



Anthurium harleyi (Araceae) — a new rupicolous species of section *Urospadix* from the northern Chapada Diamantina, Bahia, Brazil

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Summary. *Anthurium harleyi* T.A.Pontes & Mayo, a new rupicolous species of *Anthurium* sect. *Urospadix*, is described from the rupestrian grassland (*campo rupestre*) vegetation of the northern region of the Chapada Diamantina, in central Bahia state, Brazil. The new species is endemic to this region, but closely related to *A. erskinei* Mayo from the central and southern regions of the same highland. A multivariate morphometric analysis of twelve quantitative morphological variables is presented which shows the two species to be distinct. A taxonomic description, line drawings, photographs, distribution map and conservation status based on a spatial analysis are provided.

Key Words. Campo rupestre, lithophytes, Morro do Chapéu, mountaintop grasslands, multivariate morphometrics, new species, threatened species.

Introduction

Most Brazilian taxa of the genus *Anthurium* Schott belong to section *Urospadix* Engl. and occur predominantly in the humid Atlantic Forest of the eastern side of Brazil (Temponi 2006; Coelho 2004; Coelho *et al.* 2009). A few species, however, are endemic to the semi-arid interior of northeast Brazil. The earliest of these to be recognised, *A. petrophilum* K. Krause (1932), was discovered by Ernst Ule in 1906 (Pontes *et al.* 2016) and another four were found as a consequence of further botanical exploration of the central highlands of Bahia state: *A. erskinei* Mayo (1978), *A. morii* Mayo & Haigh (Haigh *et al.* 2011), *A. talmonii* Mayo & Haigh (Haigh *et al.* 2011) and *A. zappiae* Haigh, Nadruz & Mayo (Haigh *et al.* 2011). Most of these taxa are rupicolous, growing on rock outcrops in the *campo rupestre* vegetation of the Chapada Diamantina plateau in central Bahia. *Campo rupestre* (in English translated as “rupestrian grasslands” or “mountaintop grasslands”, Fernandes 2016) is a vegetational complex characteristic of the uplands of eastern Brazil and recognised for its very diverse flora (Harley 1988, 1995; Giulietti *et al.* 1997; Rapini *et al.* 2008).

A sixth species, *Anthurium harleyi* T.A.Pontes & Mayo, described here, first attracted the attention of aroid taxonomists in 1977, when the one of the present authors (SJM) visited the municipality of Morro do

Chapéu in the northern sector of the Chapada Diamantina and found a rupicolous *Anthurium* growing there. This field collection was part of a historically important botanical field programme in Bahia led by Dr Raymond Harley (Royal Botanic Gardens Kew) in collaboration with the Centro de Pesquisas do Cacau (CEPEC), Itabuna, under the auspices of its then Director, Dr Paulo de Tarso Alvim. Although the populations sampled were very variable in their leaf morphology, the long peduncle, rather narrow leaves and semi-erect spathe marked it out as different from the few comparable species then known; it remained formally undescribed but was thenceforth dubbed “*Anthurium harleyi*”. During the same field study, *Anthurium erskinei* (Mayo 1978) was discovered further south around the small towns of Mucugê, Andaraí and Igatu (“Xique-Xique”) in the Serra do Sincorá, which forms the southeastern extension of the Chapada Diamantina. This plant clearly differed from *A. harleyi* by its thicker and broadly elliptic to obovate leaves, combined with a remarkably short peduncle and an erect to semi-erect spathe.

In succeeding years new collections of plants resembling *Anthurium erskinei* were made by various botanists near Lençóis and on the western side of the Chapada Diamantina near Rio de Contas (Mayo 1995; Harley &

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Giulietti 2004), Abaíra (Sakuragui & Mayo 2003) and Piatã (Pontes 2014). The western populations differed from those between Mucugê and Lençóis in having longer peduncles and sometimes narrower leaves, and so it transpired that the distinction between *A. erskinei* and *A. harleyi* became less clear.

Richards & Mayo (2009) investigated this problem by a morphometric comparison of *Anthurium harleyi* and *A. erskinei*, using six quantitative leaf and inflorescence variables, but they found that the two species could not be completely separated due to the intermediate character of populations from the Abaíra area.

Pontes (2014) later carried out a detailed population-level study of all the *campo rupestre* species of *Anthurium* sect. *Urospadix* using morphological characters and ISSR molecular markers. He found that populations of *A. harleyi* from Morro do Chapéu were distinct from those of *A. erskinei* sampled at various localities in the southern Chapada Diamantina. His data sets also showed that *A. harleyi* and *A. erskinei* formed a group distinct from the other *campo rupestre* species and could thus be considered close genetic relatives.

The present study presents a new morphometric analysis using twelve quantitative morphological variables of vegetative and reproductive organs, which we undertook to test further the distinction between the two species. The results of this analysis justify the formal description and valid publication of *Anthurium harleyi* as a new species.

