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Molecular phylogenetics and morphological diversity in *Cipura* (Iridoideae, Iridaceae): species delimitation and taxonomic revision of the genus, with the description of two new species

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Abstract

Two new species of *Cipura* are described from the Cerrado Biome (Brazil): *Cipura kalunga*, from the northern mesoregion of Goiás state, and *C. mestrensis*, previously confused with *C. formosa*, and found in the states of Bahia, Goiás, and Tocantins. A comprehensive review of herbarium specimens combined with fieldwork enabled molecular and morphological analyses to elucidate the phylogenetic relationships within *Cipura* and assess the taxonomic status of the two new species. The new taxonomic entities are described, illustrated, compared with morphologically related species and an amended description of *C. formosa* is proposed. Distribution maps and phenological data are also provided. Taxonomical and nomenclatural notes, typifications, conservation assessments and an identification key for the different species of *Cipura* are included. Phylogenetic analyses revealed two major lineages, distinguished by the morphology of the inner tepals, and 12 distinct taxa are recognized within the genus, of which three are only known from morphology.

Key words: biodiversity, diagnosis, IUCN status, Neotropics, Tigridieae

Introduction

Phylogenetic relationships and evolutionary trends among New World Iridaceae, especially the tribe Tigridieae (Iridoideae), have been the subject of various recent studies (Rodriguez & Sytsma 2006, Goldblatt *et al.* 2008, Chauveau *et al.* 2012, Moraes *et al.* 2015, Pastori *et al.* 2018), which have shown that generic circumscriptions should be thoroughly re-evaluated to maintain the principle of monophyly at the genus level (Goldblatt & Manning 2008, Chauveau *et al.* 2012).

Cipura Aublet (1775: 38, pl. 13), with eight species currently accepted (POWO 2024), was the first genus described for the exclusively New World tribe of Tigridieae (Goldblatt & Henrich 1987), which is differentiated from the four remaining tribes of the subfamily Iridoideae by subterranean bulbs, plicate or foliate leaves and a basic chromosome number of $x = 7$ (Rudall 1991, Goldblatt & Manning 2008). Most species of Tigridieae share a structurally complex androgynoecium apparatus and such variable floral structures contrast markedly with the high degree of vegetative uniformity observed in the tribe (Goldblatt & Henrich 1991). Most genera are therefore characterised by floral attributes. However, *Cipura* is recognized first by distinctive features of the synflorescence and is easily distinguished from the remaining genera of Tigridieae by a large or occasionally reduced cauline leaf inserted in a subapical position

of the unique internode of the flowering stem, just below a single or a few sets of spathe-enclosed inflorescences called rhipidia (Goldblatt & Manning 2008). The genus is distributed from central Mexico and West Indies to Paraguay and Southeast Brazil (Goldblatt & Henrich 1987, Ravenna 2003, Ulloa *et al.* 2017). A handful of molecular studies using plastid DNA regions (Goldblatt *et al.* 2008, Chauveau *et al.* 2012) and the nuclear internal transcribed spacer (ITS) region (Rodriguez & Sytsma 2006) shows that *Cipura* is sister to *Larentia* Klatt (1882: 362) but such a relationship needs to be confirmed by further studies since only two species of *Cipura* were used so far and the type species of *Larentia* was never included in the species sampled. Three species with disjunct distribution are currently included in *Larentia*. The type species *L. linearis* (Kunth in Humboldt *et al.* 1816: 321) Klatt (1882: 362) is found from Venezuela to Central-West of Brazil and Paraguay (Ravenna 2003, Ulloa *et al.* 2017, Eggers & Chauveau 2025), whereas *L. mexicana* (C.V.Morton & R.C.Foster in Foster 1950: 22) Goldblatt in Goldblatt & Celis (2010: 413) and *L. rosei* (R.C.Foster 1945: 44) Ravenna (1977: 9) are distributed in central-western Mexico (Munguía-Lino *et al.* 2015). While rhipidia are sessile to subsessile among species of *Cipura*, the inflorescences are conspicuously pedunculate in *Larentia*, a common feature among genera of Tigridieae. However, species of *Larentia* are characterised by free stamens and only the apex of the anthers adheres to the abaxial part of the style branch below the stigmas (Ravenna 1977, 2003, Munguía-Lino *et al.* 2017), contrasting with the more or less closely adhering anthers of *Cipura* and other genera of Tigridieae with similar flower morphology.

Recent morphological observations suggested the occurrence of additional species of *Cipura*, undescribed to date. Specimens from Bahia state (Brazil: BA), originally attributed to *Cipura formosa* Ravenna (1988: 36), exhibited a synflorescence strikingly different from the typical *C. formosa* from Goiás state (GO), with more rhipidia and a much longer cauline leaf (A.J.C. Aguiar, pers. obs.). Another undescribed species of *Cipura* was also recently registered during a field study to assess plant-pollinator interactions among species of Tigridieae (Báez-Lizarazo *et al.* 2021).

This body of observations led us to carry out the present study to (1) clarify the phylogenetic relationships between and within the genera *Cipura* and *Larentia* on the basis of an extended taxonomic and molecular sampling, (2) conduct a comprehensive analysis of morphological characters, (3) combine phylogenetic and morphological evidence to provide a description of two new species of *Cipura*, including a diagnosis, and a revision of the taxonomic treatment of *C. formosa* and (4) compile and review the taxonomic, nomenclatural and conservation status of other *Cipura* species.

Materials and methods

Taxonomic and molecular sampling for phylogenetic analyses

Taxa sampled, voucher information and GenBank accession numbers are given in Table 1. A total of nine taxa of *Cipura* and three species of *Larentia* were sampled, representing *ca.* 75% and 100% of the species diversity recognized by POWO (2024) in each genus, respectively. More than 58% of these taxa were represented at least by two accessions from distinct geographic origins. Based on recent phylogenies (Goldblatt *et al.* 2008, Chauveau *et al.* 2012), 11 species from six genera of Tigridieae closely related to *Cipura* and *Larentia* were additionally sampled (one species within *Alophia* Herb. (1840: t.3779), *Nemastylis* Nutt. (1837: 157) and *Phalocallis* Herb. (1839: t.3710), two spp. within *Eleutherine* Herb. (1843a: t.57) and *Gelasine* Herb. (1840: t.3779) and four spp. within *Calydorea* Herb. (1843b: 85)) and one outgroup species was selected from Trimezieae (*Trimezia spathata* (Klatt 1871: 528) Baker (1892: 66)), the sister tribe to Tigridieae. Plant material was mostly sampled from the wild or from herbarium specimens. This study generated 200 new sequences and 63 sequences previously published (Goldblatt *et al.* 2008, Chauveau *et al.* 2012, Pastori *et al.* 2018) were also used to perform the subsequent phylogenetic analyses.

DNA isolation, amplification and sequencing

Total genomic DNA of newly sequenced specimens was extracted from 15–20 mg silica-gel dried leaf material using a modified CTAB protocol with volumes adjusted to 2 mL tubes (Doyle & Doyle 1990). A combination of ten coding and non-coding DNA regions previously used to assess phylogenetic relationships among Iridaceae (Chauveau *et al.* 2011, 2012, Pastori *et al.* 2018) was selected: three coding cpDNA genes (*mat*K, *rbc*L and *rps*4), three cpDNA intergenic spacers (*psb*A-*trn*H, *rps*4-*trn*S and *trn*Q-*rps*16), two cpDNA introns (*mat*K-*5'trn*K and *rps*16), the nuDNA ITS (ITS1–5.8S–ITS2) and a fragment of the nuclear gene *At103* spanning approximately from the middle of the exon 3 to the end of the intron 4 (Li *et al.* 2008, Bartha *et al.* 2014). Primers used to amplify each DNA region were selected according to Pastori *et al.* (2018) for the cpDNA regions, Levin *et al.* (2005) and Bohs (2007) for the ITS and

TABLE 1. Voucher information, population ID (Pop. ID), geographical origin and GenBanK accession numbers of samples from *Cipura*, *Larentia* and closely related genera used to infer phylogenetic relationships.

Species	Voucher*	Pop. ID	Geographical origin**	*rps4-trnS*	*rbcL*	*matK-5'trnK*	*trnQ-rps16*	*rps16*	*psbA-trnH*	ITS	*At103*
***Outgroup* (Trimezieae)**											
Trimezia spathata (Klatt) Baker	*Eggers 695* (ICN)	E695	BR: RS, Derrubadas	JQ670355	JQ670586	JQ670509	PP375921	JQ670429	PP375972	PP456686	PP480164
Ingroup											
Tigridieae - clade A, according to Chauveau *et al.* (2012)											
Calydorea approximata R.C.Foster	*Eggers et al. 767* (ICN)	E767	BR: RS, Santo Antônio das Missões	PP375828	PP375850	PP375872	PP375894	PP375923	PP375945	-	PP480134
Calydorea luteola (Klatt) Baker	*Eggers et al. 1113* (ICN)	E1113	BR: RS, Alegrete	PP375829	PP375851	PP375873	PP375895	PP375924	PP375946	PP456694	PP480135
Calydorea pallens Griseb.	*Goldblatt 9579* (MO)	G9579	AR: Córdoba, Cerro Colorado	JQ670279	AJ309682	JQ670442	MH426400	JQ670366	MH426448	MH426474	PP480136
Catila amabilis Ravenna	*Eggers 697* (ICN)	E697	BR: RS, Uruguaiana	JQ670284	JQ670525	JQ670447	MG648215	JQ670371	MG648259	MG648282	PP480137
Cipura cubensis Griseb.	*Henrich & Stevens 143* (MO)	HS143	NI: Estelí, Estelí	JQ670285	AJ309681	AJ579939	PP375896	AJ578772	PP375947	-	-
Cipura cubensis Griseb.	*Rodríguez & Martinelli 2856* (IBUG)	RM2856	MX: Nayarit, Compostela	PP375830	PP375852	PP375874	PP375897	PP375925	PP375948	-	PP480138

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TABLE 1. (Continued)

Species	Voucher*	Pop. ID	Geographical origin**	*rps4-trnS*	*rbcL*	*matK-5'trnK*	*trnQ-rps16*	*rps16*	*psbA-trnH*	ITS	*At103*
Cipura cf. *cubensis* Griseb.	*Eggers & Chauveau 1013* (ICN)	EC1013	BR: MT, Rosário Oeste	PP375831	PP375853	PP375875	PP375898	PP375926	PP375949	PP456696	PP480139
Cipura formosa Ravenna	*Chauveau et al. 902* (ICN)	C902	BR: GO, Cavalcante	MH426332	MH426353	MH426375	MH426397	MH426423	MH426445	MH426471	PP480140
Cipura cf. *formosa* Ravenna	*Chauveau et al. 903* (ICN)	C903	BR: GO, Alto Paraiso de Goiás	PP375832	PP375854	PP375876	PP375899	PP375927	PP375950	-	PP480141
Cipura gigas Celis, Goldblatt & Betancur	*Báez 213* (COL)	B213	CO: Meta, Puerto Gaitán	PP375833	PP375855	PP375877	PP375900	PP375928	PP375951	PP456698	PP480142
Cipura kalunga Chauveau & L.Eggers	*Chauveau & Aguiar 906A* (ICN)	C906A	BR: GO, Cavalcante	PP375834	PP375856	PP375878	PP375901	PP375929	PP375952	PP456699	PP480143
Cipura mestrensis Chauveau & L.Eggers	*Eggers et al. 984* (ICN)	E984	BR: TO, Taguatinga	PP375835	PP375857	PP375879	PP375902	PP375930	PP375953	PP456700	PP480144
Cipura mestrensis Chauveau & L.Eggers	*Chauveau & Aubriot 15* (P)	CA15	BR: TO, Ponte Alta do Bom Jesus	PP375836	PP375858	PP375880	PP375903	PP375931	PP375954	PP456701	PP480145
Cipura mestrensis Chauveau & L.Eggers	*Eggers et al. 990* (ICN)	E990	BR: TO, Ponte Alta do Bom Jesus	PP375837	PP375859	PP375881	PP375904	PP375932	PP375955	PP456702	PP480146
Cipura paludosa Aubl.	*Chauveau & Aguiar 906C* (ICN)	C906C	BR: DF, Brasília	PP375838	PP375860	PP375882	PP375905	PP375933	PP375956	PP456703	PP480148
Cipura paludosa Aubl.	*Báez 205* (COL)	B205	CO: Meta, Puerto Gaitán	MH426333	MH426354	MH426376	MH426398	MH426424	MH426446	MH426472	PP480147

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TABLE 1. (Continued)

Species	Voucher*	Pop. ID	Geographical origin**	*rps4-trnS*	*rbcL*	*matK-5'trnK*	*trnQ-rps16*	*rps16*	*psbA-trnH*	ITS	*At103*
Cipura paludosa subsp. *robusta* Ravenna	*Eggers & Chauveau 1010* (ICN)	E1010	BR: MT, Rosário Oeste	PP375839	PP375861	PP375883	PP375906	PP375934	PP375957	PP456704	PP480149
Cipura paludosa subsp. *robusta* Ravenna	*Eggers & Chauveau 1014* (ICN)	E1014	BR: MT, Rosário Oeste	PP375840	PP375862	PP375884	PP375907	PP375935	PP375958	-	PP480150
Cipura paradisiaca Ravenna	*Chauveau et al. 900* (ICN)	C900	BR: GO, Teresina de Goiás	MH426334	MH426355	MH426377	MH426399	MH426425	MH426447	MH426473	PP480151
Cipura xanthomelas Mart. ex Klatt	*Eggers et al. 924* (ICN)	E924	BR: MG, Prata	PP375841	PP375863	PP375885	PP375908	PP375936	PP375959	PP456706	PP480152
Cipura xanthomelas Mart. ex Klatt	*Eggers & Chauveau 1009* (ICN)	E1009	BR: MT, Rosário Oeste	PP375842	PP375864	PP375886	PP375909	PP375937	PP375960	PP456707	PP480153
Larentia linearis (Kunth) Klatt	*Wood & Soto 25308* (USZ)	WS25308	BO: Santa Cruz, Ñuflo de Chavez	PP375846	PP375868	PP375890	PP375915	PP375941	PP375966	PP456708	PP480159
Larentia linearis (Kunth) Klatt	*Beck 10101* (LPB)	B10101	BO: La Paz, Abel Iturralde	PP375845	PP375867	PP375889	PP375914	PP375940	PP375965	PP456709	PP480158
Larentia mexicana (C.V.Morton & R.C.Foster) Goldblatt	*Ortiz-Catedral 212* (IBUG)	O212	MX: Jalisco, Chamela	JQ670304	AM940187	AM94021	PP375916	AM940175	PP375967	-	-
Larentia mexicana (C.V.Morton & R.C.Foster) Goldblatt	*Ortiz-Catedral 215* (IBUG)	O215	MX: Jalisco, La Huerta	PP375847	PP375869	PP375891	PP375917	PP375942	PP375968	-	PP480159

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TABLE 1. (Continued)

Species	Voucher*	Pop. ID	Geographical origin**	*rps4-trnS*	*rbcL*	*matK-5'trnK*	*trnQ-rps16*	*rps16*	*psbA-trnH*	ITS	*At103*
Larentia rosei (R.C.Foster) Ravenna	*Rodríguez & Martinelli 2855* (IBUG, WIS)	RM2855	MX: Nayarit, Compostela	JQ670305	AM940186	AM940209	PP375918	AM940174	PP375969	PP456710	PP480161
Nemastylis tenuis (Herb.) S.Watson	*Rodríguez 2636* (IBUG)	R2636	MX: Jalisco, San Miguel el Alto	JQ670312	AM940190	AM940213	PP375919	AM94017	PP375970	PP456711	PP480162
Tigridieae - clade B, according to Chauveau *et al.* (2012)											
Alophia drummondii (Graham) R.C.Foster	*Rodríguez & Ortiz Catedral 3150* (IBUG)	R3150	MX: Veracruz, Dos Ríos	PP375827	PP375849	PP375871	PP375893	PP375922	PP375944	PP456687	PP480133
Eleutherine bulbosa (Mill.) Urb.	*Rodríguez 2830* (IBUG, WIS)	R2830	GT: Alta Verapaz	JQ670292	JQ670532	JQ670455	PP375910	JQ670378	PP375961	PP456688	PP480154
Eleutherine latifolia (Standl. & L.O.Williams) Ravenna	*Carasco et al. 44* (IBUG)	C44	MX: Querétaro, Jalpan	PP375843	PP375865	PP375887	PP375911	PP375938	PP375962	PP456689	PP480155
Gelasine coerulea (Vell.) Ravenna	*Eggers & Souza-Chies 335* (ICN)	E335	BR: PR, Jaguariaíva	JQ670294	JQ670534	JQ670456	PP375912	JQ670379	PP375963	PP456690	PP480156
Gelasine paranaensis Ravenna	*Eggers et al. 1049* (ICN)	E1049	BR: PR, Palmeira	PP375844	PP375866	PP375888	PP375913	PP375939	PP375964	PP456691	PP480157
Phalocallis coelestis (Lehm.) Ravenna	*Eggers & Chauveau 973* (ICN)	E973	BR: RS, Cambará do Sul	PP375848	PP375870	PP375892	PP375920	PP375943	PP375971	PP456692	PP480163

Notes: * collectors and collector number (herbarium code): COL = Universidad Nacional de Colombia; IBUG = Universidad de Guadalajara (Mexico); ICN = Universidade Federal do Rio Grande do Sul (Brazil); LPB = Herbario Nacional de Bolivia, Universidad Mayor de San Andrés; MO = Missouri Botanical Garden (U.S.A.); USZ = Museo de Historia Natural Noel Kempff Mercado, Universidad Autónoma Gabriel René Moreno (Bolivia); WIS = University of Wisconsin (U.S.A.). ** Geographical origin: AR = Argentina; BO = Bolivia; BR = Brazil (DF = Distrito Federal; GO = Goiás; MG = Minas Gerais; MT = Mato Grosso; PR = Paraná; TO = Tocantins; RS = Rio Grande do Sul); CO = Colombia; GT = Guatemala; MX = Mexico; NI = Nicaragua.

