** (and), because of the blatant resemblance of the lip with the peace sign.

In the 1950s, the "peace sign", as it is known today, was designed as a combination of the semaphore signals for the letters "N" and "D", ("nuclear disarmament") and used as the logo for the British Campaign for Nuclear Disarmament, a group at the forefront of the peace movement in the UK. It was then largely adopted by anti-war and counterculture activists in the US and elsewhere.

In addition to providing an effective mnemonic mean to identify the species, the *paxamorque* epithet also pays tribute to the Hippie movement, whose philosophy permeates the debates of the Paris Agreement (Cop 21). The programmed end of fossil fuels and the gradual exit of nuclear power rekindle the hope of a better future. So Hippie !
We therefore propose the English name "Peace-and-Love Bog Orchid" and the French name "Habénaire Hippie".

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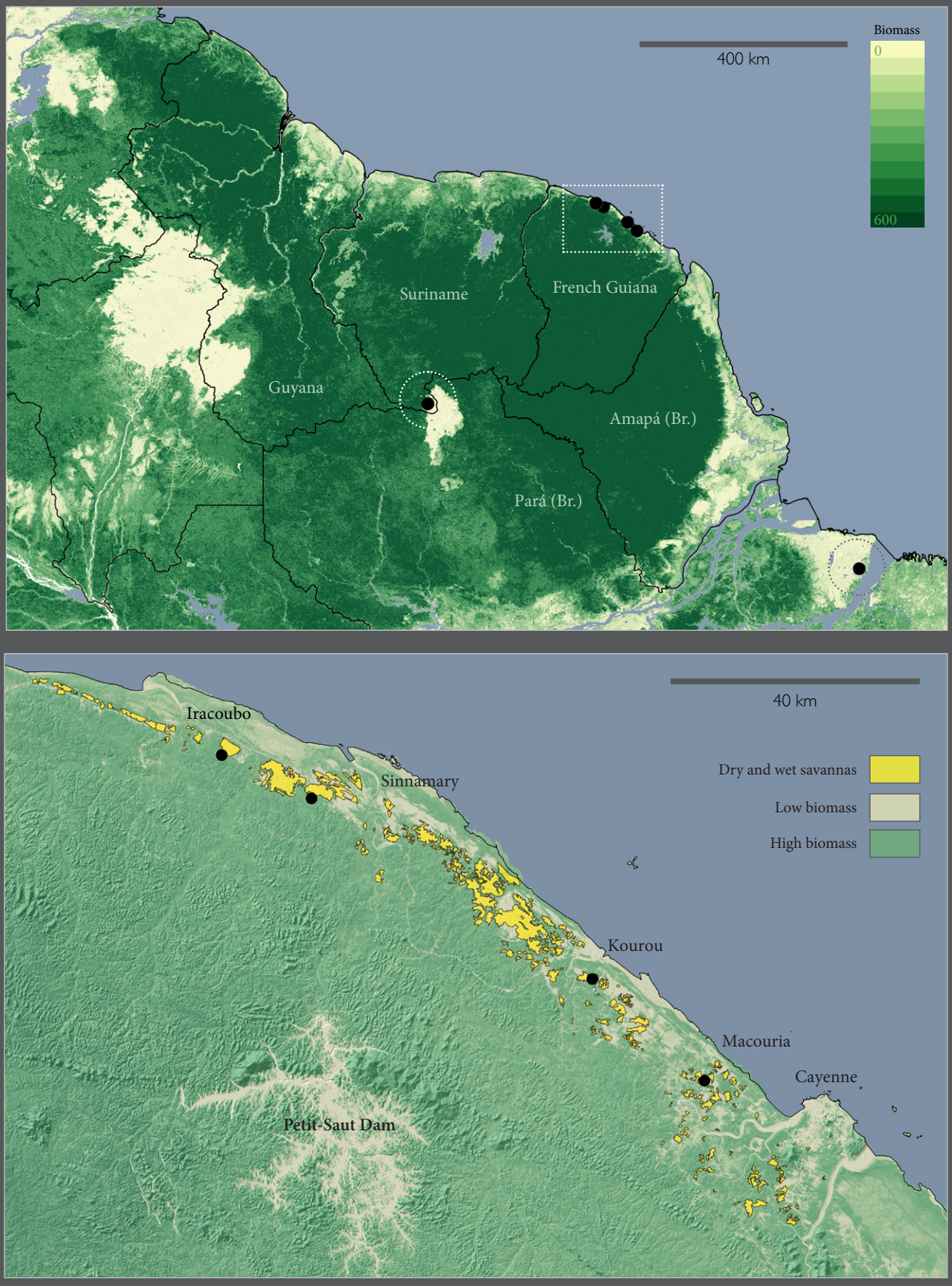

Fig. 3: Map of known localities.