Material and Methods

Morphometric Analysis

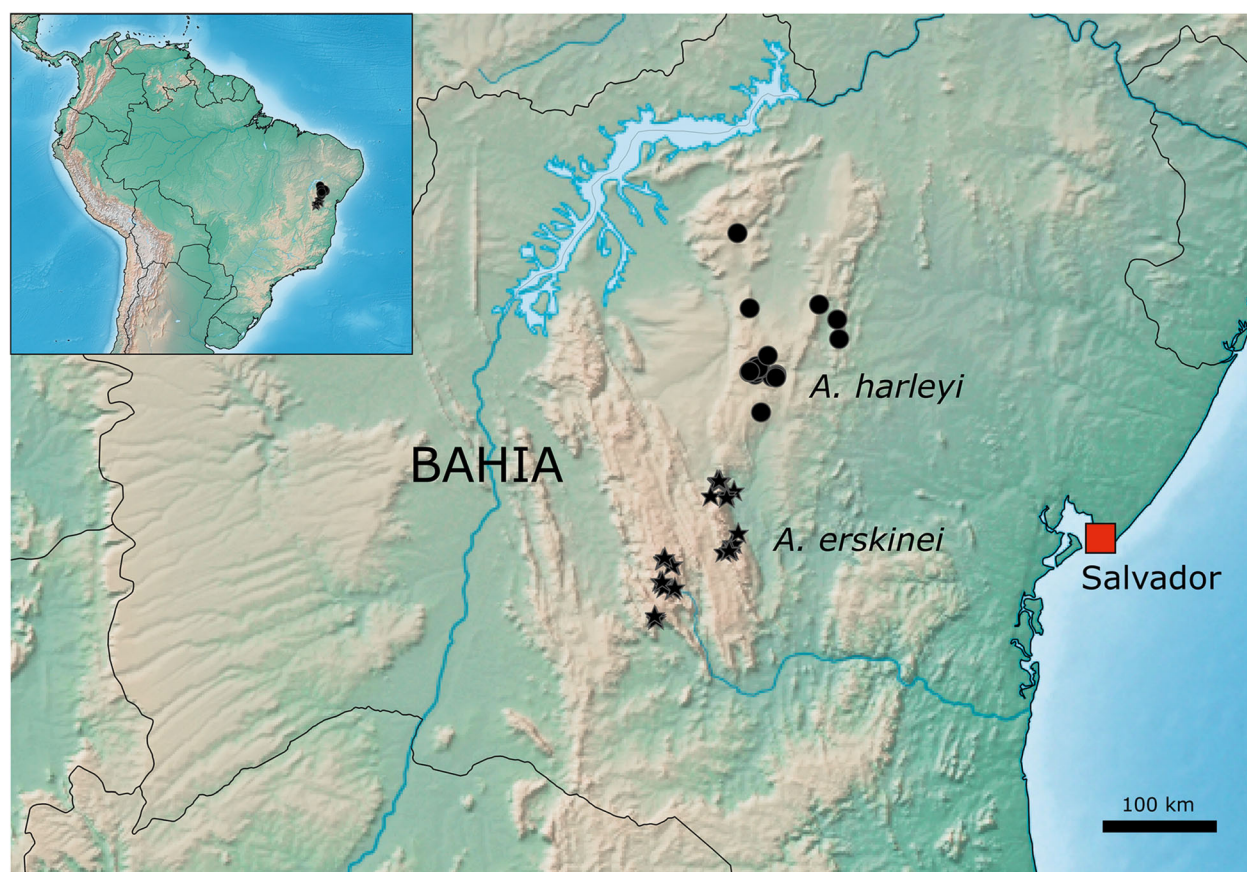
Data from 21 plants (six populations) of *Anthurium harleyi* and 15 plants (eight populations) of *A. erskinei* (see

Electronic Supplementary Material, ESM 1) were used to carry out principal component analysis (PCA) and linear discriminant analysis (LDA) with the software package PAST version 3.15 (Hammer *et al.* 2001). The data set was composed of twelve quantitative measured variables from both vegetative and reproductive organs (Table 1), captured from digital images of dried specimens using ImageJ software (Rasband 2017). The character relative inflorescence length (rel.infl) was computed for each individual from measurements made of petiole, leaf blade, peduncle and spadix, but not used in the multivariate analyses. When a specimen included a plant with more than one mature leaf or inflorescence, each was measured and the mean value calculated. Floral length and width were measured by computing the mean value of measurements made on five flowers in the central region of each spadix. The rows of the resulting matrix (ESM 1) thus consist of mean values of variables for one individual plant. PCA was carried out using both untransformed and standardised data (Legendre & Legendre 2012); standardisation of variables was computed by subtracting the column mean from each value and dividing the result by the column standard deviation. As the untransformed data matrices were heteroscedastic, the LDA was carried out with the data transformed to their natural logarithms; this produced near homogeneity in the covariance matrices of the species using Box's M test as implemented in PAST. Ranges and quantiles (minimum value, 10% quantile, 50% quantile [median], 90% quantile and maximum value) were computed for each variable in each species and boxplots created with R software, version 3.4.1 (R Core Team 2017). Jackknife testing of the discriminant analysis was carried out in PAST.

Table 1. Definition of variables used in quantitative analysis.

Variable	Code name	Measurement
Leaf blade length (cm)	bladlen	distance measured along midvein from leaf blade-petiole junction to apex of <i>Vorläuferspitze</i> ^a .
Leaf blade width (cm)	bladwid	widest width perpendicular to midvein
Leaf blade centre of gravity (cm)	bladcg	distance measured along midvein from leaf blade-petiole junction to the level of the widest blade width.
Petiole length (cm)	petlen	length from base to meeting point with blade and including the geniculum, following main axis (using segmented line selections)
Peduncle length (cm)	pedlen	length from base to dorsal junction of spathe and stipe following main axis (using segmented line selections)
Spathe length (cm)	spatlen	length from dorsal junction of spathe and stipe to tip of <i>Vorläuferspitze</i> ^a , following main axis (using segmented line selections)
Spathe width (cm)	spatwid	widest width perpendicular to spathe main axis
Spadix length (cm)	spadlen	length from base of floral zone, i.e. not including stipe, measured on anterior side, above meeting point of spathe decurrency, length measured is length of the axis i.e. following its curves (using segmented line selections)
Spadix diameter (cm)	spadwid	greatest diameter of spadix
Flower width (cm)	flwid	widest width perpendicular to spadix main axis, from corner to corner
Flower length (cm)	flen	longest length in sense of spadix main axis, from corner to corner
Relative flower size	rfs	ratio of spadix diameter to flower width at the same point along the spadix axis ^b
Relative inflorescence length ^c	rel.infl	ratio of inflorescence length (pedlen + spadlen) to total leaf length (petlen + bladlen)

^aTroll 1959, p. 341 – 342. ^bPontes *et al.* 2014. ^cthis variable derived from measurements



Map 1. Distribution of *Anthurium harleyi* (circles) and *A. erskinei* (stars). Based on specimens given in Electronic Supplementary Material 2 (ESM 2). Prepared using SimpleMappr (Shorthouse 2010).

Taxonomic Treatment including Conservation Status analysis

The taxonomic description of *Anthurium harleyi* was prepared from the 13 collections listed below under "Specimens examined", which were studied first-hand by the authors. A further 18 specimen records of *A. harleyi* listed under "Additional specimens seen as online images" were selected from the online data base SpeciesLink (SpeciesLink 2017), identified from the images and used to further complement the description.