Li *et al.* (2008) for the nuclear gene *At103*. PCR amplifications were performed using a Verity 96–Well thermal cycler (Applied Biosystems, Foster City, CA, USA) in a 25 µL total volume reaction consisting of 10–15 ng of genomic DNA, 1 µM of each primer, 200 µM dNTP, 1× optimized DreamTaq Green Buffer (Thermo Fisher Scientific, Lithuania) and 1 U DreamTaq DNA polymerase (Thermo Fisher Scientific). The *rbcL*, *rps4-trnS*, *psbA-trnH,* ITS and *At103* loci were successfully amplified with the addition of DMSO (1 µL) to the PCR mix. Bovine serum albumin (BSA, 0.6 µg/µl) was also used to amplify ITS and *At103* loci. The detailed PCR conditions for each cpDNA locus used in this study are given in Pastori *et al.* (2018). The PCR procedure for ITS and *At103* amplifications were as follows, respectively: (ITS) initial denaturation at 94 °C for 3 min, followed by 30 cycles at 94 °C for 1:30 min, 54 °C for 2 min, 72 °C for 1:30 min, and a final extension at 72 °C for 5 min; (*At103*) initial denaturation at 94 °C for 2 min, followed by 35 cycles at 94 °C for 40 s, 50 °C for 30 s, 72 °C for 1 min, and a final extension at 72 °C for 5 min. Each DNA region was amplified as a single fragment except in a few cases where internal primers originally designed for sequencing were used to amplify the targeted region in smaller fragments. PCR products were purified and sent for Sanger sequencing at Genewiz (Azenta Life Sciences, Germany). Raw forward and reverse sequences for each sample were assembled with CodonCode Aligner 6.0.2 (CodonCode Corp., Dedham, MA, USA); ambiguous bases were corrected after examination of chromatograms, and consensus sequences were edited.

Alignment and phylogenetic analyses

Sequences were aligned with MAFFT 7 using the G-INS-i strategy (Katoh *et al.* 2019) and manually validated with MEGA11 (Tamura *et al.* 2021). Unambiguously aligned gaps of the non-coding cpDNA regions and shared by two or more taxa were checked and coded with SeqState 1.4.1 (Müller 2005), according to the Modified Complex Indel Coding approach (Simmons *et al.* 2007). Phylogenetic analyses were conducted using maximum likelihood (ML) and Bayesian inference (BI) approaches and were initially performed on cpDNA and nuDNA regions separately to detect potential incongruences among genomes. Conflicts among the two different datasets were explored following the procedure described by Inácio *et al.* (2017). Since no significant incongruences were detected, all DNA regions were combined for subsequent analyses. The datasets were partitioned for each gene, intron or spacer region, and codon position in the regions coding for proteins to accommodate locus-specific variations. Gap-coded characters were also partitioned by locus. ML and BI searches were conducted for each dataset using, respectively, RAxML 8.2.12 (Stamatakis 2014) and MrBayes 3.2.7a (Ronquist *et al.* 2012) softwares available on the CIPRES Science Gateway (Miller *et al.* 2010). ML analyses were performed with RAxML-HPC2 using the GTRGAMMA model for DNA partitions, the BINGAMMA and MULTIGAMMA models for gap-coded characters. To assess the stability of the tree topology and branch length values, 200 independent ML searches with different randomized stepwise addition parsimony starting trees were conducted to find the best-scoring ML tree, and branch supports (LBS) were evaluated by 1000 pseudo-replicates of nonparametric standard bootstrap tests. Prior to the BI analyses, the most appropriate evolutionary model for each data set and data partition among the data sets was selected according to the Akaike information criterion (AIC) implemented by MrModeltest 2.4 (Nylander 2004). Gap-coded characters were treated using a standard discrete model with variable rates (Ronquist *et al.* 2020). Subsequently, BI analyses were carried out using MrBayes with two independent and simultaneous Markov chain Monte Carlo (MCMC) runs, each with four Markov chains (50,000,000 generations, sampling every 100th generation). Convergence was checked with the average deviation of split frequencies (<0.01), the Effective Sample Size (ESS >200) and the Potential Scale Reduction Factor (0.99< PSRF <1.01). All other parameters were default values. In all analyses, the first 25% trees from each run were discarded as burnin. Resulting trees from the two independent runs were then pooled to produce one 50% majority-rule consensus tree and Bayesian posterior probabilities (PP) were generated for the resulting tree. Phylogenetic trees resulting from ML (best-scoring tree) and BI (majority-rule tree) analyses were outgroup-rooted, and LBS and PP were reported on the ML best-scoring topologies to summarize the results of both analyses at once. A given node was kept in the final representation of the ML trees only if LBS reached at least 70% or if the PP was ≥ 0.95 and in the absence of topological conflict between ML and BI trees.

Taxonomic treatments

Identification of diagnostic characters and morphological descriptions of the new species were based on *in situ* observations and photographs of living plants. Measurements were performed in fresh material with an average of at least 20 specimens per species obtained from different populations when more than one population was known for the species. Measurements were taken with a digital pachymeter. For quantitative characters, values that deviate markedly from others were indicated in brackets. Morphological terminology used in the description follows Goldblatt & Manning (2008) and Beentje (2016). Distribution maps of recorded occurrences were prepared using QGIS 3.34 software (QGIS.

org 2014). Geographic information was obtained from herbarium specimen labels, field work, and available literature. This study was based on the analyses of all accessible types and other specimens of *Cipura* species held at the ANDES, COAH, COL, CORD, ICN, MBM, P, PACA, SI, UB, UEC, UFMT, and USZ herbaria, as well as high-resolution digital images from ALCB, CEN, ESA, EAC, F, HUEFS, HUFU, HUTO, IBUG, INPA, K, MEXU, MG, MO, NY, RB, U, UADY, UFG, US, WAG and WIS herbaria (acronyms follow Thiers 2025 continuously updated). The iNaturalist (2025 continuously updated) database was also checked for additional information. The amended description of *C. formosa* was based on the analysis and measurement of 12 herbarium specimens, including five paratypes, and changes to the original description were shown in italics. Since holotype and isotypes of various species of *Cipura* described by Pierfelice Ravenna are missing (García *et al.* 2024), neotypes or lectotypes were designated when necessary, based on the protologues and a revision of herbarium material. Type specimens were systematically quoted with their barcodes or accession numbers, when available. Estimatives of extent of occurrence (EOO) and area of occupancy (AOO) were performed with GeoCAT software (http://geocat.kew.org/) following Bachman *et al.* (2011). Conservation status was assessed based on the examined material, including some specimens from iNaturalist (2025 continuously updated) with reliable records and coordinates, and followed the IUCN Red List guidelines (IUCN 2024). A dichotomous key was created to distinguish the different taxa and the variation in flower colour within the *Cipura* species. The key was based on morphological characters and geographic data selected to allow taxonomic identifications under field conditions or from comprehensive photographic records. Dubious species due to the existence of few collections and limited knowledge were also included in this work and in the identification key until their taxonomy is fully known.

Results

Phylogenetic analyses

The plastid dataset included 34 terminals, 7461 bp and 48 coded indels (446 parsimony informative characters, *ca.* 5.94%). The nuclear dataset included 32 terminals and 1230 bp (213 parsimony informative characters, *ca.* 17.32%). The combined molecular dataset included 34 terminals, 8691 bp and 48 coded indels (659 parsimony informative characters, *ca.* 7.58%). Unless otherwise stated, the names of species refer to the updated nomenclature presented in the current study.

Independent analyses for each DNA marker (data not shown) did not reveal significantly supported incongruence among tree topologies obtained from the different separated analyses of plastid and nuclear markers. Therefore, all cpDNA and nuDNA datasets were concatenated into a single matrix for subsequent analyses. ML and BI phylogenies were largely identical in topology, and support values obtained from the two analyses of the combined dataset were reported on the ML best-scoring cladogram presented in Fig. 1A, whereas the corresponding ML phylogram is shown in Fig. 1B. The genera *Cipura* and *Larentia* formed a fully supported clade (LBS = 100%, PP = 1.0) sister to the remaining species of Tigridieae belonging to clade A (*sensu* Chauveau *et al.* 2012) and included in the current study. Both genera were monophyletic with strong support (LBS ≥ 90%, PP ≥ 0.99) and the relationships among species of *Larentia* were strongly to fully supported, with *L. linearis* (Figs. 2A–B) sister to the two exclusively Mexican species (*i.e. L. mexicana* and *L. rosei*). Species of *Cipura* were distributed among two fully supported sister lineages, one of them including *C. cubensis* Grisebach (1866: 251; Fig. 2C), *C.* cf. *cubensis*, *C. gigas* Celis, Goldblatt & Betancur (2003: 420; Fig. 2D) and the two subspecies of *C. paludosa* Aublet (1775: 38, pl. 13; Figs. 2E–F) sampled, but the relationships among *C. cubensis*, *C. gigas* and *C. paludosa* were not resolved (LBS < 50%, PP < 0.95) and *C.* cf. *cubensis* from Brazil (EC1013) was not directly related to the samples of *C. cubensis* from Nicaragua (HS143) and Mexico (RM2856). This clade includes only species of *Cipura* with inner tepal limbs extremely reduced or obscurely distinguished from the claws. The other lineage encompassed *C. formosa* (C902; Fig. 2G), *C.* cf. *formosa* (C903), *C. paradisiaca* Ravenna (1988: 37; Fig. 2H), *C. xanthomelas* Martius ex Klatt (1882: 362; Fig. 2I) and the two new species currently described (*i.e. C. kalunga sp. nov.* and *C. mestrensis sp. nov.*), which all display inner tepals with a limb clearly distinguished from the claw. Within this lineage, relationships among samples were strongly to fully supported. The species *C. formosa* (C902) was strongly supported as sister to the rest of the clade, which was subsequently divided into two subclades with strong support. One of them included *C. kalunga* and *C. paradisiaca*, which together formed a sister clade to *C. mestrensis*. The other one, also strongly supported, comprised *C.* cf. *formosa* (C903) and *C. xanthomelas*.

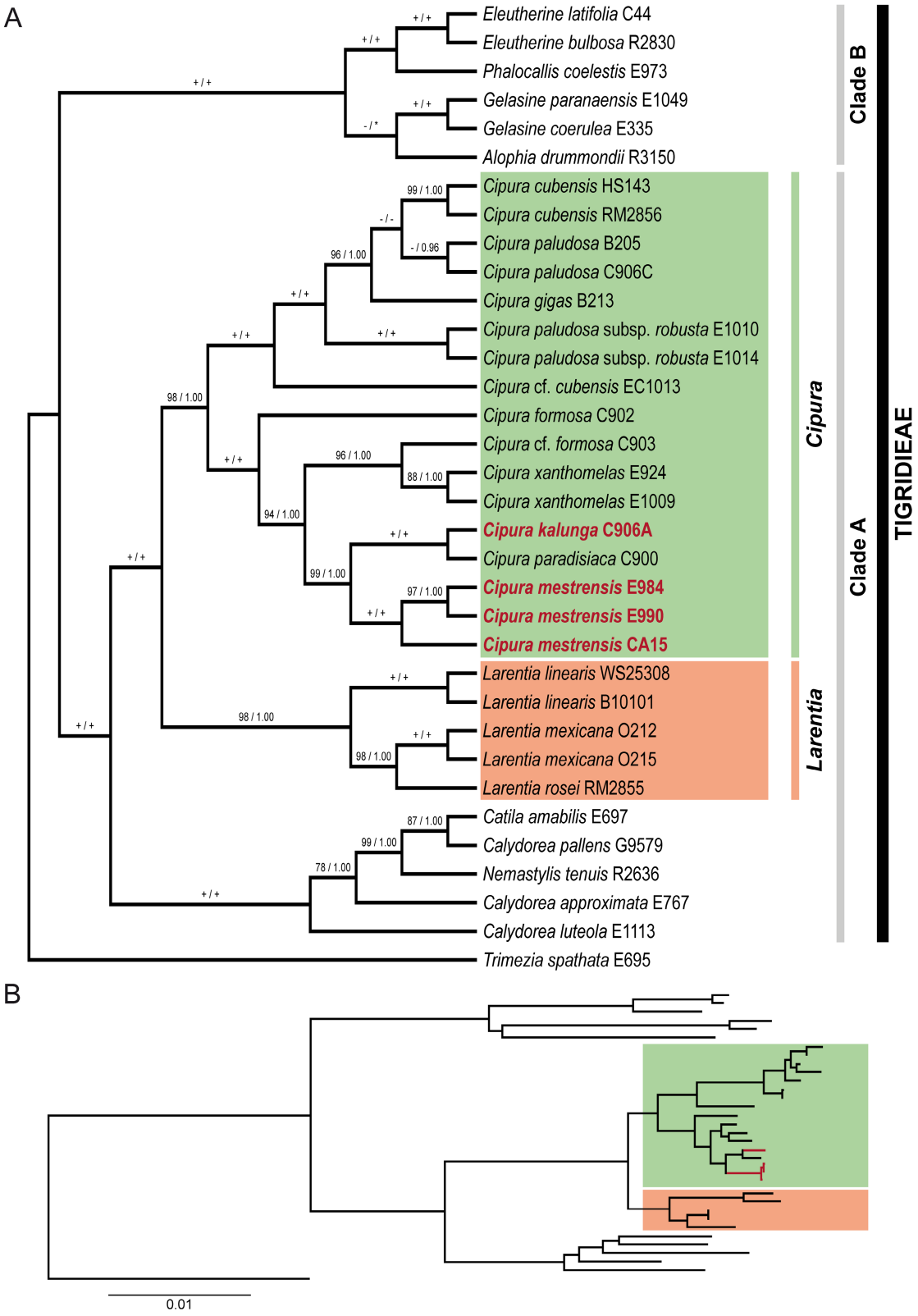

FIGURE 1. Taxonomic assessment: ML best-scoring cladogram (**A**) and phylogram (**B**) obtained from the analyses of the combined chloroplast and nuclear datasets. Trees were rooted using *Trimezia spathata* as outgroup. Support values indicated above branches follow the order likelihood bootstrap (LBS)/Bayesian posterior probabilities (PP). Bootstrap supports and posterior probabilities for a given node are provided only if one of the values reached the following thresholds: LBS ≥ 70% or PP ≥ 0.95. A plus sign (+) means full support, whereas a dash (-) indicates support value of less than 50% for LBS or less than 0.95 for PP. Nodes absent in the majority rule consensus Bayesian tree are indicated with an asterisk (*). Species of Tigridieae are subdivided into two major clades, named A and B according to Chauveau *et al.* (2012). The genera *Cipura* and *Larentia* are highlighted by colored boxes. The red-colored species names (**A**) or branches (**B**) indicate the species newly described.

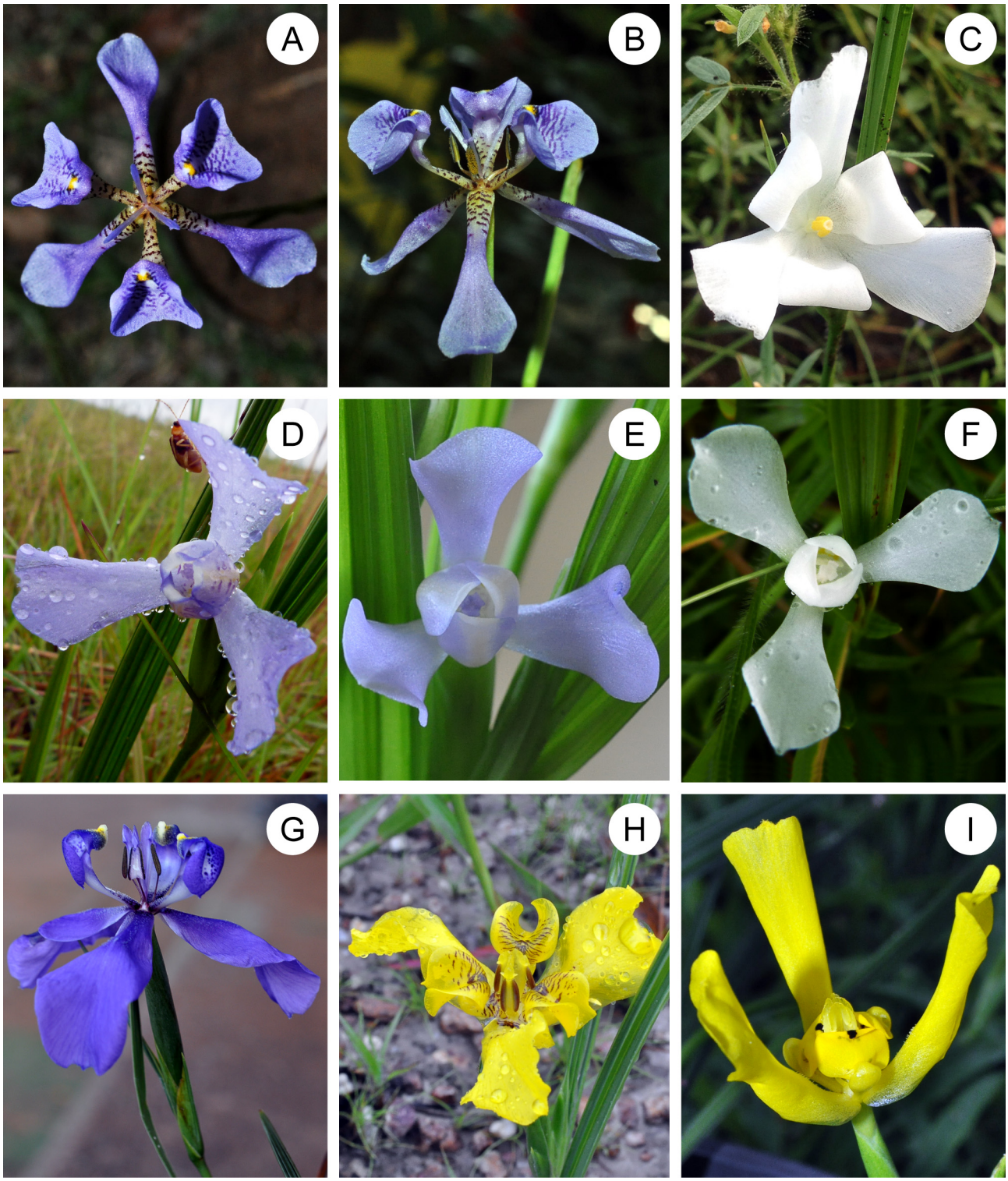

FIGURE 2. Representatives of sister genera *Larentia* and *Cipura*. **A–B**: *L. linearis* (Kunth) Klatt, **C**: *C. cubensis* Griseb., **D**: *C. gigas* Celis, Goldblatt & Betancur, **E**: *C. paludosa* Aubl., **F**: *C. paludosa* Aubl. (white form), **G**: *C. formosa* Ravenna, **H**: *C. paradisiaca* Ravenna, **I**: *C. xanthomelas* Mart. ex Klatt— Photographs by J.C. Ordoñez Jimenez (**C**), O. Chauveau (**E, G, I**), M.R. Báez-Lizarazo (**D, F**), L. Eggers (**A, B, H**).