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CONSERVATION

Proposed IUCN National Status for French Guiana.

In French Guiana, the EOO (Extent of Occurrence) covers 214 km^2 and the AOO (Area of Occupancy) is ca. 4 km^2 (4 populations spread over less than 1 km^2 each).
Only four populations, very isolated from one another are currently known. The minimum distance between two localities is 15 km and the maximum distance is 53 km.
The species is, however, extremely discreet and it is likely that other populations have gone unnoticed.
The population of Savane Bordelaise, discovered in 1975 (5 individuals collected), was destroyed in the 80' following the conversion of the dry savannas into grasslands.
The newly discovered population of Savane des Pères (ca. 25 individuals) faces an imminent threat of disappearance because the owner (the Guiana Space Center - CSG), despite the recurring alerts of the botanist experts and the CSRPN (Conseil Scientifique Régional du Patrimoine Naturel), wishes to convert his land to Agricultural activities.
The Savane Garré-Rocheau, initially isolated in the forest, is accessible by a road. The small population that it hosts (minimum 5 individuals) therefore faces, in a more or less long term, the threat of anthropization or the arrival of invasive plant species. Ultimately, only the population of Roche Gabriel (ca. 20 individuals), is relatively isolated and is not yet directly threatened. However, there is a worrying extension of shifting cultivation within 1 km of its edges.
The species is therefore known from about 50 mature individuals; the largest population has only 25 individuals. *Habenaria paxamorque* may therefore be considered Critically Endangered (CR) according to criteria C2a(i); B2ab (ii, iii, iv, v).

IDENTIFICATION & RELATIONSHIPS

Habenaria paxamorque doesn't exhibit much variability. The study of many individuals from three populations in the field shows a species well characterized and morphologically stable.
Habenaria paxamorque is easily recognized by its reduced anterior petal lobes along with well-developed lateral label lobes. As a rule in the genus *Habenaria*, there is a strong correlation between the relative development of anterior petal and lateral label lobes. In the Guianas, *H. paxamorque* is quite unique in breaking this rule. The only other regional species known to present the same pattern is *H. amalfitana*. Nevertheless, this species, from Andean and Caribbean (sub)montane forest, differs from *H. paxamorque* in many features (see table 1), the more evident being its vegetative parts (robust plants, with numerous, well-spreading, not graminiform leaves, and large foliaceous bracts).
Despite a superficial resemblance in flower morphology, these two species are probably only distantly related.
Between the numerous species of *Habenaria* with graminiform leaves of sect. *Nudae*, it is much more difficult to point its closest relatives. Using a variety of material (published descriptions, herbarium and living specimens, pictures, illustrations), a table summarizing the main features for *H. paxamorque* and ten morphologically similar species (including all the graminiform-leaved species known from the Guianas and Northern Amazonia, see Figures 9-10) has been produced (table 1). Features, which in our opinion constitute a significant difference between *H. paxamorque* and each other species, have been highlighted. For each species the total number of differences with *H. paxamorque* has been calculated. The utility of feature has been inferred by totalizing the number of species discriminated by each of these. This table is also intended to be an identification tool.

With only ten significant differences, *Habenaria subfiliformis* appears to be morphologically the closest species of *H. paxamorque*. They share a very similar habit and ecology, and could be quite difficult to tell apart in dried specimens. However a close examination reveal a number of clear-cut floral differences (see table 1). The other species investigated are significantly more different. A molecular phylogenetic analysis (Figure 8) with the same taxa and markers as *in* Batista *et al*. (2016) failed to accurately determine the relationships of *H. paxamorque*. In this analysis *H. paxamorque* was placed in a polytomy along with *H. lavrensis* Hoehne and two new species not yet described from the Central Brazilian highlands, but with very low support, indicating that more molecular data will be needed to resolve the position of the species. In any case, this analysis revealed that *H. paxamorque* is not directly related to any of the species to which it is morphologically similar.