For mapping, the 32 specimen records of *Anthurium harleyi* were combined with 40 imaged specimen records of *A. erskinei* identified online from the SpeciesLink data base. All these specimen records are listed in Electronic Supplementary Material 2 (ESM 2); those with latitude and longitude coordinates were used to make the distribution map of the two species shown in Map 1, which was prepared using SimpleMappr software (Shorthouse 2010).

A spatial analysis was carried out with the GeoCat online tool (Bachman *et al.* 2011) using 32 collections from 24 different localities. The preliminary conservation status assessments of extent of occurrence (EOO) and area of occupancy

(AOO) were based on the geographical coordinates of the specimen records (Rivers *et al.* 2011). We used latitude and longitude coordinates from the material given in ESM 2.

Results

Morphometric Analysis

PCA of the standardised data set (Fig. 1) showed greater overall variability of *Anthurium erskinei*, and the broken stick test suggested that only the first three axes (77.6% of total variance) were significant. The biplot (Fig. 2) indicates that peduncle length (pedlen) and relative flower size (rfs) are important in separating the multivariate point clouds, in addition to other variables. *A. erskinei* has shorter peduncles and relatively smaller flowers (higher values of rfs mean more flowers per spadix width).

The LDA of the logged data set showed a clear separation of the two species (Fig. 3), and 100% correct classification of the individuals of each species under the Jackknife cross-validation test. The loadings on the discriminant function (Table 2) using logged data showed the most discriminatory characters for

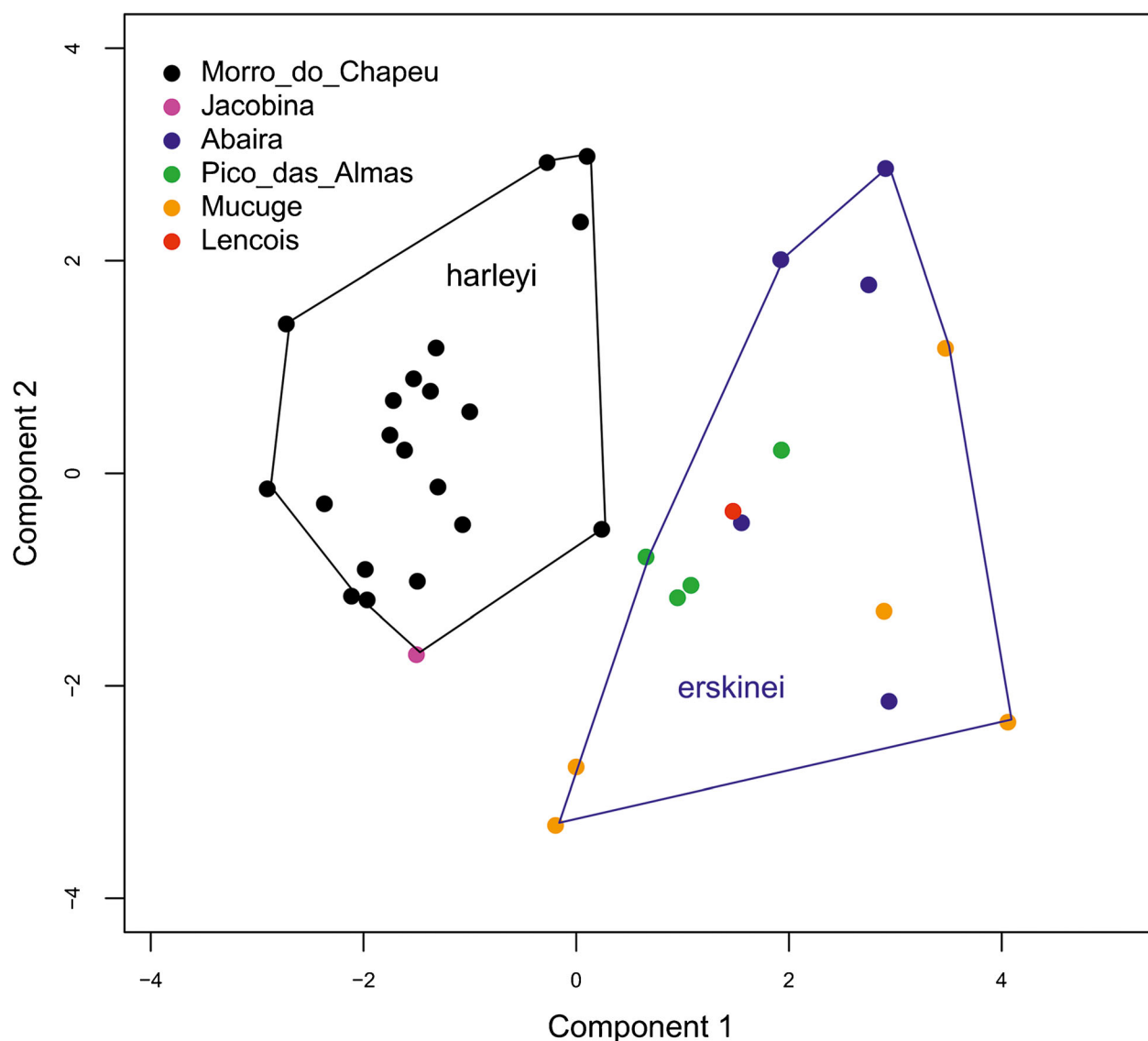


Fig. 1. Principal component analysis (PCA) of standardised data with convex hulls. *Anthurium harleyi* populations: black = Morro do Chapéu, magenta = Jacobina. *A. erskinei* populations: blue = Abaira, green = Rio de Contas (Pico das Almas), orange = Mucugê, red = Lençóis.