Taxonomic treatments, lectotypification and synonymy

1. *Cipura kalunga* Chauveau & L.Eggers, *sp. nov.* (Figs. 3 & 4)

Diagnosis:—*Cipura kalunga* differs from the two closely related species with yellow flowers by the filiform leaves (0.6–1.3 mm wide *vs.* leaves wider than 7 mm in both *C. paradisiaca* or *C. xanthomelas*). Floral perigones of *C. kalunga* and *C. paradisiaca* are remarkably comparable, but valves of spathes are shorter (lower valve (9–)10.8–17.8 mm long; upper (16–)21.4–32.6 mm long *vs.* lower valve 25–30 mm long; upper 50–52 mm long). *Cipura kalunga* can be segregated from *C. xanthomelas* by the less incurved inner tepals (*vs.* remarkably incurved) and the narrower terminal bract (0.9–1.1 mm *vs.* approximately 6.35 mm wide).

Type:—BRAZIL. Goiás: Cavalcante, estrada secundária a partir de Cavalcante em direção a Araí (GO-241), 1136 m, 26 March 2016 (fl, fr), *O. Chauveau & M.B. Lizarazo 1008* (holotype ICN!, isotypes P!, UB!, UFG!).

Perennial herb, aboveground up to (10.2–)13.7–23.5 cm tall to top flower, (7.8–)12.5–27.3 cm tall to terminal bract end; underground stem to 2.4–3.2 cm long. Bulb subglobose to ovoid, outer cataphylls dry, dark brown, 8.8–13.7 × (3.3–)9.7–11.9 mm, not resinous, prolonged in a collar up to 1.6–2.2 cm. Basal leaves, 1–3, filiform, recurved, 6–16(–21.1) cm × 0.6–1.3 mm, about as long as the flowering stem. Flowering stem 1–2 per plant, erect, cylindrical, (6.3–)8.3–17.8(–19.8) cm long. Synflorescence cymose, fasciculate, 1–4(–5) subsessile rhipidia, subtended by a conspicuous terminal bract (or cauline leaf) similar to basal leaves, (1.5–)3–10(–12.4) cm × 0.9–1.1 mm, and a second smaller bract shorter than the spathes of rhipidia. Peduncles 1–3.6(–6.4) mm long. Lower valve of spathes (9–)10.8–17.8 mm long; upper (16–)21.4–32.6 mm long, margins translucent to scarious. Rhipidia two-flowered. Flowers bright yellow, maculate, (19–)23.5–33.5(–41.2) mm diameter, with ovary partly included in the upper valve, to sometimes slightly exserted. Tepals unequal, free to shortly fused proximally for 0.1–0.25(–1.5) mm long. Outer tepals oblong to slightly pandurate, 15–21(–23.9) × (7–)8.4–11.8(–13.5) mm, bright yellow with discrete red-brown irregular spots at the base, ascending to patent, longitudinally twisted, apex rounded to truncate with a short central acumen, margins slightly translucent, without trichomes. Inner tepals smaller, unguiculate, porrect proximally, then incurved and abruptly reclinate distally, 10–13(–14.9) × (5.8–)6.4–7.9 mm, proximally 1.6–2.7 mm wide, cuneate, bright yellow, streaked red-brown; mid portion projected to the centre of the flower, streaked dark brown to dark purple with a dense oblong to ovate whitish area of oil-producing trichomes (elaiophore); distally longitudinally depressed, bright yellow without streaks or spots, sometimes white above the elaiophores; lateral sides at the distal end revolute, spotted dark brown, apex rounded to truncate. Filaments mostly free, erect to porrect, narrowing to the top, with a bulbiform base, yellow, base free or connate for 0.2–0.6 mm long, then free for 2.6–3.8(–4.2) mm long. Anthers linear, 2.7–3.5(–3.8) × 0.6–0.8(–1.1) mm, almost entirely adnate to the style arms (adnation for (1.9–)2.2–3.1(–3.3) mm long), latrorse; connective apically obtuse to acute, yellow to dirty yellow, with translucid secretion, 0.2–0.5 mm wide; locules dull yellow to black; pollen orange to dull yellow. Ovary 3.3–5.3 × (1.1–)1.4–1.9 mm, style yellow, 6.8–8.3 mm long divided into three porrect branches, undivided part 1.2–2.4 mm long, style arms yellow, 5–6.7 mm long, with erect, convergent, rounded, yellow crests, adaxial crests 2, connivent, (0.8–)1.1–1.8(–2.2) mm long, abaxial crest, ovate, acute, (0.2–)0.4–0.9(–1.3) mm long, stigmatic surfaces transverse, 2, on each side at the base of the abaxial crest, orange to reddish, 0.1–0.4 mm long. Capsule ellipsoid to obovoid, (7.3–)7.8–10.9(–11.5) × 3.9–5.5 mm, usually above from the lower valve and partially included in the upper valve of the spathes; seeds angular, wrinkled, shiny, 1.2–1.7 mm long.

Distribution and habitat:—*Cipura kalunga* is only known from the type locality (Fig. 4), in the municipality of Cavalcante, Goiás (Brazil), in grassland vegetation of the Cerrado Biome, at an elevation range of about 1100 m. The species population in the area was dense, with hundreds of individuals observed.

Phenology:—*Cipura kalunga* was registered with flowers and fruits in March and April. Flowers open before sunrise and wither around midday.

Conservation status:—Critically endangered (CR, B1+B2ab(iv)) according to the IUCN Red List guidelines (IUCN 2024). It is only known in one location, with a small extent of occurrence (<100 km^2) and area of occupancy (<10 km^2). Extent and quality of habitat are estimated to be in decline due to the intensive grain monoculture and extensive low-tech livestock farming in the Cerrado Biome.

Etymology:—The species epithet is in honour of the *Quilombo Kalunga*, recognised by the program Protected Planet (UNEP-WCMC 2021) as the first TICCA (Territories and Areas Conserved by Indigenous and Local Communities) of Brazil. The area includes the municipalities of Cavalcante, Monte Alegre de Goiás and Teresina de Goiás (Goiás). *Quilombos* is the term applied to hinterland settlements usually founded by people of African origin, generally escaped slaves.

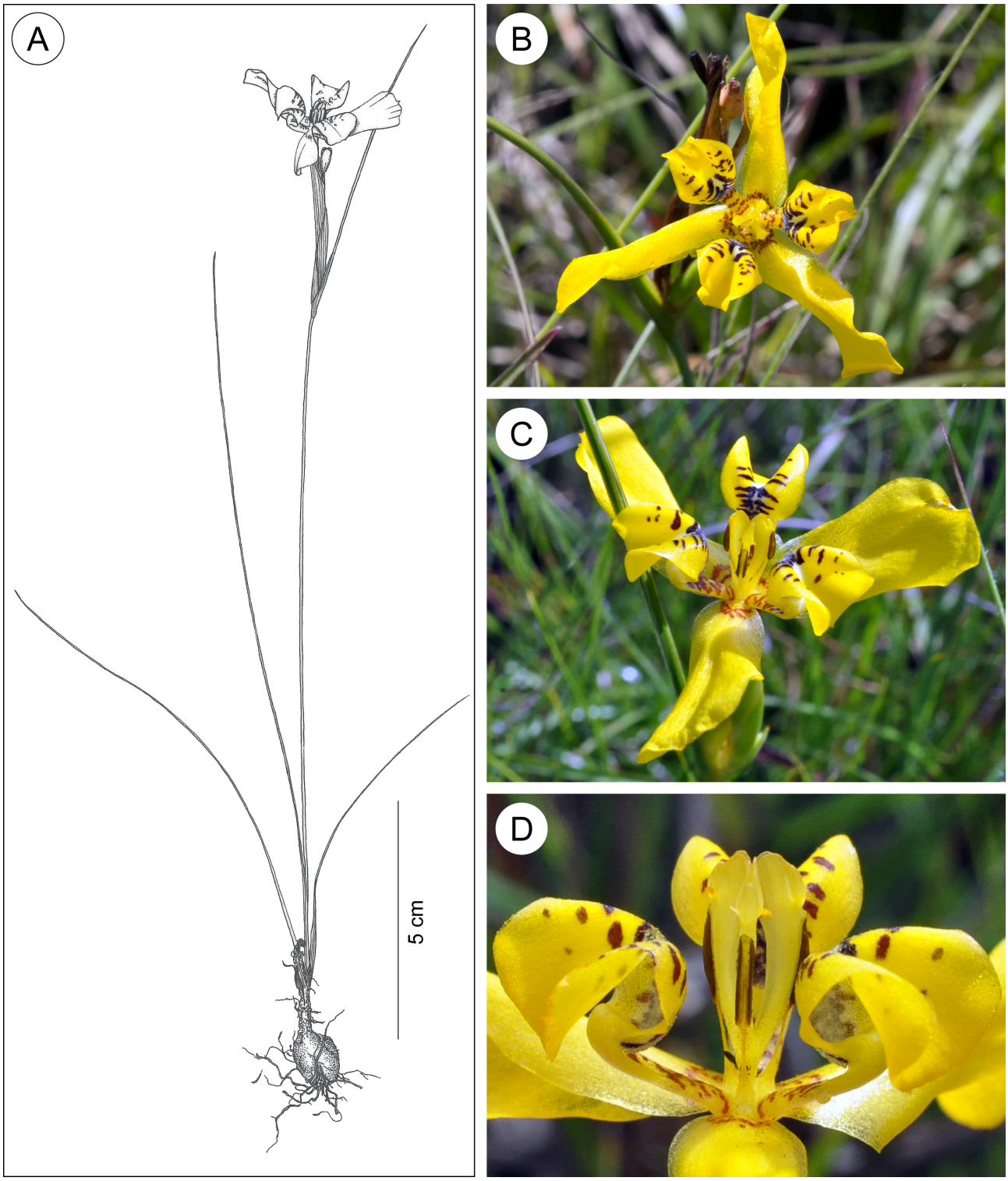

FIGURE 3. *Cipura kalunga* Chauveau & L.Eggers. **A**: General habitus. **B–D**: Flower. **B**: Apical view. **C**: Lateral view. **D**: Inner tepals, stamens and style in lateral view. From *O. Chauveau & M.B. Lizarazo 1008* (ICN!). Photographs by O. Chauveau, drawing by A. Scherer.

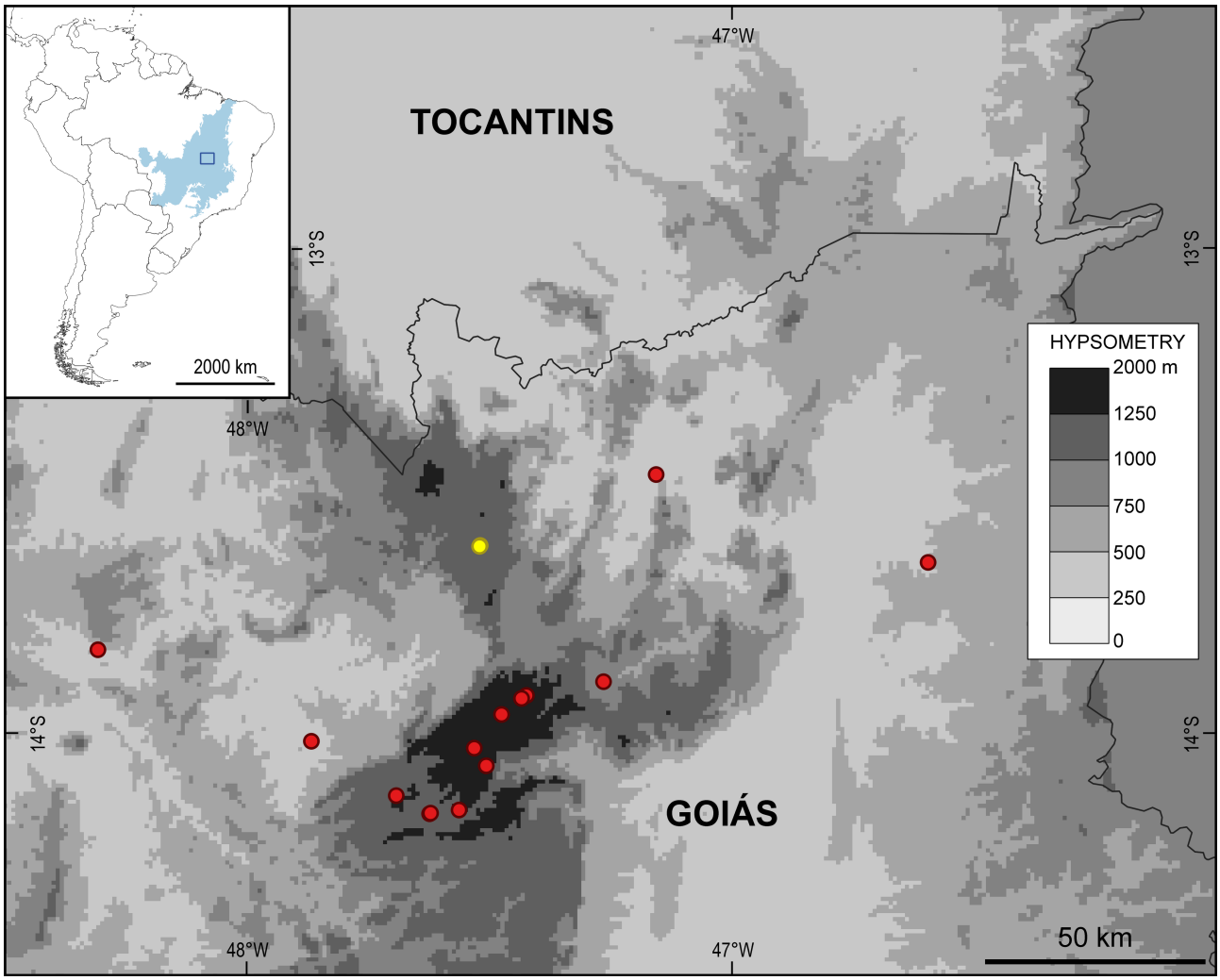

FIGURE 4. Distribution map of *Cipura kalunga* (yellow circle) and *C. paradisiaca* (red circles) in the Brazilian Cerrado Biome (blue area on the map of South America).

Paratypes:—BRAZIL. Goiás: Cavalcante, estrada secundária (GO 241), 1141 m, 24 April 2014 (fl, fr), *O. Chauveau & A. Aguiar 906A* (ICN!, UB!).

Taxonomical notes:—*Cipura kalunga*, together with *C. paradisiaca* and *C. xanthomelas*, is a yellow-flowered *Cipura* species from the Cerrado of Central Brazil. It can be easily recognized by its more delicate habit and narrower leaves (Fig. 3A). Flowers of *C. kalunga* (Figs. 3B–D) are more similar to those of *C. paradisiaca* (Fig. 1F), as the inner tepals are equally porrect, then incurved and abruptly reclinate distally, and more than half the length of the outer tepals. However, plants can be easily distinguished by their vegetative characteristics. Leaves of *C. kalunga* are filiform (6.0–16(–21.1) cm × 0.6–1.3 mm) while *C. paradisiaca* has lanceolate, plicate and rigid leaves (23–32 cm × 7–22 mm). In addition, flowering stem is shorter ((6.3–)8.3–17.8(–19.8) cm *vs.* 20–25 cm long), and valves of spathes are also shorter (lower valve (9–)10.8–17.8 mm long; upper (16–)21.4–32.6 mm long *vs.* lower valve 25–30 mm long; upper 50–52 mm long). From *C. xanthomelas*, it can also be differentiated by its delicate habit and filiform leaves (0.6–1.3 mm *vs.* 3–10 mm wide in *C. xanthomelas,* Damasceno & Gil 2016). Moreover, *C. xanthomelas* has very distinctive flowers, with connivent inner tepals, less than half the length of the outer ones, with typical dark markings on the keel and apex (Fig. 1G).

Floral biology:—Breeding system, floral biology and phenology of *C. kalunga* were studied by Báez-Lizarazo *et al.* (2021), who revealed that species' flowers had anthesis lasting between 5.5 to 6.5 hours, and were mainly visited by oil bees (*Arhysoceble* spp.), indicating that they are involved in a specialized plant–pollinator interaction.

2. *Cipura mestrensis* Chauveau & L.Eggers, *sp. nov.* (Figs. 5 & 6)

Diagnosis:—*Cipura mestrensis* is similar to *C. formosa*, but is easily recognized by the not notably resinous bulbs, by the long conspicuous bract (or cauline leaf) similar to the basal leaves (17.3–33.7(–47) cm *vs.* 3.6–5.5 cm long in *C. formosa*) and by the ascending outer tepals (*vs.* patent to slightly reclinate outer tepals of *C. formosa*). It also differs by longer leaves than those of *C. formosa* ((23–)31.5–54.8(–66.2) cm *vs.* 8–18 cm long), and by smaller flowers (31.5–38.7(–50.3) mm *vs.* up to 70 mm wide), shorter anthers (4.3–5.2(–5.8) mm *vs.* 7.3 mm long), style arms (6.1–7.3 mm *vs.* 10 mm long) and adaxial crests (2.5–3.1(–3.7) mm *vs.* 4.8 mm long).

Type:—BRAZIL. Tocantins: Ponte Alta do Bom Jesus, TO 040, 31 km após Novo Jardim, 24 km até cruzamento com TO 110, 715 m, 22 January 2016 (fl), *L. Eggers et al. 990* (holotype ICN!, isotypes P!, UB!, UFG!).