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Fig. 4: Habitat of *H. paxamorque*. Up: Savane des Pères (Kourou, 20/03/2016. Photo G. Martinerie); below: Roche Gabriel (Iracoubo, 25/03/2016. Photo G. Léotard).

ISSN 2495-2540

Fig. 5: Inflorescences and flowers of *H. paxamorque*. Roche Gabriel (Iracoubo, 25/03/2016. Photos G. Léotard (a, b, c))

Fig. 6: Inflorescences and flowers of *H. paxamorque*. Savane Garré-Rocheau (Sinnamary, 24/05/2015. Photo G. Léotard (a) / 17/05/2015. Photos H. Galliffet (b, c)).

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Fig. 7: Inflorescences and flowers of *H. paxamorque*.
Savane des Pères (Kourou, 14/04/2015. Photo H. Galliffet (a); 30/03/2016. Photos O. Tostain (b, c)).

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Fig. 8. Bayesian majority-rule consensus tree of the combined ITS and matK datasets. Numbers next to the nodes represent the posterior probabilities (PP). Values are shown only for some selected clades. Taxonomic sampling and Neotropical subgroups numbers are the same as Batista *et al.* (2016). The new species described here is highlighted in bold.

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Fig. 8.

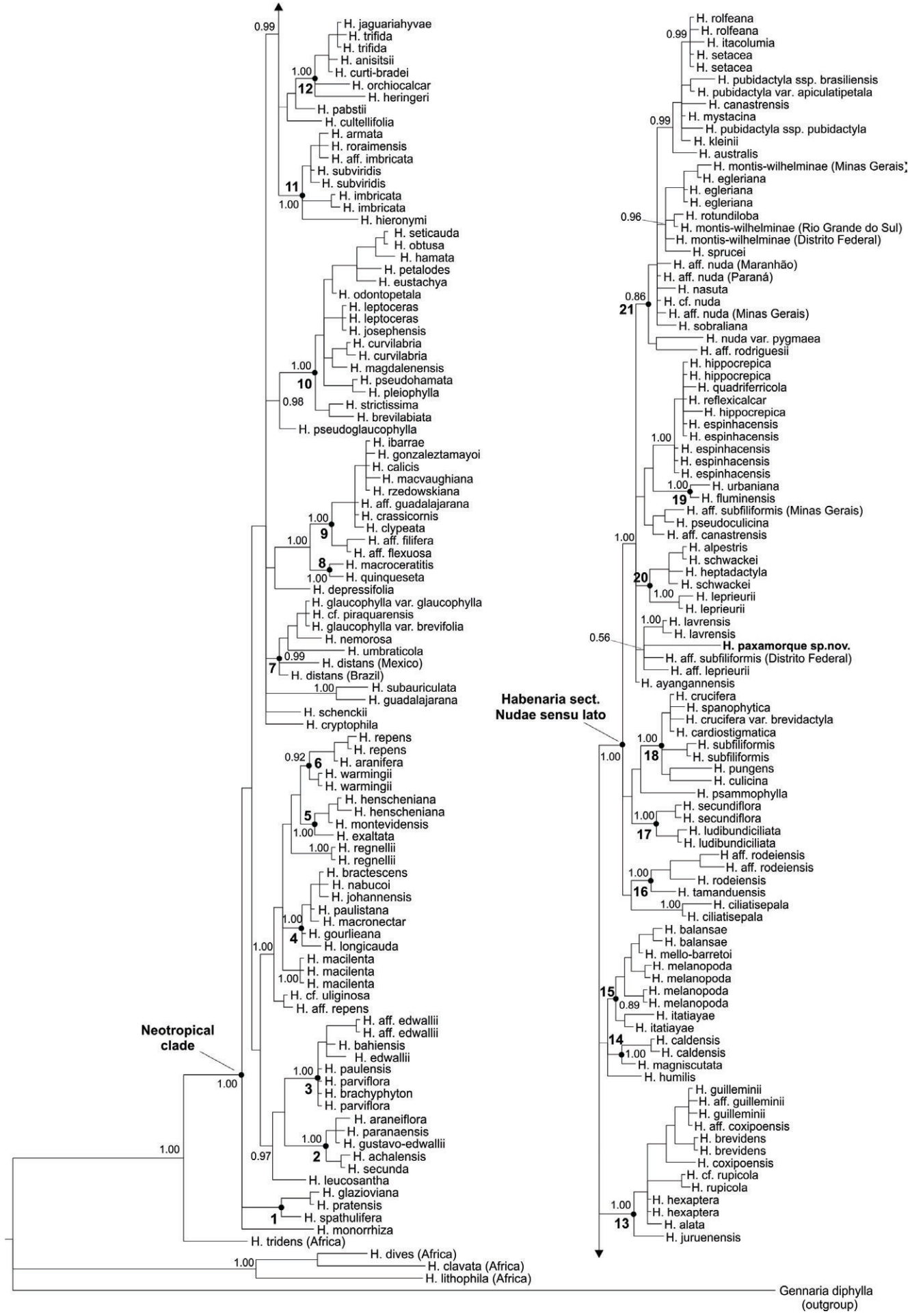

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Fig. 9: Some *Habenaria* species with graminiform leaves.

Habenaria ayangannensis, Brazil, Minas Gerais, Diamantina, 06-03-2009, JANB 2835. Photo J.A.N. Batista.

Habenaria heptadactyla, Brazil, Distrito Federal, 12-02-1997, JANB 674. Photo J.A.N. Batista.

Habenaria ludibundiciliata, Brazil, Goiás, Alto Paraíso, 03-01-2008, JANB 2377. Photo J.A.N. Batista.

Habenaria leprieurii, French Guiana, Iracoubo, roche Gabriel, 25-03-2016. Photo G. Léotard.

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Fig. 10: Some *Habenaria* species with graminiform leaves.

Habenaria montis-wilhelminae, French Guiana, Maripasoula, Haut Marouini, 20-06-2004, Granville & Crozier 16252. Photo J.-J. de Granville.

Habenaria schwackei, French Guiana, Matoury, savane de Cogneau-Lamirande, 15-02-2009. Photo G. Léotard.

Habenaria sprucei, French Guiana, Sinnamary, savane Brigandin, 03-04-2016. Photo G. Léotard.

Habenaria secundiflora, French Guiana, Sinnamary, savane Brigandin, 29-04-2014. Photo H. Galliffet.

Habenaria subfiliformis, French Guiana, Iracoubo, savane Mal-Ventre, 05-05-2016. Photo G. Léotard.