Anthurium harleyi as: shorter and narrower leaf blades, leaf blade centre of gravity (see Table 1) more basally positioned, and longer peduncles. Less marked characteristics of *A. harleyi* are longer petioles, shorter and narrower spathes and spadices, and relatively larger flowers (fewer per spadix width). Table 3 gives the variables (in original values) that most influenced the discrimination between the two species, and Fig. 4 boxplots of all variables based on their standardised values. Fig. 4 shows that the two species are distinguished most strongly by relative inflorescence length ("rel.infl"; because of its derivation from original measurements this character was not included in the discriminant analysis). Nevertheless, these results show that neither in original nor in standardised form did any of the variables

completely distinguish the two species, in contrast to their combination in multivariate analyses.

Taxonomic Treatment

Anthurium harleyi T.A.Pontes & Mayo, **sp. nov.** Type: Brazil, Bahia, Morro do Chapéu, Rio do Ferro Doido, 1 March 1977, R. M. Harley *et al.* 19221 (holotype CEPEC!; isotypes ALCB!, B!, HUEFS!, K!, M!, MBM!, MO!, NY!, P!, RB!, SP!, SPF!, US!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77192381-1>

Plant rupicolous. *Stem* aerial, abbreviated, erect to slightly creeping, brown, internodes short, 0.1 – 0.5 (–

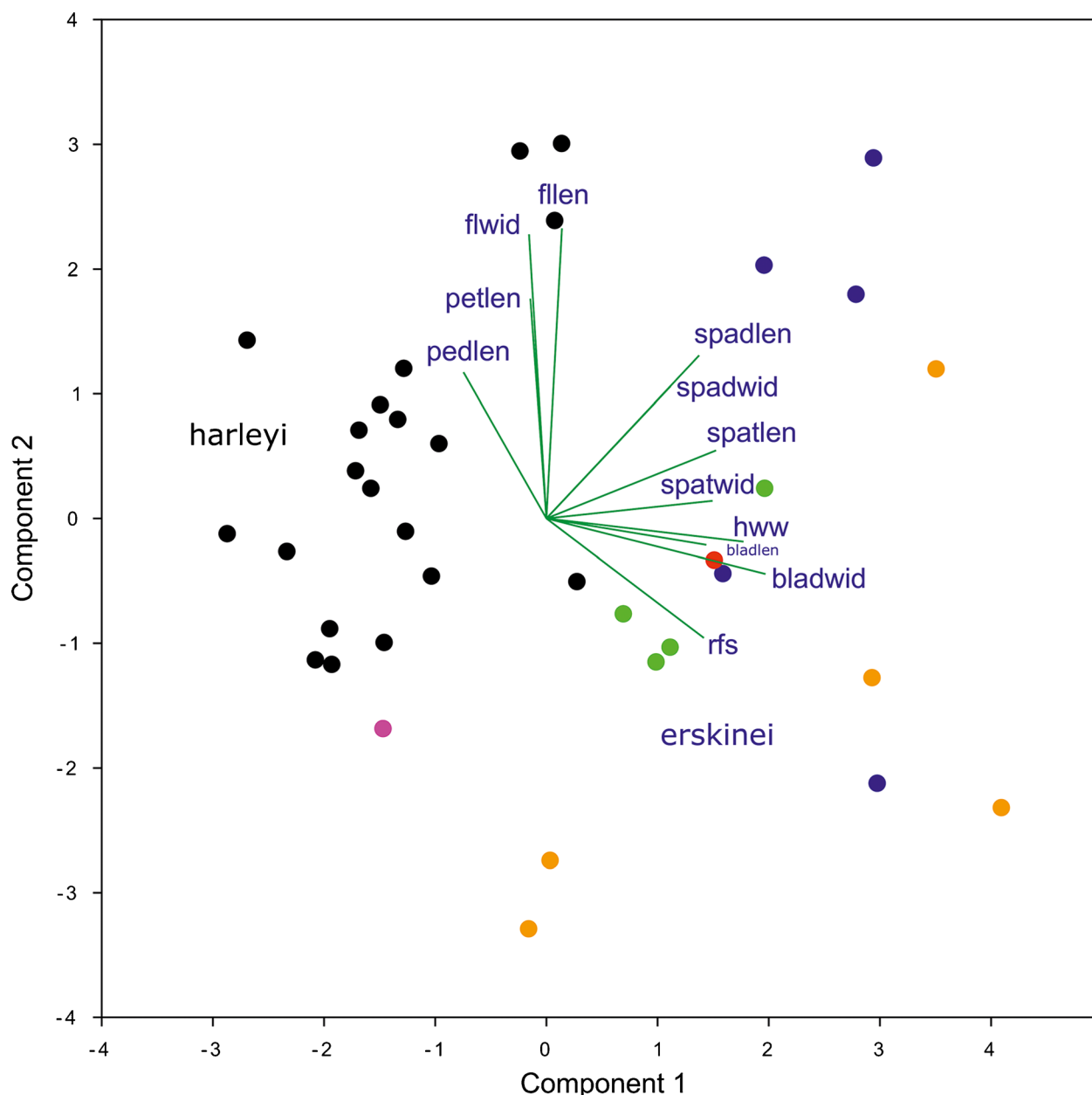


Fig. 2. Principal component analysis (PCA) of standardised data with biplot showing correlation of morphological variables with axes. *Anthurium harleyi* populations: black = Morro do Chapéu, magenta = Jacobina. *A. erskinei* populations: blue = Abaíra, green = Rio de Contas (Pico das Almas), orange = Mucugê, red = Lençóis.