Perennial herb, aboveground up to (19–)23.5–47 cm tall to top flower, (28.3–)43.1–62.9(–77) cm tall to terminal bract end; underground stem to (0.4–)2.6–5.7(–7.2) cm long. Bulb subglobose to ovoid, outer cataphylls dry, dark brown, 25.4–40(–53.3) × 19.4–33.7(–40.3) mm, not notably resinous, prolonged in a collar up to (0.4–)2.6–4.5(–5.1) cm. Basal leaves, 1(–2), strongly plicate, linear-lanceolate, erect, (23–)31.5–54.8(–66.2) cm × (5.1–)6.2–10(–13.7) mm, longer than the flowering stem, sometimes with a conspicuous sheath 5–10 cm long. Flowering stem 1(–2) per plant, erect, cylindrical, (10.4–)19.5–39.8 cm long. Synflorescence cymose, fasciculate, 1–4(–9) subsessile to short pedunculated rhipidia, subtended by a conspicuous bract (or cauline leaf) similar to basal leaves, proximally conduplicate, 17.3–33.7(–47) cm × 4–9.6(–11.1) mm, and a second smaller bract shorter than the spathes of rhipidia. Peduncles 0.9–10(–15.3) mm long. Lower valve of spathes (16.7–)21.6–29.6(–35.4) mm long; upper 36.1–52(–55.5) mm long. Rhipidia two-flowered. Flowers lavender to lilac, sometimes white, maculate, 31.5–38.7(–50.3) mm diameter, with ovary partly included in the upper valve, to sometimes slightly exserted. Tepals unequal, shortly fused proximally for 0.3–0.4 mm long. Outer tepals oblong, seemingly oblanceolate to spatulate due to margins strongly revolute from the base to the apical third, 32.7–39.5 × 11.3–17.1 mm, mostly lavender, whitish to yellowish with red-brown to mauve irregular spots at the proximal third, notably upright to ascending, apex rounded, repand, with glandular trichomes distributed along and above the maculate portion. Inner tepals smaller, unguiculate, porrect, then incurved and spreading distally, (15.4–)16.5–19 × 6.5–8.5(–9.6) mm, proximally 2.9–3.3(–5.5) mm wide, cuneate, lavender to whitish or yellowish, streaked red-brown to mauve; mid portion projected to the centre of the flower, with a dense oblong yellow area of oil-producing trichomes (elaiophore), occasionally streaked dark brown; distally longitudinally depressed, whitish with or without lavender spots; lateral sides at the distal end revolute, lavender to whitish, with or without purple strikes, terminal end reclinate and strongly undulate. Filaments mostly free, erect to incurved, narrowing to the top, proximally white, then mauve, base free or connate for 0.2–0.3 mm long, then free for 4.4–5.6 mm long. Anthers lanceolate, 4.3–5.2(–5.8) × 1.4–1.6 mm, ½ to 1/3 adnate to the style arms (adnation for 1.7–2.5 mm long), latrorse; connective apically obtuse to acute, yellowish to white, sometimes with translucid secretion, 0.6–1 mm wide; locules dark brown to black; pollen yellow. Ovary 6.2–9.4 × 2.2–2.6 mm, style white, 10.6–11.9(–12.8) mm long divided into three porrect branches, undivided part 3.6–4.8(–5.7) mm long, style arms white, 6.1–7.3 mm long, with erect, convergent, rounded, white to lavander crests, adaxial crests 2, connivent, 2.5–3.1(–3.7) mm long, abaxial crest, ovate, acute to bilobed, 0.3–1.4(–2.4) mm long, stigmatic surfaces transverse, 2, on each side at the base of the abaxial crest, lavender or yellow to orange, 0.3–0.4 mm long. Capsule ellipsoid to oblanceoloid, 11–17.5 × (4.1–)5–6.4 mm, usually above from the lower valve and partially included in the upper valve of the spathes; seeds angular, wrinkled, shiny, 1.7–2.2 mm long.

Distribution and habitat:—*Cipura mestrensis* occurs mainly in the *Espigão Mestre* - *Serra Geral* range of Brazil, between the Tocantins and São Francisco River basins, in eastern Goiás and Tocantins, and western Bahia (Fig. 6). The species was found in the municipalities of Barreiras, Formosa do Rio Preto, Luís Eduardo Magalhães and São Desidério (Bahia); Posse (Goiás), and Mateiros, Ponte Alta do Bom Jesus, Taguatinga and Tupiratins (Tocantins). It occurs in grasslands or forests borders in the Cerrado matrix, in sandy soils, sometimes with rocky outcrops, at an elevation range of 360–845 m.

Phenology:—*Cipura mestrensis* was recorded with flowers in January, March and April, and with fruits from February to April.

Conservation status:—Near Threatened (NT) according to the IUCN Red List guidelines (IUCN 2024). Although the taxon meets the area requirements under criterion B2 for threatened (AOO < 500 km^2), it does not meet two conditions of the subcriteria. The species occurs within several conservation units as Ecological Station (Estação Ecológica da Serra Geral do Tocantins) and State Parks (Parque Estadual do Jalapão and Parque Estadual de Terra Ronca), which ensure a certain level of protection. However, due to its restricted distribution in the *Espigão Mestre* range, the species may face environmental threats in this area.

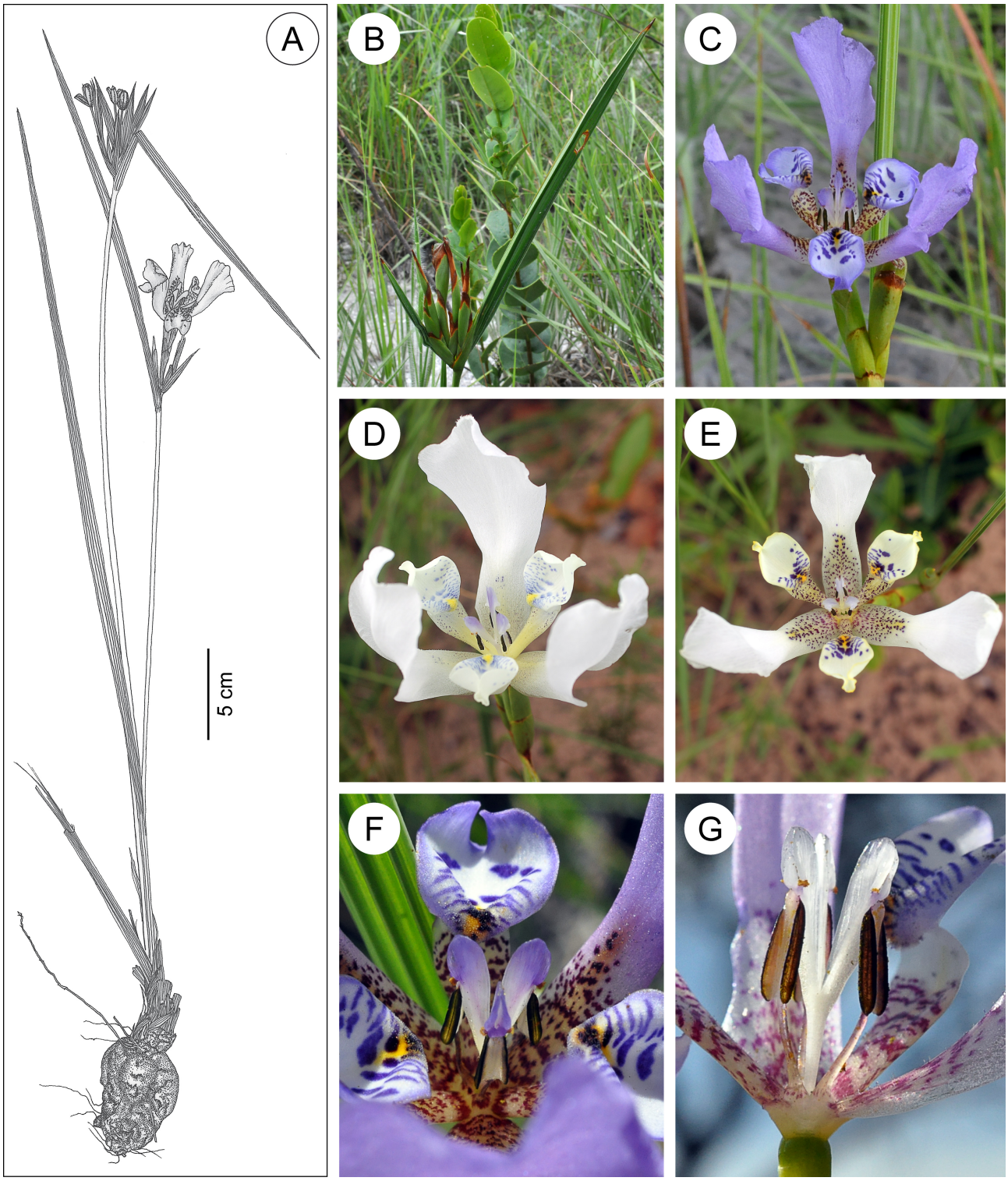

FIGURE 5. *Cipura mestrensis* Chauveau & L.Eggers. **A**: General habitus. **B**: Cymose synflorescence with subsessile to short pedunculated rhipidia, subtended by a conspicuous bract (or cauline leaf) similar to basal leaves, and a second smaller bract. **C–G**: Flowers. **C**: Lateral view of the typical lavender to lilac flower. **D–E**: White variation in flower-colour. **D**: Lateral view. **E**: Apical view. **F–G**: Style-colour variation. **A–C** and **F** from *L. Eggers et al. 990* (ICN!), **D–E** from J. Ribeiro (pers. obs.) and **G** from *O. Chauveau & X. Aubriot 15* (P!). Photographs by O. Chauveau (**B**, **C**, **F**, **G**), J. Ribeiro (**D**, **E**), drawing by A. Scherer.

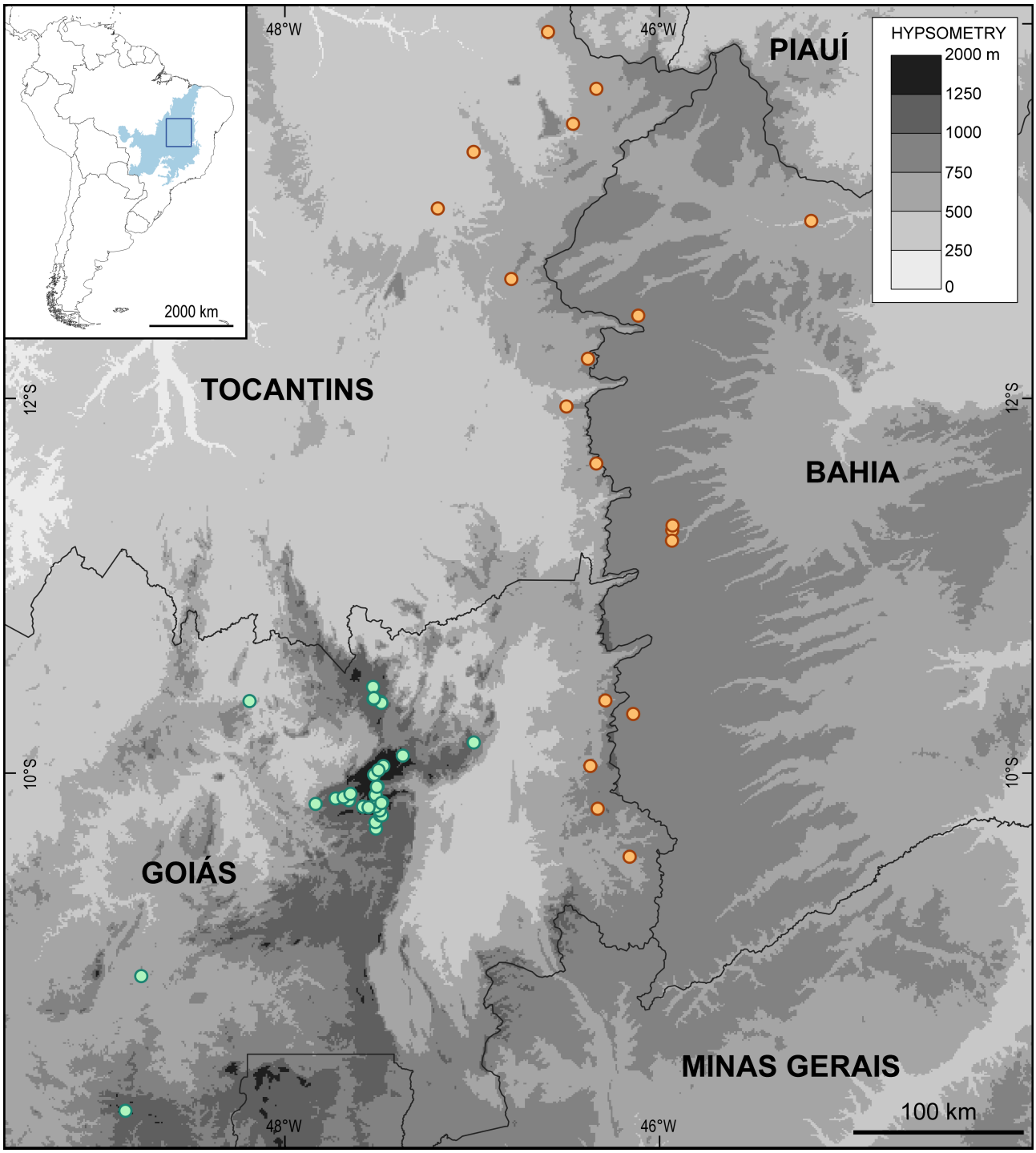

FIGURE 6. Distribution map of *Cipura formosa* (green circles) and *C. mestrensis* (orange circles) in the Brazilian Cerrado Biome (blue area on the map of South America).

Etymology:—The specific epithet refers to the *Espigão Mestre* range, which is the most important geographical area of distribution of the species.

Paratypes:—BRAZIL. Bahia: Barreiras, Espigão Mestre, ca. 32 km W of Barreiras, Valley of the Río das Ondas, 600 m, 5 March 1971 (fr), *H.S. Irwin et al. 31566* (UB0014193!); Formosa do Río Preto, ca. de 20 km da guarita da Fazenda Estrondo, 450 m, 2 February 2000 (fr), *M.R. da Fonseca et al. 1263* (CEPEC00086895 [photo!], HUEFS0046768 [photo!]); id., arredores da cidade, 480 m, 29 April 2000 (fl), *F. França et al. 3260* (HUEFS00044284 [photo!]); Luis Eduardo Magalhães, Espigão Mestre, ca. 100 km WSW of Barreiras, 760 m, 6 March 1972 (fl), *W.R. Anderson et al. 36639* (NY00537865 [photo!], UB0014206!); id., 760 m, 6 March 1972 (fr), *W.R. Anderson et al. 36683* (UB0014207!); id., São Desidério, Espigão Mestre, ca. 10 km N of Río Roda Velha, ca. 100 km WSW of

Barreiras, 800 m, 9 March 1972 (fl, fr), *W.R. Anderson et al. 36887* (UB0014199!). Goiás: estrada Belém-Brasília para Nazaré, 20 km da cidade, 18 March 1974 (fl), *J.A. Rizzo 9709* (UFG0009709 [photo!]); Posse, Rio da Prata, ca. 6 km. S. of Posse, 800 m, 765 m, 5 April 1966 (fr), *H.S. Irwin 14376* (NY00910427 [photo!], RB00627322 [photo!], UB0014453!); id., ca. 26 km da cidade em direção à Guarani de Goiás, Fazenda das Araças, 765 m, 7 March 2004 (white fl), *M.A. Silva et al. 4893* (ESA093493 [photo!]); São Domingos, povoado São João, trilha do mirante, 10 March 2024 (white fl.), *A.F. Rocha 162* (UFG 52999 [photo!]); Tocantins: Mateiros, Estação Ecológica Serra Geral do Tocantins, estrada central, 620 m, 31 January 2015 (fl), *G.M. Antar et al. 733* (SPF 219961 [photo!]); id., Parque Estadual do Jalapão, campo próximo a Fazenda Lua Cheia, acessado pela antiga estrada São Felix-Mateiros, 543 m, 22 January 2014 (fl), *G.M. Antar & L.F. Nascimento 368* (SPF 219959 [photo!]); Ponte Alta do Bom Jesus, TO 040, 31 km após Novo Jardim, 24 km até cruzamento com TO 110, 710 m, 30 March 2016 (fl, fr), *O. Chauveau & M.B. Lizarazo 1006* (ICN!); id., Estação Ecológica Serra Geral do Tocantins, acampamento Brejo do Leite, 85 km SE de Ponte Alta, 360 m, 24 February 2021 (fr), *M.F. Simon et al. 3964* (CEN00117842 [photo!]); id., estrada Ponte Alta do Tocantins-Rio da Conceição, próximo à fazenda do Sr. Luís Periquito, 465 m, 29 January 2015 (fl), *G.M. Antar et al. 704* (SPF 219958 [photo!]); id., TO 110, cerca de 6 km ao norte de Ponte Alta do Bom Jesus, 553 m, 13 Mars 2025 (fr), O. Chauveau & X. Aubriot 15 (P!); Taguatinga, BR 242, cerca de 9,5 km de Taguatinga, 845 m, 21 January 2016 (fl), *L. Eggers et al. 984* (ICN!, P!); id., Serra Geral de Goiás, 9,5 km de Taguatinga (a partir do trevo para Palmas) em direção ao distrito de Luis Eduardo Magalhães, 815 m, 26 January 2015 (fl), *J. Paula-Souza et al. 4763* (ESA090369 [photo!]); Tupiratins, Fazenda Vitória, Lagoa própria de Neuton, 13 January 2001 (fl), *S.F. Lolis et al. 250* (UFG0046688 [photo!]).

Taxonomical notes:—*Cipura mestrensis* is recognized by the lilac to lavender, less frequently white flowers, with notably ascending outer tepals (Figs. 5A, C, D) and dark transverse striations at the proximal portion of the tepals (Fig. 5C), subtended by a long bract (Figs. 5A–B). The species is more similar to *C. formosa* (Fig. 2G); however, it can be distinguished by flower, bract and leaf characteristics. Flowers of *C. mestrensis* display typically ascending outer tepals (*vs.* patent to slightly reclinate outer tepals in *C. formosa*) and are smaller (31.5–38.7(–50.3) mm *vs. ca*. 70 mm wide). In addition, the plants present a much longer terminal bract (17.3–33.7(–47) cm *vs.* 3.6–5.5 cm long in *C. formosa*) and longer leaves ((23–)31.5–54.8(–66.2) cm *vs.* 8–18 cm long). Bulbs of *C. mestrensis* are also not remarkably resinous as bulbs of *C. formosa*.