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Table 1

FEATURES		*paxamorque*	*subfiliformis*	*secundiflora*	*ludibundiciliata*	*ayangannensis*	*montis-wilhelminae*	*sprucei*	*heptadactyla*	*leprieurii*	*schwackei*	*amalfitana*	Total
Spur	length (in mm)	4.5-5.5	6	10	6-11	8	9	9-15	12-13	9-12	17-25	3.5-4	9
	spur length / lip central lobe length (ratio)	1-1.1	1.5	2	1.5-2.5	2	1-1.2	1.2-1.5	3-4	2-3	3-5	0.7-0.9	9
	free vs. enclosed in bract (at anthesis, in vivo)	free	free	free	enclosed	free	enclosed (free)	enclosed	free	enclosed	enclosed	free	5
	apex dilated	no	no	yes	yes	yes	yes	yes	yes	yes	yes	no	8
Lip central lobe	length in mm	4.5	3.5	5	3.8	5	8	7.5-8.5	4-5	(3-)4-5	5	5	2
	length / width (ratio)	10	8	6-8	6	8	6-7	5.5-8	4-6	3.5-4.5	2.5-4.5	4.5-5	7
Lip lateral lobes	lip lateral lobes length / lip central lobe length (ratio)	0.9	1.3	1.1	1.4	1.2	0.2-0.25	0.9-1	0.9-1	0.7-0.9	0.8-1.1	0.4-0.7	6
	lip lateral lobes width / lip central lobe width (ratio)	0.5	0.6	0.6	0.8	0.5	0.3-0.5	0.6-0.9	0.7-1	0.3-0.45	0.7-1	0.5-0.7	4
	angle of divergence with respect to the central lobe (degree)	40-45	70-90	40	45	60-80	60-80	40-50	80-90	70-80	90	30-50	6
Petal anterior lobe	petal anterior lobe length / petal posterior lobe length (ratio)	0.2-0.35	1-1.3	1.1	1.1-2.3	1.1	0.1	0.8-1	0.8-1	0.8-1(-1.2?)	1	0.2-0.4	8
Petal posterior lobe	apex free from dorsal sepal vs. tightly coalescent	quite free	coalescent	coalescent	coalescent	coalescent ?	coalescent	divaricate	quite free	quite free	quite free	quite free	5
Dorsal sepal	length	3.8	3	5-6	2.5-4	3.2	6.5	7.5-9	3-4.2	2.8-3.4	4.5-5.2	5	8
	length / width (ratio)	1.4	1	1.4	0.9-1	1	1.3	1.15-1.35	1.3-1.4	1.5	1.2-1.3	1.15-1.25	4
	semi-annular basal thickening present	yes	no	no	no	no ?	no	no	no	no	no	no	10
Lateral sepals	length / width (ratio)	2.7	2.5	3	2-2.3	2.4	2.5	2.4-3	2.9	(3?-)4-4.5	2.2-3	2	2
	spreading vs. reflexed	spreading	reflexed	spreading	spreading	reflexed	spreading	spreading	reflexed	reflexed	reflexed	spreading	5
	margins	glabrous	glabrous	glabrous	generally ciliate	glabrous	glabrous	papillose	glabrous	glabrous	glabrous	glabrous	2
Inflorescence	flower number	(4-)6-13(-23)	4-9	4-?	3-15	3-7	2-6	2-8	8-22	(2-)3-7(-9)	2-9	5-15	7
	one-sided	no	yes (-no)	no?	yes	no	no (-yes)	yes	no	yes	yes	no	4
	density	medium	quite lax	medium	medium	medium	medium	medium	very dense	very lax	medium	quite lax	2
Other floral features	sub-concolor coloration (greenish-yellow)	yes	yes	yes	yes	yes	yes	no: translucid perianth	no: bright yellow	no: ochraceous or deep green	no: white	yes	4
	distance between viscidia (in mm)	0.5	± 0.5	0 (contiguous)	0.8-1	± 0.5	2	2-2.5	0 (contiguous)	0 (contiguous)	0 (contiguous)	1	7
	ovary mostly parallel to the stem	yes	yes	no	no	no	yes	yes	no	yes	no	yes	4
Phenology (month of flowering peak in French Guiana)		April	June	April	cf. note [1]	cf. note [1]	May	March	cf. note [1]	March	February	cf. note [1]	4
Ecology		wet savanna	wet savanna	savanna	dry savanna	highland savanna	Inselberg	wet savanna	savanna	wet savanna	wet savanna	(sub)montane forest	4
Other differences			tallest		very long mucros	very short bracts	wider leaves, bigger tubers	transverse veins in sepals	pedicels long, lip lateral lobes dilated	lip lateral lobes dilated	pedicels long, lip lateral lobes dilated	cf. note [2]	
Number of differences in respect with *H. paxamorque* (excluding phenology)			10	12	13	14	15	17	16	18	18	18	
References		pers. obs.[3]	pers. obs.[3] Batista *et al.* 2008	pers. obs.[3] Batista *et al.* 2008 Carvalho *et al.* 2013	Batista *et al.* 2006	Batista *et al.* 2008 Carvalho *et al.* 2013 Renz 1992	Granville n°16252 [5] Renz 1992	pers. obs.[3]	pers. obs.[3] Batista *et al.* 2008	pers. obs.[3] J. Renz floral analysis [4] Batista *et al.* 2008 Carvalho *et al.* 2013	pers. obs.[3] J. Renz floral analysis [4]	pers. obs.[3] Feldman & Barré 2001	

Notes:

[1] Not relevant because the phenology is not comparable (occur too far from French Guiana).

[2] Stem more robust. Leaves not graminiform (up to 8 mm wide), well spreading, more numerous. Lower bracts foliaceous. Lip lateral lobes ciliates towards apex. Lip central lobe subspatulate. Smallers staminodes.

[3] Data obtained mostly from field observation, but also including measurements from herbarium specimens (incl. online digital images).

[4] Data obtained from floral analysis of J. Renz, preserved in his herbarium (RENZ, online digital images).

[5] Guyane française, Inselbergs du Haut Marouini, 02°36'30"N, 54°01'45"W, 220m, mare temporaire de savane-roche, 20/06/2004, Granville J.-J. de, Crozier F. 16252 (CAY059377, P02078952, field picture!).

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