1.0) cm long, 2.0 – 5.0 diam., roots densely covering stem, numerous, white to pale green, thick and succulent, up to 0.8 cm diam. *Prophylls* and *mesophylls* 2.0 – 7.0 cm long, c. 2.0 cm wide, membranaceous, vinaceous green, greyish brown to brown when dried, persistent after decomposing to brown fibres. *Leaves* ± rosulate; *petiole* (1.6 –) 2.9 – 17.4 (– 38.9) cm long, 0.2 – 0.9 cm diam., 0.2 – 1.3 times longer than leaf blade, usually deeper than wide, sometimes terete, adaxial side rarely planar, usually canaliculate with channel shallow to deep and broad to narrow, with margins acute to obtuse to narrowly keeled, abaxial side

rounded, usually not keeled, basal sheath short, (1.0 –) 1.5 – 3 (– 3.5) cm long; *leaf blade* (7.0 –) 10.4 – 25.5 (– 75.5) cm long, (2.5 –) 3.5 – 7.4 (– 13.7) cm wide, 2.1 – 4.8 times longer than wide, widest point (= centre of gravity, see Table 1) at (2.6 –) 4.0 – 12.6 (– 18.9) cm from blade base, narrowly oblong, elliptic, ovate or lanceolate, curved to planar in each half, when fresh rigidly coriaceous and brittle and U-shaped to slightly arched in cross-section, base usually obtuse to rounded, sometimes acute, cuneate, truncate or emarginate, apex acute to rounded, sometimes shortly acuminate, or retuse, mucronate,

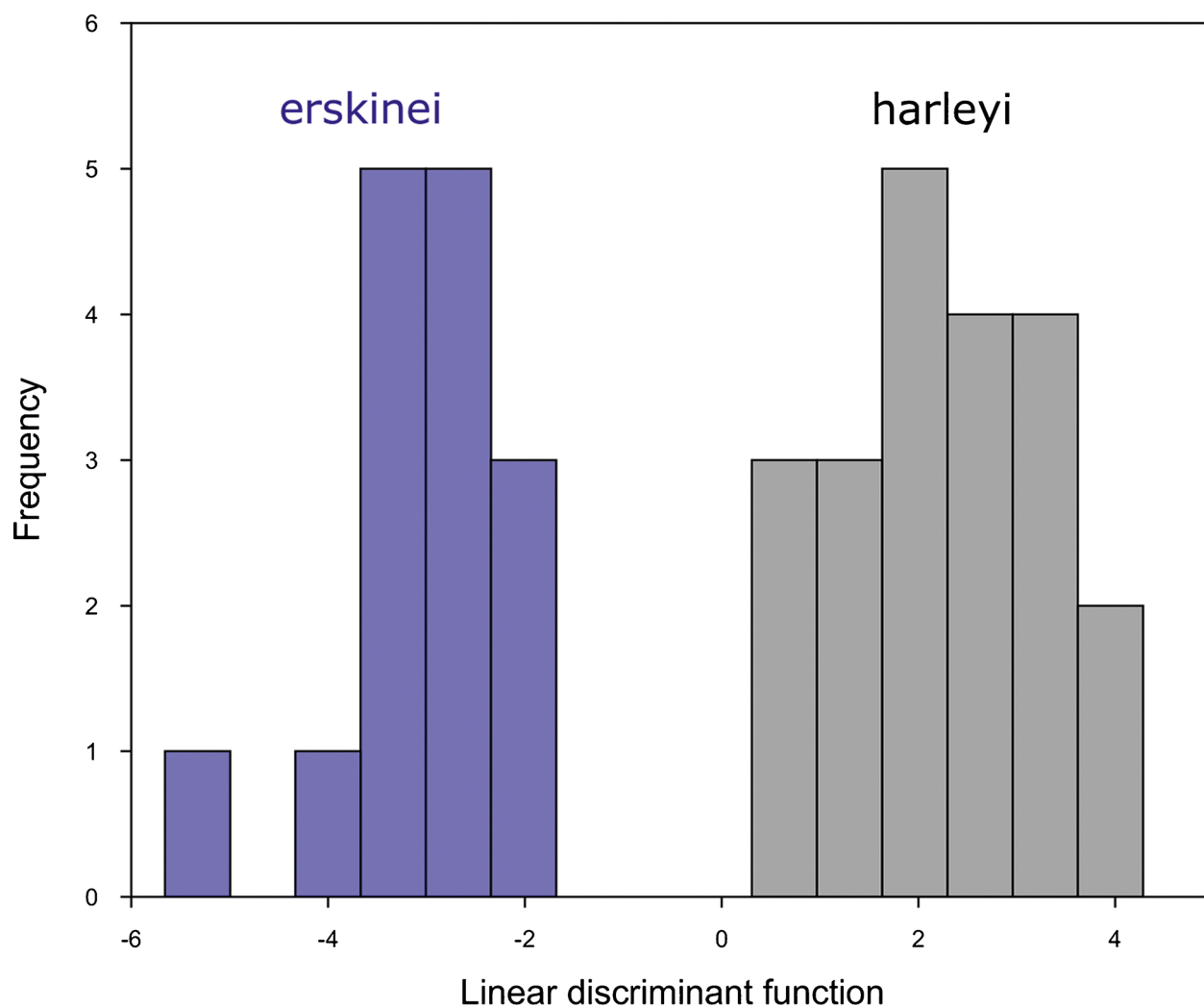


Fig. 3. Linear discriminant analysis (LDA) of log-transformed data. Frequency barplot of the scores of *Anthurium harleyi* and *A. erskinei* on the linear discriminant function axis.

margins planar, adaxial surface dull green, abaxial surface paler and without punctiform glands, finer venation in dried leaves strongly and reticulately prominent but in living plants somewhat obscured and inconspicuous and only slightly impressed on adaxial surface; *midvein* (*primary vein*) prominent on both surfaces, adaxially obtuse to rounded and yellowish, abaxially more prominent, \pm triangular in cross-section, centrally obtuse to acutely keeled, *secondary veins* 11 – 16 pairs, not prominent on either surface, poorly differentiated from tertiaries and quaternaries, joining into an inframarginal collective vein 0.1 –

1.3 cm from the blade margin. *Inflorescence* solitary per leaf, usually overtopping leaves; *peduncle* (12.4 – 19.0 – 39.3 (– 58.5) cm long, 0.2 – 0.8 cm diam., green to brown with white to vinaceous points at the apex, terete or with two opposite keels; *spathe* (1.9 – 2.8 – 5.3 (– 10.1) cm long, (0.75 –) 1.08 – 1.70 (– 3.6) cm wide, 0.6 – 1.2 times longer than spadix, 1.9 – 4.7 times longer than wide, at anthesis held at 45° – 90°, later usually becoming erect, sometimes clasping the spadix, persistent to fruiting stage, ovate, elliptic, oblong or lanceolate, cymbiform to recurved at acuminate apex, base rounded to emarginate, thickly coriaceous, margin slightly convolute to

Table 2. Loadings of variables on the discriminant axis of a linear discriminant analysis carried out with log-transformed data set. See Table 1 for explanation of variable codes. Computed with PAST version 3 (Hammer *et al.* 2001).

	bladlen	bladwid	bladcg	petlen	pedlen	spatlen	spatwid	spadlen	spadwid	flwid	flen	rfs
Discriminant axis	-0.11	-0.13	-0.15	0.08	0.19	-0.07	-0.05	-0.06	-0.03	0.02	0.01	-0.05

Table 3. Ranges of eight quantitative variables (untransformed data) that most strongly discriminate *Anthurium harleyi* and *A. erskinei* in the linear discriminant analysis. Based on mean values from 21 individuals of *A. harleyi* and 15 individuals of *A. erskinei*. Computed with R version 3.4.1. (R Core Team 2017).