Samples of the new species were mixed with specimens of *C. formosa* in the examined material of the original description of the latter. Concerning geographical distribution, *C. mestrensis* occurs further west than *C. formosa*, and is characteristic of the relief of the *Espigão Mestre* range. Populations of *C. mestrensis* with white flowers are less common and were so far only found in the states of Bahia and Goiás.

Nomenclatural notes:—The collections *Anderson et al. 36639* (NY00537865 [photo!], UB0014206!), *Anderson et al. 36683* (UB0014207!) and *Anderson et al. 36887* (UB0014199!) from Bahia were listed in the protologue of *C. formosa* (Ravenna 1988) but do not match the description of this species. In fact, they correspond to *C. mestrensis*.

3. *Cipura formosa* Ravenna (1988: 36) (Fig. 2G)

Lectotype (designated here):—BRAZIL. Goiás: Chapada dos Veadeiros, 1000 m, 13 February 1966 (fl), *H.S. Irwin et al. 12718* (UB0037100!; isolectotypes: IAN138025 [photo!]; NY00910408 [photo!]; P01772582!; US barcode 01327930 [photo!]).

Perennial herb, aboveground up *to 29–31 cm tall to top flower, 18.1–28.5(–32.7) cm tall to top spathe or terminal bract end*, underground stem to *0.7–4(–5) cm* long. Bulb robust, subglobose, outer cataphylls dry, dark brown, *25–52(–65) × 24–37(–55) mm*, resinous, prolonged in a collar up to *0.5–2(–3.5) cm*. Basal leaves, *3–6*, strongly plicate, linear-lanceolate, erect, *(6–)10.5–20.3(–26.5) cm × 2.5–9.9*(–13) *mm*, shorter or about as long as the inflorescence. Flowering stem 1(–2) per plant, erect, cylindrical, *11.7–24.7 cm long.* Inflorescence terminal rhipidium, rarely 2 sessile to subsessile fasciculate rhipidia, subtended by a bract (or cauline leaf) similar to basal leaves, proximally conduplicate, *2.4–5.1(–8) cm long*, and a second smaller bract shorter than the spathes of rhipidia. Peduncles *1–5(–9) mm long*. Lower valve of spathes *(28–)36.4–43.5(–49) mm long;* upper *(43–)54.7–64.8 mm long.* Rhipidia two-flowered. Flowers dark violet, maculate, up to 70 mm wide, with ovary partly included in the upper valve, to sometimes slightly exserted. Tepals unequal. Outer tepals largely oblanceolate, patent or frequently reclinate from the base, 40–44 × 21–16 mm, mostly violet, with red-brown to purple spots at the base, *patent to slightly reclinate* and with sparse glandular trichomes at the base and around the central vein. Inner tepals smaller, unguiculate, porrect, then incurved and abruptly reflexed distally, claw 13–14 mm long, proximally 2.3 mm wide, then to 4.9 mm wide, white to lilac gradually becoming violet to purple, with red-brown to purple spots, with sparse glandular trichomes at the first third; limb 12.8 × 11 mm, mid

portion projected to the centre of the flower presenting a conspicuous white prominence crowned white to yellow, distally longitudinally depressed and strongly reflexed, concavity white without or presenting few purple spots; lateral sides revolute, violet, with purple spots, final end rounded with a small acumen; oil-producing trichomes (elaiophore) are distributed in the mid portion of the tepals, from the darkest part below the white projection to the yellow crown above it. Filaments free, to 4.5 mm long, filiform, with a bulbiform base, mauve to whitish spotted with mauve. Anthers oblong-linear, to 7.3 × 2–2.2 mm, ½ to 1/3 adnate to the style arms; connective apically truncate to incise, white to light violet; locules dark brown to black; pollen dull yellow. Ovary *6.3–7.4*(–9) × 1.8 mm, style violet, 4–4.5 mm long, style arms to 10 mm long, with erect, convergent, rounded violet crests, adaxial crests 2, connivent, 4.8 mm long, abaxial crest, ovate, acute to bilobed, 1.8 mm long, stigmatic surfaces transverse, 2, on each side at the base of the abaxial crest, violet. Capsule ellipsoid to obovoid.

Distribution and habitat:—*Cipura formosa* occurs in central and northern Goiás (Brazil), in the municipalities of Alto Paraíso de Goiás, Cavalcante, Minaçú, and Pirenópolis. It occurs in grasslands, often in *campos rupestres* of the Cerrado Biome, in rocky or sandy soils, frequently waterlogged, at an elevation range of (612–)870–1600 m.

Phenology:—*Cipura formosa* blooms from December to April. Fruits were reported in April and July.

Conservation status:—Near Threatened (NT) according to the IUCN Red List guidelines (IUCN 2024). Although the taxon meets the area requirements for threatened under criterion B1 (EEO < 20,000 km^2) and B2 (AOO < 500 km^2), it does not meet two conditions of the subcriteria. However, we believe that the species may face environmental threats, due to the high degree of degradation of the Cerrado Biome. Most of the examined material of *C. formosa* comes from the limits of Chapada dos Veadeiros National Park (Goiás), a conservation unit that clearly plays an important role in protecting biodiversity. The species also occurs in the Serra dos Pirineus State Park (Goiás).

Examined material:—BRAZIL. Goiás: Alto Paraíso de Goiás, 20 km S of Alto Paraíso, 1 April 1983 (fl), *G.G. Hatschbach et al. 36286* (MBM036076!); id., Agua Fria 1, Chapada dos Veadeiros, 24 April 1994 (fl), *C. Munhoz et al. 711* (HEPH00026361 [photo!]); id., Chapada dos Veadeiros, ao longo da GO-118, 20 km N de Alto Paraíso, 1510 m, 30 March 2015 (fl), *M.F. Simon et al. 3693* (CEN00112753 [photo!]); id., id., área a direita da GO-118, na altura do km 157-158, ca. 9 km ao S e antes de Alto Paraíso, 25 March 2001 (fl), *J.A.N. Batista et al. 1211* (CEN00037487 [photo!]); id., id., ca. 16 km south of Alto Paraíso, 1000 m, 20 March 1969 (fl), *H.S. Irwin et al. 24747* (IAN138610 [photo!], NY00910407 [photo!], UB0037102!, US barcode 01327929 [photo!], WAG.1413786 [photo!]); id., id., ca. 18 km N of Alto do Paraíso, 1250 m, 21 March 1971 (fl), *H.S. Irwin et al. 32867* (K001183875 [photo!]); NY00910406 [photo!], UB0014202!, US barcode 01327928 [photo!]); id., id., ca. 20 km by road N of Alto Paraíso, 1600 m, 5 March 1973 (fl), *W.R. Anderson et al. 6369* (MO-1434941 [photo!], NY00910405 [photo!], UB0037101!); id., id., estrada de terra a leste, subindo na Serra da Baliza, nas terras do Sr. Paulo, no alto do morro, perto da casinha abandonada, 1436 m, 2 April 1997 (fl), *T.B. Cavalcanti et al. 2195* (ICN00045319!, ESA039512 [photo!], UFG0046711 [photo!]); id., id., Fazenda São Bento, próximo a Cachoeira Almecégas II, 16 April 2009, (fl), *G. Martinelli et al. 16534* (RB00570209 [photo!]); id., id., road from Alto Paraíso to Teresina, km 20, 29 May 1994 (fl), *S. Bridgewater et al. S207* (K001183876 [photo!], UB0014204!, UFG0015283 [photo!]); id., estrada Alto Paraiso de Goiás - Colinas do Sul (GO-118), ca. 15 km de Alto Paraíso de Goiás, 1380 m, 14 March 1995 (fl), *T.B. Cavalcanti et al. 1357* (CEN00019558 [photo!]); id., id., cerca de 27 km da GO-118 (próximo a Mata Funda), 1220 m, 27 January 1997 (fl), *B.M.T. Walter et al. 3640* (CEN00031785 [photo!], ESA049225 [photo!], UFG0025189 [photo!]); id., estrada para Colinas do Sul, mata denominada mata funda, margem esquerda da estrada, 23 February 1991 (fl), *B.A.S. Pereira et al. 1523* (UB0014359!); id., estrada secundária (chão) a partir de GO-239, 1266 m, 13 April 2014 (fl), *O. Chauveau et al. 903* (ICN00041484!); id., Fazenda Água Fria, cerca de 10 km em direção a Teresina de Goiás, 1448 m, 22 April 2000 (fr), *C. Munhoz et al. 1121* (ESA082590 [photo!], IBGE00049446 [photo!]); id., id., id., 4 February 2001 (fl), *C. Munhoz et al. 2492* (MO1433742 [photo!], IBGE00050803 [photo!]); id., id., id., 21 May 2000 (fr), *C. Munhoz et al. 1393* (IBGE00049515 [photo!]); id., id., id., 19 February 1997 (fl), *C. Munhoz et al. 2561* (IBGE00050503 [photo!]); id., id., id., 9 March 1997 (fl), *C. Munhoz et al. 2610* (IBGE00050660 [photo!]); id., id., id., 1 July 2000 (fr), *C. Munhoz et al. 1742* (ESA093498 [photo!], IBGE00049511 [photo!]);); id., Fazenda Rosmarinho, GO-118, a 11 km do trevo para Niquelândia e Colinas do Sul, 1125 m, 22 January 2005 (fl), *J. Paula-Souza et al. 4361* (ESA089902 [photo!]); id., Fazenda São Bento, margem direita da rodovia Alto Paraíso - Colinas de Goiás, 23 February 1991 (fl), *D. Alvarenga et al. 786* (IBGE00027809 [photo!], UB0014360!); id., GO-118, Alto Paraíso de Goiás - São João d'Aliança 15 km, Morro do lado esquerdo, 1200 m, 5 April 2006 (fl, fr), *T.B. Cavalcanti et al. 3750* (CEN00068857 [photo!], ICN00045326!); id. id., cerca de 7,5 km antes da entrada de Alto Paraíso, a partir de Teresina de Goias, 1397 m, 23 January 2016 (fr), *L. Eggers et al. 994* (ICN00041482!); id. id., ca. 4.2 km do trevo GO-239, sentido Brasília, lado um portão de trilha, entrando, ca. 20 m a esquerda, 1283 m, 15 May 2011 (fl), *J.M.F. Mendoza et al. 4999* (CEN00111265 [photo!]); id., Parque Nacional Chapada dos Veadeiros, Vereda, s.d. (fl), *C.B.R. Munhoz et al. 7855* (UB0014198!); id., id., estrada para as

Sete Lagoas, passando a leste do Morro da Baleia e pelo Peito de Moça, próximo à base do Morro da Baleia, 1255 m, 20 March 2012 (fl), *L.M. Borges et al. 543* (RB00785341 [photo!]); id., id., 881 m, 24 January 2016 (bt), *L. Eggers et al. 996* (ICN00041481!); id., rod. GO-118, 4 km N de Alto Paraíso de Goiás, 1250 m, 10 February 1994 (fl), *G. Hatschbach et al. 60301* (MBM168669!); id., rod. GO-327, Parque Nacional Chapada dos Veadeiros, 12 February 1990 (fl), *G. Hatschbach et al. 53892* (MBM136397!, US barcode 01327926 [photo!]); id., rodovia GO-12, 10 km S de Alto Paraíso, 24 May 1975 (fl), *G.G. Hatschbach 36766* (CORD!, MBM036082!, NY00910409 [photo!]); id., Serra da Baliza, entrada a 5 km ao sul da cidade em direção à antena de TV, 1460 m, 5 February 2019 (fl) *M.F. Simon et al. 4277* (CEN00125293 [photo!]); Cavalcante, 31 km by road S of Terezina, ca. 40 km N of Alto Paraíso, 1500 m, 16 March 1973 (fl), *W.R. Anderson et al. 7176* (UB0014361!); id., estrada de chão entre Cavalcante e Araí, 1190 m, 12 April 2000 (fl), *R.C. Mendonça et al. 5525* (FURB00073510 [photo!], IBGE00060017 [photo!]); id., GO-241, sentido Cavalcante para Araí, cerca de 28 km da saida de Cavalcante, 1170 m, 5 May 2020 (fl), *B.M.T. Walter et al. 7127* (CEN00132534 [photo!]); id., Chapada dos Veadeiros, estrada de terra GO-241, Cavalcante – Prata, saída ao norte da área urbana de Cavalcante, seguindo à esquerda na bifurcação para Engenho II, 22 km de Cavalcante, margem direita da estrada, 1201 m, 23 March 2012 (fl), *L.M. Borges et al. 580* (K002084909 [photo!], RB00914339 [photo!]); id., estrada secundária (chão) à partir de Cavalcante, 1194 m, 12 April 2014 (fl), *O. Chauveau et al. 902* (ICN00041483!); id., Serra do Tombador, 1200 m, 13 April 2013 (fl), *J. Cordeiro et al. 4838* (MBM383097!); id., id., 1128 m, 19 April 2013 (fl), *J. Cordeiro et al. 4978* (MBM383443!); estrada Alto Paraiso-Cavalcante, 16,1 km da entrada de Alto Paraíso, Fazenda Cara Preta à direita da estrada, 1550 m, 25 February 1991 (fl), *B.M.T. Walter et al. 679* (IBGE00027895 [photo!], MO-1434942 [photo!]); Minaçú, Minaçú balsa do Rubão, km 12, marca do rio Bonito na rua 20, área de influência da futura Hidrelétrica de Cana Brava, 400 m, 19 February 2002 (fl), *G. Pereira da Silva et al. 5834* (CEN00044113 [photo!]); Pirenópolis, estrada subindo a Serra dos Pireneus, 16 km centro cidade, 1250 m, 15 April 1994 (fl), *R. César & V.L.G. Klein 72* (UFG0015614 [photo!]); id., Parque dos Pireneus, 10 March 2011 (fl), *M.R.V. Zanatta et al. 588* (UB0014196!); id., id., à direita da estrada para a Cachoeira do Sonrisal, 24 March 2013 (fl), *A.J.C. Aguiar 22* (UB0014201!); São George, Parque Nacional Chapada dos Veadeiros, trilha para as cachoeiras do rio Preto, 869 m, 13 April 2014 (fr), *O. Chauveau et al. 904* (ICN00041485!).

Taxonomical notes:—*Cipura formosa* is more similar to *C. mestrensis* and can be differentiated by the presence of a resinous bulb and shorter terminal bract (3.6–5.5 cm *vs.* 17.3–33.7(–47) cm long in *C. mestrensis*), shorter leaves (8–18 cm *vs.* (23–)31.5–54.8(–66.2) cm long), and larger flowers (around 70 mm wide *vs.* 31.5–38.7(–50.3) mm diameter) with outer tepals patent to slightly reclinate (*vs.* upright to ascending) (Fig. 2G).

Various specimens were collected by our research group across different populations in the Chapada dos Veadeiros region of the Cerrado, central Brazil. The flowers of specimens *Chauveau et al. 902* (ICN00041483!), *903* (ICN00041484!) and *904* (ICN00041485!) displayed more or less marked polymorphisms (Fig. 7), especially in tepals markings and shape. Samples from *Chauveau et al. 902*, which bear flowers typical of the species original description (Figs. 7A–B), and *Chauveau et al. 903*, with small variations in the colour pattern of the inner tepals (Figs. 7C–D), were included in our phylogenetic analyses. These two samples did not form a clade; instead *Chauveau et al. 903* was found to be more closely related to *C. xanthomelas* than to *Chauveau et al. 902* (Fig. 1). This combination of morphological and molecular evidence revealed a high degree of hidden diversity among populations of *C. formosa*. Given the numerous possible explanations for the non-monophyly of *C. formosa*, such as hybridization, polyploidization or recent introgression, as well as for the morphological distinctions observed across several populations (*e.g.* specific adaptations to distinct environmental conditions), more comprehensive morphological and molecular investigations are required.

Nomenclatural notes:—The protologue of *C. formosa* was based on nine collections, six from Goiás and three from Bahia (Brazil). The collection *Ravenna 499* held at Ravenna's Herbarium is the holotype, and isotypes were reported at K, NY and RB. We were unable to find these specimens in the various herbaria mentioned above. Nevertheless, the paratypes were located and the samples collected in Goiás match the description of *C. formosa*, whereas the three paratypes from Bahia state (*i.e.* Anderson *et al. 36639* (NY00537865 [photo!], UB0014206!), *Anderson et al.* 36683 (UB0014207!) and *Anderson et al.* 36887 (UB0014199!)) display morphological features that do not agree with the species description and belong to *C. mestrensis*, previously described. According to the *Code* (Turland *et al.* 2018, Art. 9.12), the specimen *Irwin et al. 12718* (UB0037100!) was chosen among the paratypes, since it matches perfectly with the current amended description of *C. formosa*.