Variables/Quantiles	<i>harleyi</i>					<i>erskinei</i>				
	min	10%	median	90%	max	min	10%	median	90%	max
Leaf blade length (cm)	7.8	12.0	16.6	22.6	22.9	13.2	18.1	28.8	48.1	59.9
Leaf blade width (cm)	3.2	3.5	4.1	7.3	8.4	5.4	6.2	8.9	13.2	20.9
Leaf blade centre of gravity ^a	3.5	4.8	6.7	9.3	11.4	7.0	8.7	17.5	25.0	25.2
Petiole length (cm)	1.9	2.6	7.4	17.8	25.0	1.6	1.7	5.9	8.9	14.2
Peduncle length (cm)	12.4	18.9	26.7	36.7	37.7	1.1	2.5	11.2	30.1	42.5
Relative inflorescence length ^{a, b}	0.77	0.84	1.16	1.69	3.39	0.20	0.30	0.44	0.80	1.18
Spathe length (cm)	2.5	2.7	3.8	5.3	6.8	3.1	4.5	5.7	7.6	8.6
Relative flower size ^a	2.31	2.39	2.86	3.22	3.58	2.68	3.02	3.68	4.60	4.68

^a see Table 1 for definitions. ^b not used in the discriminant analysis.

planar, ventrally purplish brown, vinaceous to yellowish rose, dorsally dark green tinged purplish brown, spathe decurrency acute, obtuse to cuneate, extending for 0.2–1.6 cm along peduncle; *spadix* (2.2–) 2.8–6.1 (–11.6) cm long, (0.4–) 0.53–0.85 (–1.4) cm diam., 4.3–11.3 times longer than wide, cylindric to conic or rarely clavate, dark, dull purple at anthesis becoming brown afterwards, sessile or with green stipe 0.1–2 (–4.0) cm long. *Flowers* 0.33–0.49 cm long, 0.36–0.42 cm wide, relative flower size 2.3–3.6 (ratio of spadix and flower width), anthers cream becoming brown when dried, style slightly prolonged, stigma subglobose, c. 0.1 cm diam., projecting beyond tepals for 0.05 cm. *Fruit* a berry 0.4–1.0 cm long, 0.2–0.8 cm wide, broadly obovoid, rounded at apex, green to dark green, whitish at base; *seed* 0.5 cm long, 0.35 cm wide, oblong-ovate, elliptic to plano-convex in transverse section, yellowish. Figs 5, 6.

RECOGNITION. Among the species of sect. *Urospadix* occurring in the Chapada Diamantina, *Anthurium harleyi* is most similar to *A. erskinei*, sharing the following characters: rupicolous habit with the stem wedged in rock crevices, leaf blades simple, thick, rigid, brittle and usually attenuate to rounded at the base, spathes patent to erect. *Anthurium harleyi* differs most clearly from *A. erskinei* in the following characters (Table 1, Table 3, Fig. 4): inflorescence projecting more strongly from the foliage (greater relative inflorescence length), shorter and narrower leaf blade, lower leaf blade centre of gravity, shorter spathe, and relatively larger flowers (fewer flowers per spadix width). Additional distinctive characters of *A. harleyi* are: midrib yellowish on adaxial side, spathe more strongly patent at anthesis with recurved apex, later becoming erect, spadix dark purple at anthesis, and more northerly distribution within the Chapada Diamantina, suggesting an allopatric pattern in relation to *A. erskinei* (Map 1).

DISTRIBUTION. *Anthurium harleyi* is endemic to the northeastern region of the Chapada Diamantina, occurring in the municipalities of Jacobina, Morro do Chapéu and Umburanas (Map 1).

SPECIMENS EXAMINED BY AUTHORS. BRAZIL. BAHIA.

Morro do Chapéu municipality: Morrão, summit, near the transmission tower, 17 May 2011, *T. A. Pontes & E. P. Lucas* 256 (HUEFS); c. 8 km SW of Morro do Chapéu, west of road to Utinga, summit of Morro, 30 May 1980, *R. M. Harley, G. L. Bromley, A. M. Carvalho, J. M. S. Nunes, J. L. Hage & E. B. Santos* 22787 (CEPEC, HUEFS, K, MO, RB); same locality, 3 March 1977, *R. M. Harley, S. J. Mayo, R. M. Storr, T. S. Santos & R. S. Pinheiro* 19339 (B, CEPEC, HUEFS, K, MO, NY, P, RB); c. 5 km from Morro do Chapéu, on the road to Utinga, 19 April 2001, *E. Melo, F. França, B. M. Silva, L. Sena & M. Rodrigues* 3311 (HUEFS, UB); c. 5 km S of Morro do Chapéu on the road to Bonito, 30 Jan. 2003, *F. França, S. Atkins, B. M. Silva & M. E. R. Junqueira* 4085 (HUEFS); surroundings of Morro do Chapéu, 15 Jan. 1977, *G. Hatschbach* 39634 (K, MBM); Morro do Chapéu, 19 Nov. 1986, *L. P. Queiroz et al.* 1257 (HUEFS, MBM); Morrão, around Telebahia transmission station, c. 6 km W of BA-046 (Morro do Chapéu-Utinga road), 14 March 1995, *L. P. Queiroz & N. S. Nascimento* 4272 (CEPEC, HUEFS, K, NY); 2 km NE of Morro do Chapéu on road to Jacobina, 11 March 2002, *W. W. Thomas, A. P. Prata, S. Sant'Ana & J. L. Paixão* 12935 (CEPEC); 19.5 km SE of Morro do Chapéu, on BA052 road to Mundo Novo by the Rio Ferro Doido, 1 March 1977, *R. M. Harley, S. J. Mayo, R. M. Storr, T. S. Santos & R. S. Pinheiro* 19221 (CEPEC holotype, ALCB, B, HUEFS, K, M, MBM, MO, NY, P, RB, SP, SPF, US isotypes); near the Cachoeira do Ferro Doido, at the edge of the precipice, 17 May 2011, *T. A. Pontes & E. P. Lucas* 254 (HUEFS). **Jacobina municipality:** around Tombador, 6 Sept. 1999, *E. Melo, F. França, B. M. Silva & M. Rodrigues* 2985 (HUEFS); Cachoeira de Itaitú, 30 March 1996, *A. M. Giuliatti, E. Woodgyer, M. L. Guedes, B. Stannard & R. M. Harley* PCD 2671 (ALCB, CEPEC, HUEFS, K).