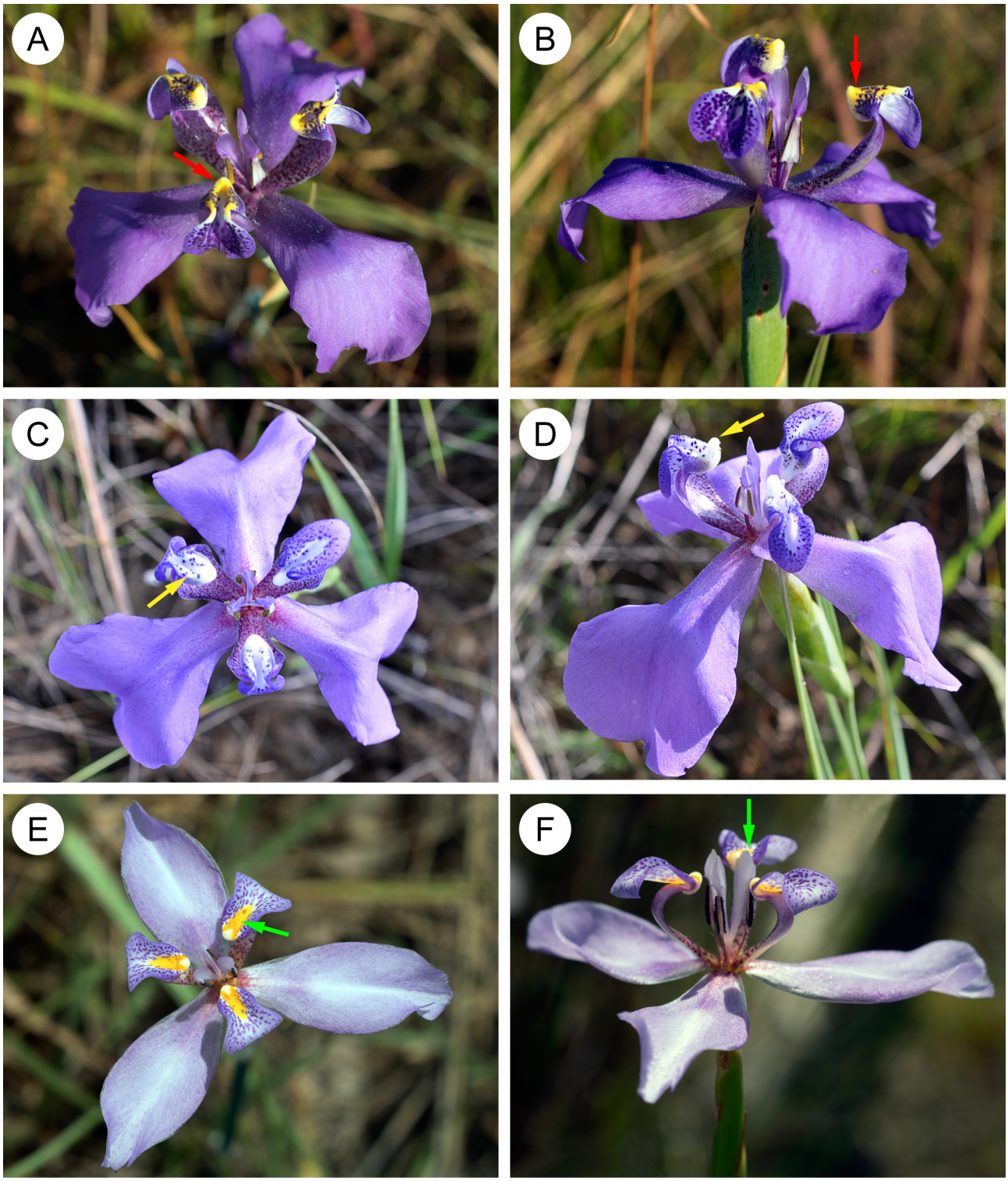

FIGURE 7. Variation in floral traits among populations of *Cipura formosa* Ravenna. **A–B**: Typical flower from *O. Chauveau et al. 902* (ICN!) with a yellow crown (red arrows) at the top and above the elaiophores of the inner tepals. **A**: Apical view. **B**: Lateral view. **C–D**: Flower of *C.* cf. *formosa* from *O. Chauveau et al. 903* (ICN!) with a lighter colour, the yellow crown being absent (yellow arrows) on the inner tepals. **C**: Apical view. **D**: Lateral view. **E–F**: Flower of *C.* cf. *formosa* from *O. Chauveau et al. 904* (ICN!) with outer tepals narrowly oblanceolate and a conspicuous yellow mark (green arrows) above the elaiophores on the inner tepals. **E**: Apical view. **F**: Lateral view. Photographs by O. Chauveau.

4. *Cipura cubensis* Griseb. (1866: 251) (Fig. 2C)

Lectotype (designated by Howard (1988: 211)):—CUBA. [Matanzas]: [Río] Hanabana, 1865 (fl), *C. Wright 272* (GOET004135 [photo!]).

= *Cipura campanulata* Ravenna, Revista Inst. Munic. Bot. 2: 51. 1964. Neotype (designated here):—MEXICO. San Luis Potosi, Las Canoas, 19 August 1891 (fl, fr), *C.G. Pringle 5023* (UVMVT113108 [photo!]).

Conservation status:—Data deficient (DD). Taxonomic uncertainty explains lack of information (IUCN 2024). The conservation status should be assessed after re-examination of the specimens identified as *C. cubensis* and *C. campanulata*, as well as the other species of the region (*C. insularis* and *C. inornata*), as misidentifications may occur among herbarium specimens.

Examined material:—BELIZE. Belize: Crooked Tree, along new Northern Hwy, 13.6 miles S Tower Hill Bridge (about 6 rd. mi. N jct. rd. to Crooked Tree), 5 m, 15 August 1992 (fl), *R.D. Worthington 21398* (MO-206256 [photo!]). BRAZIL. Mato Grosso: Rosário Oeste, MT 246 (BR 163), entre Barra do Bugres e BR 364, 215 m, 27 October 2016 (fl, fr), *L. Eggers & O. Chauveau 1013* (ICN00061852!). COSTA RICA. Guanacaste: La Cruz, along main access road to Sector Santa Elena, Parque Nacional Guanacaste, within 0.5 km from the gate at the Carretera Interamericana (ca. 3 km S of Cuajiniquil turnoff), 275–285 m, 15 June 2004 (fl, fr), *M.H. Grayum 11997* (MO-1620136 [photo!]). CUBA. s.l., s.d. (fl), *C. Wright 3747* (NY01505290 [photo!]); s.l., s.d. (fr), *C. Wright 3749* (NY01505295 [photo!]); Cienfuegos: Abreus Cieneguita, 22 June 1895 (fl), *R. Combs 211* (NY01505281 [photo!], P01772588 [photo!]); Granma: Buey Arriba, Southern Oriente and Pico Turquino, San Felipe (formerly S. Juan de Buena Vista); Southwest of Bueycito, 1 August 1922 (fl), *E.L. Ekman 14697* (NY01505283 [photo!]); Havana, Loma de la Pita, San Miguel de Casanova (Havana), 12 October 1923 (fr), F. *León 11528* (NY01505292 [photo!]); Isla de la Juventud: Isles of Pines, 25 June 1901-─10 July 1901 (fl), *A.A. Taylor 67* (NY01505288 [photo!]); La Habana: Havana, wet pasture not far from Sta Maria del Rosario (Havana), 8 August 1914 (fl, fr), *F. León & Hioram 4350* (NY01505294 [photo!]); Mayabeque: Madruga, 24–27 July 1916 (fl), *F. León & C. de la Torre 6371* (NY01505289 [photo!]); Oriente: Nagua, 18 August 1922 (fl), *E.L. Ekman 14896* (NY01505293 [photo!]); Pinar del Rio: Guane Palm, barrens west of Guane, 25 November 1911 (fr), *J.A. Shafer 10486* (NY01505291 [photo!]); Villa Clara: Corralillo Motembo, 10 August 1918 (fl), *F. León & M. Roca 8229* (NY01505280 [photo!]); Ranchuelo, September 1904 (fl, fr), *E. Cuesta 912* (NY01505285 [photo!]); Sagua la Grande, 7 September 1903 (fl, fr), *N.L. Britton & P. Wilson 372* (NY01505282 [photo!]). GUATEMALA. Alta Verapaz: San Juan Chamelco, 1 km al Noroeste de San Juan Chamelco, 50 m del balneario Xucaneb, 1250 m, 8 July 1992 (fl, fr), *A. Rodríguez et al. 2829* (IBUG 186518 [photo!]); Petén: La Libertad and vicinity, August─November 1933 (fr), *M. Aguilar 20* (WIS v0339565 [photo!]). MEXICO. Campeche: Champotón, 3 km al Sur de Conhuas, 150 m, 5 July 1995 (fl), *C.B. Gutiérrez 4467* (MEXU 765383 [photo!]); Chiapas: Ocosingo, 3 km al E de la colonia Benito Juárez Miramar, 295 m, 4 November 1993 (fl, fr), *A. Reyes-García & A. Challenger 2584* (MEXU 594057 [photo!], MO-205640 [photo!]); id., 3 km al E de la colonia Benito Juárez Miramar, 320 m, 21 August 1993 (fl), *A. Reyes-García & M.S. Sousa 2134* (MEXU 595393 [photo!]); Ocozocuautla,"La Encañada", km 5 carretera Ocozocuautla-Apicpac, 850 m, 25 July 1988 (fl), *F. Pimentel 31* (MEXU 523178 [photo!]); Nayarit: Acaponeta, a 2-3 km de la Mesa de Pedro y Pablo, camino a San Blasito, 820 m, 12 September 1989 (fl), *O.V. Téllez & A. Salinas 12053* (MEXU 1380074 [photo!]); Txtlán, km 5─6 de la terracería a Cacalután, 1100 m, 22 September 1989 (fl), *O.V. Téllez & A. Salinas 12310* (MEXU 1380073 [photo!]). NICARAGUA. Atlántico Norte: Puerto Cabezas, Puerto Cabezas, 0─20 m, 8 October 1978 (fl), *W.D. Stevens 10711* (MO-1843147 [photo!]); Atlántico Sur: Laguna de Perlas, along road 2 km S of Laguna de Perlas, 2─5 m, 22 June 2009 (fl), *W.D. Stevens et al. 28632* (MO-2405200 [photo!]); Chontales: Acoyapa, 8.5 km NW of Río Oyate bridge along road to San Carlos, 65–70 m, 24 June 2008 (fl), *W.D. Stevens & O.M. Montiel 27379* (MO [photo!]); Estelí: Estelí, 0.4 km from Estelí entrance to Cerro Quiabuc, 870 m, 21 May 2010 (fl), *W.D. Stevens et al. 30021* (MO-2320062 [photo!]); id., km 163 on Hwy 1, ca. 11.2 km N of entrance to Estelí, 920 m, 29 June 1978 (fl), *W.D. Stevens 9109* (MBM 89265!). PANAMA. Herrera: Las Minas, Finca "La Esperanza" 3 km al NO de Ocú, 27 September 1986 (fl, fr), *M.E. Mitre 72* (MO-206257 [photo!]).

Taxonomical notes:—*Cipura cubensis*, *C. campanulata* and *C. inornata* Ravenna (1984: 194) have white campanulate flowers and a long history of misunderstanding. The first name used for a white-flowered *Cipura* was *C. cubensis*, based on a specimen from Cuba collected by Wright (Grisebach 1866). Subsequently, Ravenna described two similar species: *C. campanulata* from a specimen collected in the state of Tamaulipas (Mexico) (Ravenna 1964), and *C. inornata* from plants distributed in Venezuela and Costa Rica (Ravenna 1984). The latter species was reported as closely related to *C. campanulata*, distinct by its plicate-teniolate leaves and by the inner tepals shorter than the outer. Due to the inability to find the type of *C. cubensis* at the time of their review of South and Central American *Cipura*,

Goldblatt & Henrich (1987) did not recognize this species in their study and instead considered all plants with white campanulate flowers as *C. campanulata*. Similarly, they also reduced *C. inornata* as a synonym of *C. campanulata*. Soon after, Ravenna (1988) observed the phototypes of *C. cubensis* from GOET and decided to validate *C. cubensis* and to reduce *C. campanulata* as a synonym. However, he considered *C. inornata* as a distinct species. More recently, Celis *et al.* (2003) accepted *C. cubensis* and included *C. inornata* as a separate species in their identification key, although the status of the latter remained questionable. Contrastingly, *C. campanulata* was still recognized by Henrich & Goldblatt (1994), Goldblatt & Manning (2008), and Munguía-Lino *et al.* (2015). Additionally, POWO (2024) accepted *C. campanulata* (with *C. inornata* as a synonym) and considered *C. cubensis* a synonym of *C. paludosa*. Finaly, in the taxonomic treatment of *Cipura* in *Flora e Funga do Brasil* (Gil & Damasceno 2025), *C. cubensis* was synonymized with *C. paludosa*, and *C. campanulata* was not reported in Brazil.

We studied the image of the type specimen of *C. cubensis* from GOET and we agree with Ravenna (1988) and Celis *et al.* (2003) that *C. cubensis* has priority over *C. campanulata*. Wright's drawings incorporated with the exsiccate of the type specimen of *C. cubensis* show the morphology of the style, stamens and tepals, as well as a flower in longitudinal section with four tepals equal in length, which indicates that the plant is not *C. paludosa*, where tepals are organized in two whorls of different size and arrangement. The daily blooming period, with flowers opening after sunrise and closing before 10 a.m., was also reported by Grisebach (1866). In this context, the distribution of *C. cubensis* extends from Cuba to Mexico, Central America, Colombia, Venezuela and the north-east and centre-west of Brazil. For Brazil, Ravenna (1988) cited two collections of *C. cubensis*: *Ravenna 469* (HB 36701) from Piauí state, and *Hatschbach 39399* (MBM060797!) from Goiás state. In 2017, we examined specimen *Hatschbach 39399* (MBM060797!), which was at the time identified as *Cipura* sp., based on the prevailing assumption that *C. cubensis* was restricted to Cuba. Subsequent morphological analyses have led us to reassign this specimen to *C. cubensis*. Furthermore, we located specimen *Hatschbach & Barbosa 78782* (MBM301316!) collected in Bahia, which also exhibits morphological traits consistent with *C. cubensis*. Although we were unable to locate *Ravenna 469* (HB 36701), fieldwork in Mato Grosso yielded specimen *Eggers & Chauveau 1013* (ICN00061852!), which presents floral characteristics coherent with those of *C. cubensis*. However, the specimen displays markedly broader leaves than those described for the species (Fig. 8). A notable degree of variation in leaf width was observed among specimens identified as *C. campanulata* across different herbaria, including our own material. Specifically, specimens from Mexico (*e.g. Ibarrarán & Nolasco 51* (IBUG 197773 [photo!] and IBUG 199337 [photo!]), *Lundell 863* (WIS v0339568 [photo!]), *Munguía-Lino & Vázquez-García 29* (IBUG 199814 [photo!] and IBUG 208784 [photo!]), and *Ortiz 3010* (UADY 22678 [photo!]), as well as *Ekman 14697* (NY01505283 [photo!]) from Cuba exhibit leaves substantially wider than those reported in the original descriptions of *C. cubensis* and *C. campanulata*. Furthermore, since specimen *Eggers & Chauveau 1013* was distantly related to the two other *C. cubensis* specimens included in the phylogenetic analysis (Fig. 1), it is still possible that the morphospecies *C. cubensis* may consist of different putative species. Further taxonomic and molecular investigations would be required to test this hypothesis.

An additional challenge in accurately identifying herbarium specimens of white-flowered *Cipura* species lies in the fact that *C. paludosa* can also produce white flowers (Fig. 2F). This complicates identification in dried material, as the arrangement of tepals is often distorted during pressing, and overall preservation quality may be poor. However, in the field, *C. paludosa* is readily distinguishable by its floral morphology: the outer tepals are spreading, while the inner tepals are significantly shorter and narrower, connivent with apices slightly recurved outward. The inner tepals are also proximally concave and feature a conspicuous central zone of yellow, oil-producing trichomes (elaiophores). In contrast, *C. cubensis* possesses outer and inner tepals that are subequal in size, forming a campanulate perigon, and elaiophores are lacking (Fig. 2C).

Nomenclatural notes:—The protologue of *C. cubensis* lists only a single collection made by Wright in "Cuba occ. [occidentalis], in savanis pr. [Río] Hanabana". The specimen was found at GOET and an additional Wright's handwritten text attached to the exsiccate provided relevant information describing the flower: "perianth segments delicate white narrowly oblong a little broader towards the apex or equal obtuse apiculate. Expanded flower broadly campanulate". Location (Hanabana), collection date (10 June 1865) and data related to floral phenology were also reported. Based on the morphological characteristics of the type specimen, we conclude that *C. campanulata* is morphologically consistent with the earlier-described *C. cubensis*, of which it is a synonym, as previously noted by Ravenna (1988).

As with most types of Ravenna's species, the type specimens of *C. campanulata* from collection *Ravenna 271* are missing, and no other specimen from Ravenna (1964) was available for designation as a lectotype. The specimen *Pringle 5023* (UVMVT113108 [photo!]) is a characteristic sample, which fits the description of *C. campanulata* and was collected in the state of San Luis Potosi (Mexico), neighbouring the state of Tamaulipas, where *Ravenna 271* was collected. It was designated here as the neotype of *C. campanulata* (Turland *et al.* 2018, Art. 9.8).

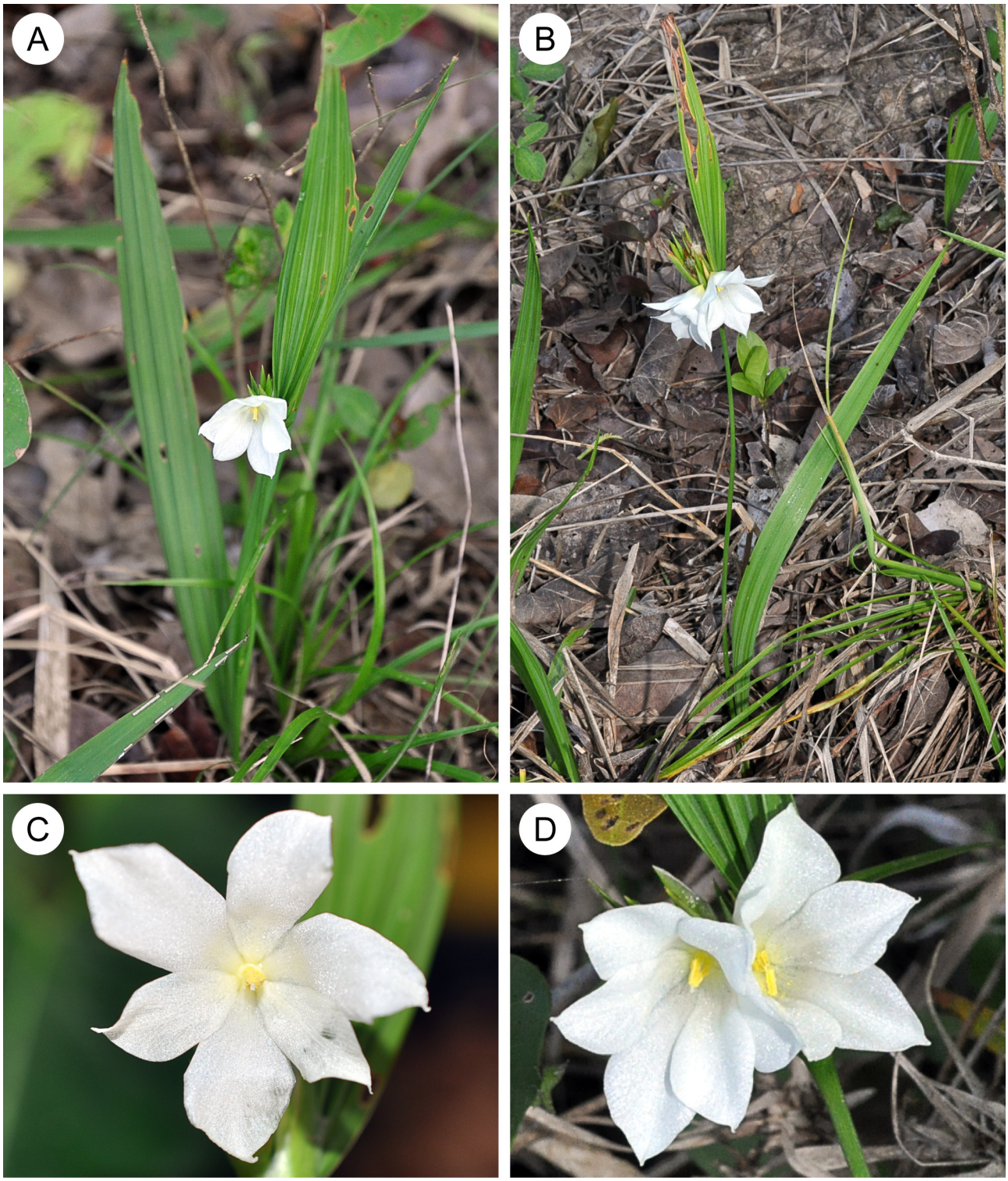

FIGURE 8. *Cipura* cf. *cubensis* Griseb. **A–D**: from *L. Eggers & O. Chauveau 1013* (ICN!) **A–B**: General habitus. **C–D**: Flower. Photographs by L. Eggers.

5. *Cipura gigas* Celis, Goldblatt & Betancur (2003: 420) (Fig. 2D)

Type:—COLOMBIA. Guaviare: Miraflores, 465 m, 1 June 1997 (fl), *J. Betancur & R. López 7296* (COL000000153 [photo!]; isotypes: COAH 78421 [photo!]; NY00622109 [photo!]).

Conservation status:—Not Evaluated (NE). The species has EEO > 20,000 km^2, but AOO < 500 km^2. We were unable to assign the most appropriate threat category due to insufficient information about the species' environment or

potential threats. However, *Cipura gigas* was registered in the El Tuparro National Park, a conservation unit in western Colombia (Celis *et al.* 2003).

Examined material:—COLOMBIA. Arauca: Cravo Norte, Los Llanos, río Casanare Esmeralda, 130 m, 19 October 1938 (fr), *J. Cuatrecasas & H. García Barriga 3856* (COL 188317!); Boyacá [Casanare]: Llanos Orientales, al sur de El Yopal, 12 July 1963 (fl, fr), *J. Blydenstein & C. Saravia 1385* (COL 96880!); Casanare: Paz de Ariporo, Intendencia de Casanare, margen derecho del Río Casanare, Caserío Indígena Tsamani, 100 m, 31 July 1977 (fl), *G. Niño 317* (COL 186908!); Meta: La Macarena, Zona de preservación del AMEM, vereda cachivera, Parque la Macarena, por el camino que conduce del río Guayabero al caño cristales, 400 m, 1 August 2000 (fl), *R.C. López et al. 6765* (COAH 043550!, COAH 043551!); Puerto Gaitán, Laguna de Carimagua, 150–175 m, November-December 1975 (fl, fr), *B. Rewinkel & M. Rewinkel 20* (COL 430403!); Puerto López, Finca "Los Laureles", 300 m, 3 June 1980 (fl), *O. Rangel & J. Espina 1429* (COL 214694!); Ranch Menegua, 100 kilometers South + East of Villavicencio, 16 July 1945 (fl), *H. Schiefer 814* (COL 37808!); San Martín, La Serranía, Las Gualas, 250 m, 20 November 1939 (fl, fr), *J. Cuatrecasas 7811* (COL 22727!); Vista Hermosa, Carretera de Bella Vista a Piñalito, 350 m, 11 August 1972 (fl), *R.E. Echeverry & R.M. Jaramillo 2315* (COL 127654!); Vichada: Cumaribo, alrededores del Centro Administrativo, Territorio Faunístico El Tuparro, entre los valles inferiores de los ríos Tuparro y Tomo, 11 August 1979 (fl), *S. Salamanca AC-432* (COL 198773!); Cumaribo, Comisaria del Vichada, Casanare, Río Vichada, 13 July 1945 (fl), *F. di Giovanni 146* (COL 69900!); Puerto Carreño, PNN El Tuparro, centro administrativo, 71 m, 5 July 2012 (fl), *A.M. Bedoya et al. 171* (ANDES!); San José de Ocuné, near Aracure creek, 15 May 1945 (fl), *F. di Giovanni 69* (COL 71709!); Santa Rosalía, Comisaria del Vichada, caño Urimica, 22 December 1971 (fr), *I.R. Cabrera 1888* (COL 125068!).

Taxonomical notes:—Referred as *Cipura* sp. 2 in Goldblatt & Hendrich's review (1987) and described in Celis *et al.* (2003), *C. gigas* was mostly collected in Colombia and in two municipalities of Venezuela (States of Atures and Portuguesa). The species is similar to the light blue *C. paludosa* by the color of the flowers and the inner tepals erect and imbricate, strongly concave. It is distinguished from *C. paludosa* subsp. *paludosa* by the size of the plant (50–100 cm tall), the thick, resinous bulb (of 3 cm diameter) and the width of the basal leaves ((2–4)8–10 mm *vs.* 4.5–20 mm wide in *C. paludosa*). Celis *et al.* (2003) did not mention *C. paludosa* subsp. *robusta*, but *C. gigas* can usually be recognized by the larger basal leaves ((2–4)8–10 mm *vs.* 2.5–5 mm) and longer cauline leaves (13–25 cm *vs.* 4–13 cm in *C. paludosa* subsp. *robusta*).

6. *Cipura inornata* Ravenna (1984: 194)

Lectotype (designated here):—VENEZUELA. 8 km a Palo Seco septentrionem versus civit Guárico Venezuelae, 25 June 1976 (fl), *P. Ravenna 2177* (K000363176 [photo!]).

Conservation status:—Data deficient (DD). Taxonomic uncertainty, and restrict or missing collections do not allow the conservation status assessment of *C. inornata* (IUCN 2024).

Taxonomical notes:—Flowers of *C. inornata* are white and slightly different from *C. cubensis*, but both species are usually indistinguishable from herbarium specimens. Outer and inner tepals of *C. cubensis* are similar, while in *C. inornata* outer tepals are oblanceolate-spathulate, 21–22 × 12 mm and inner tepals are obovate, 15–17 × 8.5–9 mm (Ravenna 1884). Several other distinctive features were highlighted by Ravenna: the almost flat leaves, bell-shaped perianth, minutely funnel-shaped stigma in *C. cubensis vs.* lightly plicate leaves, cup-shaped perianth and minutely 3-lobed stigma in *C. inornata* (Celis *et al.* 2003). Additional collections of white-flowered *Cipura* populations from the region where the type specimen was found are needed to conduct comparative studies with fresh material and to accurately assess the discriminatory value of the diagnostic characters used to distinguish *C. inornata* from *C. cubensis*.

Nomenclatural notes:—The protologue of *C. inornata* mentions three collections: the holotype *Ravenna 2177* (Ravenna's Herbarium) from Venezuela with one isotype at VEN, and the specimens *Ferreyra 15945* (USM) and *Ravenna 319* (Ravenna's Herbarium), two paratypes collected in Costa Rica and from a cultivated plant grown from a bulb collected in Costa Rica, respectively. None of these specimens were located, but we found another isotype of *Ravenna 2177* at K (K000363176 [photo!]), which was designated as lectotype (Turland *et al.* 2018, Art. 9.12).

7. *Cipura insularis* Ravenna (1988: 42)

Lectotype (designated here):—CUBA. Pinar del Río, 1860-64 (fl, fr), *C. Wright 3256* (NY01505287 [photo!]; isolectotypes: PBRU00054883 [photo!]; PBRU00054887 [photo!]; NY01505286 [photo!]; K000363178 [photo!]; P01772591!; P02066311!; S S06-18355 [photo!]).

= *Cipura cubensis* C.Wright in Sauvalle, Anales Acad. Ci. Méd. Habana 8: 51. 1871, nom. illeg.

Conservation status:—Data deficient (DD). *Cipura insularis* is a dubious species known only by the type material, preventing the assessment of its conservation status (IUCN 2024).

Taxonomical notes:—The description of *C. insularis* was based on a single collection from Cuba and stated that the species has yellow flowers, as also handwritten in the NY01505287 ("Cipura yellow"). Since no other specimens of *C. insularis* could be found elsewhere, collections are needed at the type locality to confirm the status of this species.

Nomenclatural notes:—The protologue lists the collection *Wright 3256* (NY) as the type of the species. We found two specimens of this collected material in NY (NY01505287 [photo!] and NY01505286 [photo!]). We designated here the specimen NY01505287 as the lectotype of *C. insularis* due to the presence of handwritten records of location, vegetation pattern and colour flower beside the specimen (Turland *et al.* 2018, Recommendation 9A.3).

8. *Cipura paludosa* Aubl. (1775 : 38) (Fig. 2E–F)

Lectotype (designated by Goldblatt & Hendrich (1987: 339):—FRENCH GUIANA. Near Mt. Kourou (as Courou), s.d. (fl), *J.B.C.F. Aublet s.n.* (P00777331!).

= *Cipura graminea* Kunth., Nov. Gen. Sp. 1: 320. 1816. Lectotype (designated by Goldblatt & Hendrich (1987: 339):—VENEZUELA. [Bolívar]: Santo Thomas del Angostura, *s.d.* [1800] (fl), *F.W.H.A. Humboldt & A.J.A. Bonpland 1111* (P00669616!); isolectotypes: P00622976!; B -W 01026 -00 0 [photo!]; B -W 01026 -01 0 [photo!]).

= *Cipura major* Rusby, Bull. New York Bot. Gard. 6: 493. 1910. Lectotype (designated by Goldblatt & Hendrich (1987: 339):—BOLIVIA. [La Paz]: Tumupasa, 1800 ft, 16 December 1901 (fl), *R.S. Williams 546* (NY00319358 [photo!]; isolectotypes: BM014605581 [photo!]; K000363175 [photo!]; US barcode 00092696 [photo!]).

= *Sphenostigma gramineum* S. Moore, Trans. Linn. Soc. London, Bot. 4: 493. 1895. Lectotype (designated here):—BRAZIL. Mato Grosso: Santa Cruz [Barra dos Bugres], December 1891 (fl), *S. Moore 732* (BM001009987 [photo!]; isolectotypes: F-Berlin negative 11088 [photo!]; NY00319572 [photo!]).

Conservation status:—Least Concern (LC). The species is widely distributed and does not fulfil the threatened status requirements.

Examined material:—BOLIVIA. Beni: Yacuma, Estación Biológica del Beni, Estancia el Porvenir, a 50 km este de San Borja, camino carretero entre Trinidad y San Borja, 26 April 1995 (fl), *E. Gutierrez 1564* (USZ 40522!); id., id., id., 12 June 1988 (fl), *E. Villanueva et al. 860* (F 2021519 [photo!]); Chuquisaca: Tomina, aprox. a 40 min de la comunidad de las Casas, trayecto a Llantoj, 22 April 2005 (fl), *J. Gutiérrez et al. 1276* (HSB 00005011!); [Pando:] Manuripi, Motacusal, 11–17 November 2013 (fl), *A.A. Murakami et al. 5011* (USZ!); Santa Cruz: Ichilo, 4.5 km SSE of Buena Vista, 14 January 2006 (fl, fr), *M. Nee 53781* (USZ 73364!); Velasco, Camino a las Mechitas, a 8 km de regreso del aserradero Cerro Pelado, 23 January 1997 (fl), *J. Guillen et al. 260* (SI 58124!). BRAZIL. Bahia: Correntina, Rio Corrente, 21 January 1997 (fl), *G.G. Hatschbach et al. 66036* (MBM210402!); Valley of the Rio das Ondas, ca. 10 km of Barreiras, 2 March 1971 (fl), *H.S. Irwin et al. 31284* (UB0014403!); Distrito Federal: Campus da UB, em frente ao prédio de Medicinas Tropicais, 24 December 2009 (fl), *E.B.A. Dias 685* (CEN00075152 [photo!], UB0014363!); Alto da Samambaia, 1966 (fl), *E.P. Heringer 10949* (UB0014394!); Goiás: [Acreúna], 5 km O de Acreúna (mun. Paraúna [Acreúna]), 20 November 1975 (fl), *G.G. Hatschbach 37722* (MBM048074!); Caldas Novas, at the headwaters of the creck, Rio Quente, at hotel, "Pousada do Rio Quente", 13 km WSW of city of Caldas Novas, 22 December 1974 (fl), *E.P. Heringer & G. Eiten 14165* (UB0014192!); Serra dos Pirineus, ca. 5 km S of Corumbá de Goiás, 3 December 1965 (fl), *H.S. Irwin et al. 10995* (UB0014412!); [Tocantins]: Araguaína, ca. 2 km N of Araguaína, 13 March 1968 (fl), *H.S. Irwin et al. 21149* (COL 127963!); Maranhão: Lorêto, "Ilha de Balsas" region, between the Rios Balsas e Parnaíba, 2 km N of main house of Fazenda "Morros", about 35 km S of Lorêto, 24 March 1962 (fl), *G. Eiten & L.T. Eiten 3763* (UB0014200!); Mato Grosso: Nova Xavantina, hillside between old Fundação Brazil Central resthouse and Rio das Mortes, 30 December 1967 (fl), *D. Philcox & A. Fereira 3759* (NY00910393 [photo!], P01772552!, RB00628253 [photo!], UB0014177!); Poconé, Pirizal, 19 January 2001, (fl), *S.C. Costa 102* (UFMT 24236!); Xavantina, Rio dos Mortos, 24 Nov 1946 (fl), *H. Sick B162* (RB00628184 [photo!]); Mato Grosso do Sul: Bela Vista, Corrego Capei, 17 March 1985 (fl), *G.G. Hatschbach & J.M. Silva 49192* (MBM113896!); Campo Grande, Sítio do Dr. Alfredo Neder, 24 December 1973 (fl), *D. Sucre 10351* (RB00628220 [photo!]); Corumbá, Fazenda Nhumirim, Nhecolância - Pantanal, 26 February 1985 (fl, fr), *A. Pott et al. 1754* (MBM150326!); Minas Gerais: Monte Alegre, 18 November 1973 (fl), *G.G. Hatschbach & C. Koczicki 33380* (MBM028727!); Paracatu, Fazenda Acangaú, 05 March 1989 (fl), *R.C. Mendonça et al. 1287* (RB00628218 [photo!]); Santa Cruz de Minas, Serra de São José, 31 January 2008, (fl),

A. Rapini et al. 1668 (HUEFS0139896 [photo!]); Pará: Maraba, January 1985 (fl), *F.H. Caetano s.n*. (MBM116759!); id., East of Fazenda Urucurituba, on Rio Tapajós, opposite Fordlandia, 18 April 1943 (fr), *W.A. Archer 8424* (COL 86374!); Roraima: Fazenda Félix de Lima, influência Rio Cabixi, próximo ao Porto Félix - Cabixi, 21 April 2014 (fl), *M.G. Caxambu et al. 5427* (MBM397212!); Porto Velho, ao longo do acesso secundário para canteiro de obras da UHE Jirau, a 2 km de Nova Mutum Paraná, 27 March 2011 (fl), *M.F. Simon et al. 1205* (HUEFS0199584 [photo!]); São Paulo: Fernandópolis, Mata do Zoológico, 13 February 1993 (fl), *R. Neves 121* (RB00685711 [photo!]); São José do Rio Preto, Estação Experimental de Zootecnia, 20 December 1976 (fl), *M. Coleman 78* (RB00628214 [photo!]); Tocantins: Mateiros, Região do Jalapão, proximidades do riacho Formiga, fazenda do Seu Vicente, *s.d.* (fr), *P.L. Simpson & A.B. Sampaio 47* (UB0014205!). COLOMBIA. Antioquia: empty lots and disturbed areas in urban Medellín in what was once a Humid Subtropical Forest Zone, 30 June 1977 (fl), *S. White & W.S. Alverson 771* (COL 197233!); Arauca: 13 km al sur de Arauca, Laguna El Venero, Hato de Tiberio Sosa, 26 September 1977 (fl), *J.P. Jorgenson 48* (COL 103157!); Boyacá: El Yopal, Llanos orientales. Sur del hato Matapantano, 10 July 1963 (fl), *J. Blydenstein & C. Saravia 1170* (COL 96828!); Magdalena: Savannah near Rio Cajacara, 20 km south of Codazzi, 25 May 1944, (fl), *O. Haught 4178* (COL 23626!); Meta: Rio Güerar, ca. 10 km below junction with Rio Zanza, north end of Cordillera Macarena, 11 August 1950 (fl), *S.G. Smith & J.M. Idrobo 1526* 9 (COL 43544!). CUBA. [Villa Clara:] Sta Clara, Sabana de la Gloria, Banao Mts, 29 July 1918 (fl), *B. León & F.M. Roca 7926* (NY01505284 [photo!]). GUYANA. [North Rupununi], Rupununi River, Karanambo, 1 September 1988, (fl, fr), *P.J.M. Maas et al. 7158* (UB1096998!); *s.d.* (fl)*, W. Thuillier s.n.* (B -W 01025 -01 0 [photo!]). PARAGUAY. [Cordillera:] San Bernardino, December 1915 (fl), *E. Hassler 1566* (SI 37983!); San Pedro: Lima, Estancia "Carumbe", 1 December 1969 (fl), *T.M. Pedersen 9459* (MBM249486!). PERU. Pasco: Oxapampa, road to Mallampampa, ca. 10 km SW of Huancabamba, 21 January 1984 (fl), *D.N. Smith & J. Canne 5785* (SI 58122!). VENEZUELA. Amazonas: Atures, carretera Pt. Ayacucho hacia Samariapo: Km 11, al lado occidental de la carretera: Piedra "La Tortuga", 18 July 1993 (fl), *A. Gröger 979* (M-0244332 [photo!]).