ADDITIONAL SPECIMENS SEEN AS ONLINE IMAGES

(SpeciesLink 2017). **Umburanas municipality:** Serra do Curral Frio, 32 km from Delfino on old road to Mimoso de Minas, 9 March 1997, *E. N. Lughadha, P.*

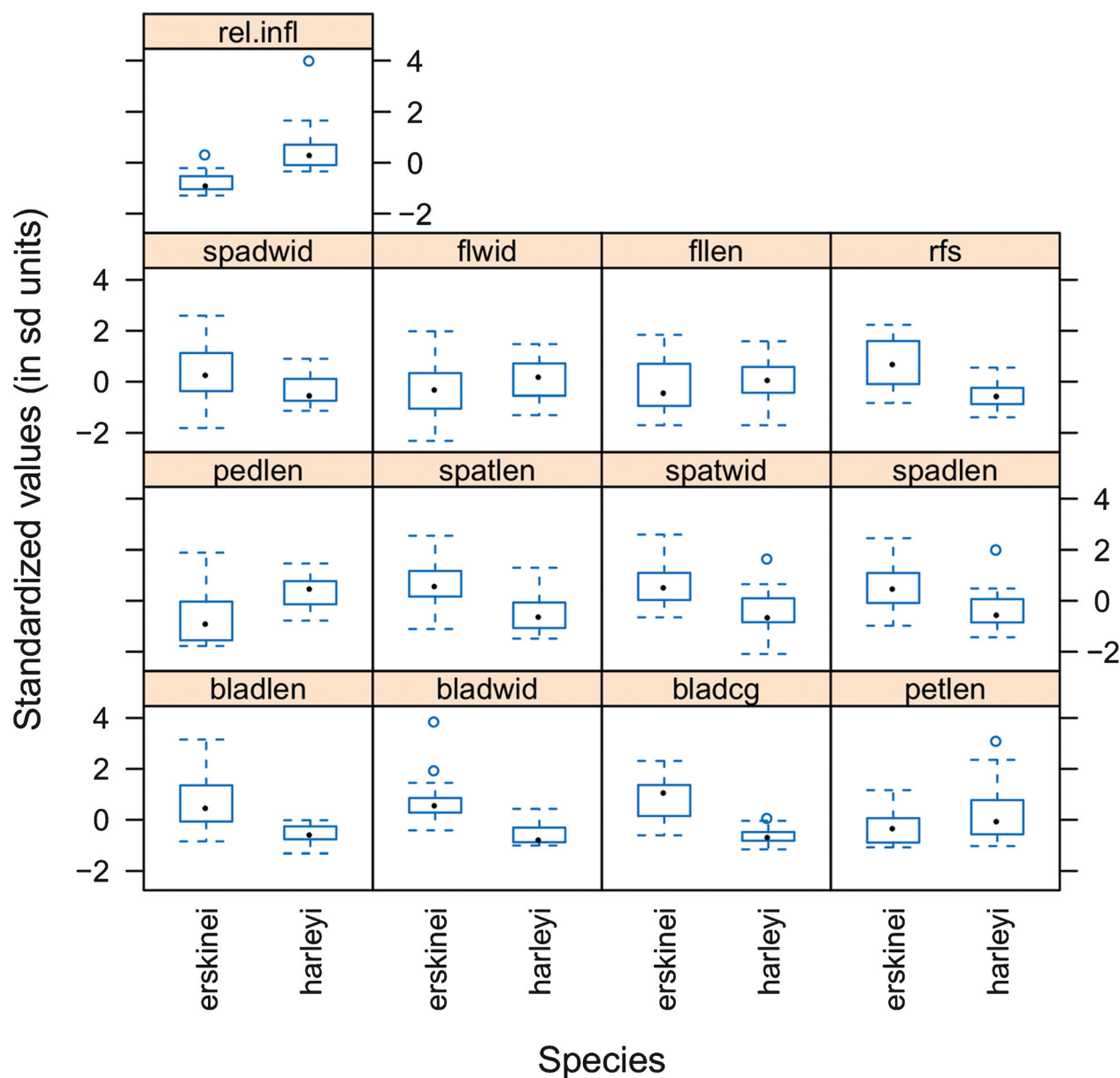


Fig. 4. Comparison by species of the standardised variables used in the multivariate analyses, with one derived variable added — relative inflorescence length (rel.infl). Boxplots computed using R (R Core Team 2017).

Gasson, R. Harley & A. M. Giuliatti PCD 6168 (ALCB). **Morro do Chapéu municipality:** Piemonte da Diamantina, Morrão, 15 March 2008, M. L. Guedes, *Alunos de Botânica III* 14539 (ALCB); same locality, 18 July 2011, M. L. Guedes, E. Velloso et al. 18916 (ALCB, HURB); c. 13 km on road to Utinga, neighborhood of television aerial, Morrão, 21 July 2006, J. Paula-Souza, F. O. Zuloaga, O. Morrone, R. Tsuji & M. F. Silveira 6299 (ESA); Morro with television aerial, 27 Oct. 1978, G. Martinelli 5228 (RB); Morro do Chapéu, 10 Nov. 2007, N. Roque, G. M. Carvalho, *Alunos de Botânica III* 1750 (ALCB); road to Morrão, 5 Aug. 2001, F. R. Nonato, C. Correia, E.

Smidt & V. P. Silva 990 (HUEFS); Piemonte da Diamantina, c. 9 km from Morro do Chapéu, near road to Utinga, Fazenda Colvaquinho, 15 March 1996, A. A. Conceição, S. Atkins, E. Woodger & B. Stannard PCD2427 (ALCB); c. 7 km S of town of Morro do Chapéu, summit of Morro, 16 Feb. 1971, H. S. Irwin, R. M. Harley & G. L. Smith 32290 (UB); Morrão, around Telebahia transmission station, c. 6 km W of BA-046 (Morro do Chapéu-Utinga road), 19 June 1994, L. P. Queiroz & N. S. Nascimento 4024 (HUEFS); Piemonte da Diamantina, Cachoeira do Ferro Doido, 1 May 2006, P. H. C. B. Cardoso & A. B. Xavier 44 (ALCB); Road to Mundo Novo, c. 5 km



Fig. 5. *Anthurium harleyi*. A habit; B leaf base, abaxial lateral view; C inflorescence; D spadix base, stipe and spathe at male anthesis; E infructescence; F berry. A, C & D: Pontes & Lucas 254 (Morro do Chapéu, Bahia, Brazil); B, E & F Pontes & Lucas 256 (Morro do Chapéu, Bahia, Brazil). PHOTOS: TIAGO ARRUDA PONTES.

near the dry bank of the Rio Jacuípe, 5 Sept. 2010, E. Melo, B. M. Silva & I. L. Oliveira 8499 (HUEFS); Road to the grotto of Boa Esperança, 30 April 2011, E. Melo, F. França, B. M. Silva, G. C. Rocha & A. Coutrim 9674 (HUEFS); Cachoeira do Ferro Doido, 27 Oct. 1978, G. Martinelli 5285 (RB); Morro do Chapéu, trail from the Cachoeira do Ferro Doido to Vila do Ventura, 21 Jan. 2006, N. Roque, *Alunos de Botânica III* 1301 (ALCB); Piemonte da Diamantina,

Cachoeira do Rio Ferro Doido, 5 March 1997, P. Gasson, E. N. Lughadha, L. B. Silva & R. M. Harley PCD 6057 (ALCB); Ferro Doido, at the margins of the waterfall, 20 April 2004, A. C. Pereira, M. Machado, V. Moraes & M. Stapff 84 (HUEFS). **Jacobina municipality:** Itaitu distr. at 20 km on road to Cachoeira Veu da Noiva, s.d., J. G. Jardim, A. M. Carvalho, A. M. Amorim, S. C. Sant'Ana & G. F. Pitanga 741 (CEPEC, NY).



Fig. 6. *Anthurium harleyi*. A habit; B leaves and inflorescence; C petiole and midrib cross-section; D spathe and spadix; E spadix detail showing arrangement of flowers; F individual flower viewed laterally in the sense of the spadix axis; G flower in longitudinal section viewed from same angle; H mature infructescence; J berry, lateral view; K seed from two lateral views. From *Harley et al* 19221. Scale bars A = 15 cm; B = 4 cm; C - D = 1.5 cm; E = 5 mm; F - G = 2.2 mm; H = 2 cm; J - K = 4 mm. DRAWN BY LUCY T. SMITH.

HABITAT. The species occurs in *campo rupestre* vegetation usually on rock outcrops, growing in crevices in shade under bushes or exposed to the sun; also found in *cerrado* vegetation, seasonal forest and gallery forest near streams, and occasionally in *caatinga* vegetation; elevation 600 – 1300 m alt.

CONSERVATION STATUS. When the IUCN default cell width (2 km) was used, *Anthurium harleyi* was classified as Vulnerable (VU) based on Extent of Occurrence (EOO = 7,074 km²) and Endangered (EN) based on Area of Occupancy (AOO = 72 km²). With the auto-value cell width (16 km) the classification was Vulnerable (VU) based on Extent of Occurrence (EOO = 7,074 km²) and Not Threatened (NT) based on Area of Occupancy (AOO = 2,530 km²).

PHENOLOGY. *Anthurium harleyi* flowers and fruits throughout the year.

ETYMOLOGY. The epithet of the species is given in honour of Raymond M. Harley, who has contributed so much to taxonomic knowledge of the flora of Bahia and Brazil's *campo rupestre* vegetation.

Discussion

Anthurium harleyi appears to have been collected first by H. S. Irwin, R. M. Harley and G. L. Smith in 1971 near the town of Morro do Chapéu at the summit of the eponymous hat-shaped mountainous outcrop, and many other collections have since been made in the area. For many years the name *A. harleyi* has been used to determine herbarium specimens and cultivated plants, and was also cited in publications such as those by Mayo (1984, 1990), Richards & Mayo (2009) and Pontes (2014), but it was never validly published until now. Andrade & Mayo (2013) published a taxonomic description of this species under the name *Anthurium sp.*

Temponi (2006), in an extensive study of Brazilian *Anthurium* species, provided molecular phylogenetic evidence for the view that the closest relatives of species of sect. *Urospadix* in the semi-arid interior of Bahia are to be found in the humid Atlantic forest, a suggestion made earlier by Mayo (1978, 1990) on grounds of morphological similarity. *Anthurium erskinei* and *A. cleistanthum* G.M.Barroso from Espírito Santo were paired in Temponi's total evidence tree, implying that *A. erskinei*, and by extension the related *A. harleyi*, belong to a lineage whose members occur mainly in humid forest. This prompts the conjecture that the evolution of rupicolous species of *Anthurium* in the Chapada Diamantina adapted to seasonal drought was influenced by cyclic episodes of forest advance and retreat in the interior of northeast Brazil during and after the Pleistocene. Andrade *et al.* (2007) and Andrade & Mayo (2010) invoked a similar cause to account for genetic patterns in *Monstera* species in Northeast Brazil.

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