Examined material, white flowers:—BOLIVIA. Santa Cruz: Velasco, Parque Nacional Noel Kempff M., Campamento La Torre, 21 November 1993 (fl), *T. Killeen et al. 6153* (USZ 40519!); COLOMBIA. Casanare: Orocué, Hato Santana, Estero cerca de Punta tujua, 19 July 2013 (fl), *A.M. Bedoya et al. MFL 721* (ANDES!); Cordoba: 5 km carretera San Benito-San Juan, 17 July 1973 (fl), *J.M. Idrobo & A. Cleef 6647* (COL 470680!); Huila: Neiva, margenes de la quebrada el Tigre, de occidente a oriente, 5 May 1996 (fl), *F. Llanos & W.F. Gerardino 2709* (COL 408146!); Magdalena: Hacaritama, aeroporto de Aguachica y Ocaña, 4 June 1952 (fl), *R.R. Castañeda 3053* (COL 76551!); Meta: Villavicencio, grass in front of Rockefellar lab, 24 July 1945 (fl), *H. Schiefer 825* (COL 37818!); Tolima: Honda, 1 km al N del pueblo em la carretera a Mariquita, 20 May 2007 (fl), *R. Bernal et al. 4190* (COL 523572!). BRAZIL. Mato Grosso do Sul: Corumbá, Fazenda Nhumirim (Embrapa), Nhecolandia, Pantanal, 18 March 1989 (fl), *A. Pott & Z.M. Campos da S. 4661* (MBM150419!).

Taxonomical notes:—*Cipura paludosa* is the most widespread species of *Cipura*, distributed from southern Mexico, through Central America, with a southern limit in Bolivia, Paraguay and south-eastern Brazil (POWO 2024). The species is not registered in Ecuador and Suriname, probably due to the lack of collections in both countries. The species can have pale blue and white flowers (Figs. 2E–F), a particularity mentioned in the original description and other publications (*e.g.* Goldblatt & Hendrich 1987, Celis *et al.* 2003, Henrich & Goldblatt 2003).

Nomenclatural notes:—The protologue of *Sphenostigma gramineum* was based on a single collection (*Moore 732*) from Santa Cruz [Barra dos Bugres], Mato Grosso (Brazil). We located three syntypes, a photograph of the Berlin negatives at F, and specimens at BM and NY. The BM specimen (BM001009987 [photo!]) was selected as lectotype because it is a complete plant with bulb, leaves, flowers, and it presents Moore's original notes (Turland *et al.* 2018, Art. 9.12, Recommendation 9A.3). Furthermore, the BM herbarium is the main repository of Moore's types.

9. *Cipura paludosa* subsp. *robusta* Ravenna (1988: 38)

Lectotype (designated here):—BRAZIL. Mato Grosso: Serra do Roncador, *ca.* 60 km N of Xavantina, 550 m, 25 May 1966 (fl), *H.S. Irwin et al. 16000* (UB0014160!; isolectotypes: K001183678 [photo!]; NY00910396 [photo!]; US barcode 01327951 [photo!]).

Conservation status:—Near Threatened (NT). The species meets the requirement criteria for threatened under criterion B2 (AOO < 500 km^2), but does not meet two conditions of the subcriteria (IUCN 2024). The subspecies occurs in some conservation units in Bolivia and Brazil, which ensure a certain level of protection.

Examined material:—BOLIVIA. Santa Cruz: Angel Sandoval, Candelaria, Salida de Candelaria a 1.5 km sobre el camino a las petas, 127 m, 12 May 2008 (fl), *J.R.I. Wood et al. 24865* (USZ 93428!); J.M. de Velasco, 5 km al Norte de San Miguel en el camino a San Ignacio, 447 m, 8 April 2008 (fr), *J.R.I. Wood et al. 24278* (UB!, USZ 93427!); id.,

Cerro Pelao, 450 m, 1 April 1994 (fl, fr), *R.V. Guillén 1249* (USZ!); id., id., 500 m, 20 March 1997 (fl, fr), *L. Sánchez & R. Choré 464* (USZ 47929!, SI 58123!); id., Parque Nacional Noel Kempff Mercado, campamento Los Fierros, 200 m, 14 March 1997 (fl), *L. Sánchez et al. 265* (USZ 40547!); id., id., id., 200 m, 14 March 1997 (fl), *L. Sánchez et al. 266* (USZ 40517!); id., id., a 10 km del campamento Los Fierros, 200 m, 4 March 1997 (fl), *S. Jiménez et al. 1145* (USZ 47910!); id., id., campamento Huanchaca II, a 5 km del campamento hacia antigua pista del huanchaca II, 600 m, 8 March 1997 (fl), *S. Jiménez & R. Gutiérrez 1291* (USZ 40521!); id., id., Sector Sur, campamento Las Gamas, 850 m, 14 April 1993 (fl, fr), *T.J. Killeen et al. 5237* (USZ 40516!); id., id., meseta de Caparuch, a orillas del arroyo, E de la pista, 400 m, 12 May 1994 (fr), *B. Mostacedo et al. 1785* (USZ 40514!); id., Reserva Forestal Bajo Paraguá, 12 km de Santa Rosa de la roca, yendo a Huanchaca, 350 m, 21 March 1994 (fl), *R.V. Guillén et al. 1053* (MEXU 881534 [photo!], USZ 40515!); id., id., 200 m, 11 May 1994 (fl), *T.J. Killeen & J. Wellens 6282* (USZ 79332!). BRAZIL. Mato Grosso: Água Boa, Estrada Água Boa - Nova Xavantina, ca. 40 km após a entrada de Canarana, 23 March 1997 (fl, fr), *V.C. Souza et al. 14979* (UFMT 28517!); Alto Boa Vista, cerca de 10 km WSW de Alto Boa Vista, Fazenda Suiá-Miçu, 22 March 1997 (fl), *V.C. Souza et al. 14903* (ESA049203 [photo!]); Alto Paraguai, Estrada Cuiabá - Barra do Bugres, km 47, Fazenda São Pedro, 1 April 1983 (fl, fr), *G. Guarim Neto et al. 857* (UFMT 5435!); Barra do Garças, Distrito de Idianópolis, fazenda Brasil (divisa com Fazenda Roncador), 20 March 1997 (fl), *G.F. Árbocz et al. 3468* (UFMT 28518!); Cáceres, Vila Nova, 27 February 1986 (fr), *C.N. da Cunha et al. s.n.* (UFMT 11941!); Chapada dos Guimarães, 30 January 1989 (fl), *L. Krieger s.n.* (ESA093512 [photo!]); id., 13 February 1975 (fl, fr), *G.G. Hatschbach et al. 36132* (CORD!, MBM036081!); Comodoro, 21 March 2012 (fl), *E.C. Antunes & L.L. Antunes 90* (RB01064551 [photo!]); Cuiabá, Chapada dos Guimarães, 80 m acima da Cachoeira Véu da Noiva, 27 January 1989 (fl, fr), *T.B. Cavalcanti et al. 88* (UFG0046718 [photo!]); id., próximo ao Ribeirão Bandeira, 220 m, 22 March 1980 (fr), *D.L. Amaral 167* (NY02225549 [photo!], RB00628279 [photo!]); Nobres, 42 km de Diamantino em direção a Nobres, Serra do Tombador, 400 m, 17 May 1997 (fl, fr), *V.C. Souza et al. 16009* (UFMT 28512!); id., cerca de 30 km NE (em linha reta) de Nobres, BR-242, ca. 2 km do entroncamento com a BR-364/163, Serra da Caixa Furada, 19 May 1997 (fl, fr), *V.C. Souza et al. 16413* (ESA043596 [photo!], UFMT 28509!); id., km 128, Indústria de Cálcário ECOPLAN, 22 April 1983 (fl, fr), *C.N. da Cunha et al. 996* (UFMT 397!); Nova Xavantina, Caveira de Indio, approx. 10 km W of Xavantina on the N bank of the Rio das Mortes, 13 January 1977 (fl), *J.A. Ratter et al. 4113* (UB0013990!, UEC056179 [photo!]); Novo Mundo, Parque Estadual Cristalino, extremo leste da Serra do Rochedo, acesso pela Fazenda AJJ, 374 m, 25 January 2008 (fr), *D. Sasaki et al. 1863* (K000579624 [photo!]); id., propriedade particular de preservação ambiental delimitada pelo Parque Estadual Cristalino e pelos rios Teles Pires e Cristalino, próximo à Trilha da Serra, 338 m, 21 January 2007 (fl, fr), *D. Sasaki et al. 1356* (K000579659 [photo!], INPA 220129 [photo!], NY01146405 [photo!]); Poconé, Rod. BR-070, km 584, 4 May 1995 (fl, fr), *G.G. Hatschbach et al. 62237* (MBM185090!); Rosário Oeste, BR-364 Cuiabá - Rosário Oeste, ca. 15 km após Jangada, 21 April 1983, (fl, fr), *G. Guarim Neto et al. 909* (UFMT 398!); id., Fazenda N. Sra. Conceição, a 30 km da cidade na segunda entrada da estrada para manso, 15 February 2008 (fl), *A.L. Prado et al. 8501* (UFMT 39469!); id., id., id., 2 Feb 2008 (fl), *A.L. Prado et al. 8525* (UFMT 39455!); id., id., id., 300, 22 March 2008 (fl, fr), *A.L. Prado et al. 8647* (UFMT 39514!); Santa Cruz do Xingu, Parque Estadual do Xingu, limite norte do Parque, 260 m, 3 March 2011 (fr), *D.C. Zappi et al. 3085* (RB00621669 [photo!]); Santo Antônio do Leverger, estrada para Barão de Melgaço, 2 February 2002 (fl, fr), *L.S. Kinoshita et al. 2002/51* (UEC056172 [photo!]).

Taxonomical notes:—*Cipura paludosa* subsp. *robusta* was poorly described by Ravenna (1988), and is distinguished from the typical subspecies by the robust habit (*ca.* 50 cm *vs.* 10–40 cm tall for *C. paludosa* subsp. *paludosa*), the thick, resinous bulb (35 mm wide *vs.* rarely resinous, 8–20 mm diameter), and the long, firmly plicate leaves (29–40 cm *vs.* 16–27 cm long). Although the measurements form a rough continuum, *C. gigas* could be distinguished by its narrower basal leaves (2.5–5 mm *vs.* (2–4)8–10 mm) and shorter cauline leaves (4–13 cm *vs.* 13–25 cm long). We examined many specimens from Bolivia at USZ Herbarium, most of which were difficult to identify as either *C. paludosa* subsp. *robusta* or *C. gigas* due to contrasting characteristics, which sometimes fit with one taxon or the other. Further investigations are needed to clarify the morphological distinction between both species and to better define their taxonomic circumscription.

While *Cipura paludosa* subsp. *paludosa* has a much broader distribution, *C. paludosa* subsp. *robusta* has been reported only in the states of Mato Grosso and Pará (Brazil). However, its occurrence in Pará requires further confirmation through additional collections, since one paratype (*Pires et al. 6266* (UB)) is doubtful, and the other (*Purça-Pires 6106* (NY)) has not been located.

Nomenclatural notes:—Ravenna (1988) cited six different collections from Mato Grosso and Pará (Brazil) in the protologue, and designed the collection *Ravenna 677* held at Ravenna's Herbarium as the holotype, with one isotype at K. We were unable to locate any of the specimens of the *Ravenna 677* collection. Among the paratypes, only *Irwin et*

al. 16000 (K, NY, UB, US) and *Pires et al.* 6266 (UB) were found. However, the identification of the collection *Pires et al. 6266* (UB) from Pará is questionable. Therefore, we selected the specimen *Irwin et al. 16000* (UB0014160!) as the lectotype, as it is a well-preserved and complete specimen characteristic of the taxon, collected within its natural distribution range (Turland *et al.* 2018, Art. 9.12). Although the specimen was twice determined as yellow-coloured *Cipura,* the label clearly stated that the perianth is lavender-blue, with inner segments featuring a median yellow line with lateral purple bars, traits typical of *C. paludosa.*

10. *Cipura paradisiaca* Ravenna (1988: 37) (Fig. 2H)

Lectotype (designated here):—BRAZIL. Goiás: Chapada dos Veadeiros, 20 km W of Veadeiros, 1000 m, 11 February 1966 (fl, fr), *H.S. Irwin et al. 12554* (UB0037106!; isolectotypes: INPA 84705 [photo!]; MO-143702 [photo!]; NY00910373 [photo!]; U.1343756 [photo!]).

Conservation status:—Endangered (EN, B2ab(iii)) according to the IUCN Red List guidelines (IUCN 2024). *Cipura paradisiaca* meets the area requirements for threatened under criterion B2 (AOO < 500 km^2). The number of locations is fewer than ten and the extent of occurrence (EEO < 20,000 km^2) is declining, along with the quality of habitat due to intensive grain monoculture and extensive low-tech livestock farming in the Cerrado Biome. However, the species occurs in the Chapada dos Veadeiros National Park (Goiás), one of the most important protected areas of the Brazilian Cerrado.

Examined material:—BRAZIL. Goiás: Alto Paraíso de Goiás, 13 km da cidade, em direção à São Jorge, 1170 m, 9 February 2002 (fl), *R. Schütz Rodrigues et al. 1410* (UEC096402 [photo!]); id., 15 km N, 1 March 1982 (fl, fr), *P.I. Oliveira & W.R. Anderson 492* (MBM075962!, MEXU 1221261 [photo!]); id., 27 km by road N of Alto Paraíso, 1750 m, 9 March 1973 (fl, fr), *W.R. Anderson et al. 6710* (UB0037107!); id., 9 March 2013 (fl), *A.J.C. Aguiar 19* (UB0014434!); id., 9 March 2013 (fl, fr), *A.J.C. Aguiar 20* (UB0014431!); id., 9 March 2013 (fl), *A.J.C. Aguiar 21* (UB0014436!); id., Água fria, ca. 6 km Alto Paraíso p/ Teresina de Goiás, Chapada dos Veadeiros, road to Cavalcante, 1200 m, 6 December 1997 (fl, fr), *C. Munhoz et al. 604* (UB0014427!); id., Alto Paraíso, arredores, 1100 m, 1 December 1992 (fl), *G.G. Hatschbach & E. Barbosa 58340* (MBM156917!); id., ca. 8 km NW of Veadeiros, road to Cavalcante, 1200 m, 22 October 1965 (fl, fr), *H.S. Irwin et al. 9467* (UB0014429!); id., Chapada dos Veadeiros, 13 km by road S of Terezina, 1000 m, 16 March 1973 (fl, fr), *W.R. Anderson et al. 7259* (NY00910436 [photo!], UB0037105!); id., id., 5 km E of Alto Paraíso, 1500 m, 24 January 1979 (fl), *B. Gates & G.F. Estabrook 34* (RB00627273 [photo!], UB0037104!); id., id., ca. 35 km north of Alto Paraíso de Goiás, 1000 m, 14 March 1969 (fl, fr), *H.S. Irwin et al. 24320* (MO-1437405 [photo!], NY00910375 [photo!], U.1343757 [photo!], UB0037103!); id., id., ca. 10 km west of Alto Paraíso de Goiás, 1000 m, 24 March 1969 (fl, fr), *H.S. Irwin et al. 24975* (NY00910362 [photo!], U.1343758 [photo!], UB0037108!); id., Estrada Alto Paraíso a Campo Belo, km 8, 28 November 1976 (fl, fr), *G.J. Shepherd et al. 3719* (MBM052560!, UEC056170 [photo!]); id., Fazenda Mato Fundo, 1200 m, 16 October 1990 (fl, fr), *G.G. Hatschbach et al. 54675* (MBM140578!); Minaçu, canteiro de obras da UHE, local exatamente acima do túnel que será a casa de máquinas (turbina), 500 m, 10 December 1991 (fl), *B.M.T. Walter et al. 960* (CEN00015614 [photo!]); São Domingos, Saída da fazenda dos alageanos, em direção à Estiva, 12 March 2004 (fl, fr), *A.A. Santos et al. 2325* (CEN00055254 [photo!]); Teresina de Goiás, ca. 40 km de Teresina de Goiás, 370–425 m, 23 February 2003 (fl), *F. França et al. 4637* (HUEFS0070571 [photo!]); id., Chapada dos Veadeiros, 13 km by road S of Terezina, 1000 m, 16 March 1973 (fl, fr), *W.R. Anderson et al. 7259* (NY00910436 [photo!], UB0037105!).

Taxonomical notes:—*Cipura paradisiaca* is a yellow-flowered *Cipura* that vegetatively resembles *C. xanthomelas*, differing in its flowers, which have inner tepals about two-thirds the length of the outer, with a concave and horizontal limb projecting outwards. In contrast, flowers of *C. paradisiaca* are more similar to those of *C. kalunga*, but the species can be distinguished by the shape of the leaves and terminal bracts, which are lanceolate, in contrast to the filiform leaves of the latter. The species is known exclusively from the state of Goiás (Brazil).

Nomenclatural notes:—The description of *C. paradisiaca* was based on eight collections from Goiás. The collection *Ravenna 500* at Ravenna's Herbarium was designated as the holotype, with isotypes reported at BM, K, MBM, NY and UB. However, we were unable to locate the *Ravenna 500* collection elsewhere. Therefore, a lectotype designation was necessary. The paratype *Irwin et al. 12554* (UB0037106!) was selected as the lectotype because it is a characteristic and well-preserved specimen (Turland *et al.* 2018, Art. 9.12).

11. *Cipura rupicola* Goldblatt & Henrich (1987: 337)

Type:—VENEZUELA. Amazonas: Atures, 90 m, 23 June 1984 (fl, fr), *G. Davidse & J.S. Miller 26437* (MO-3472629 [photo!]; isotypes: COL000000154!]; K000363174 [photo!]; NY00319359 [photo!]).

Conservation status:—Critically endangered (CR, B1ab(i,iii)) according to the IUCN Red List guidelines (IUCN 2024). *Cipura rupicola* meets the area requirements for threatened under criterion B1 (EEO < 100 km^2). The number of locations is fewer than five, and both the extent of occurrence and habitat quality are estimated to be declining. The species' conservation status should be reassessed following more extensive collection efforts along the Colombia-Venezuela border.

Examined material:—VENEZUELA. Amazonas: Atures, carretera Pto. Ayacucho Samariapo, km 11, afloramiento "Piedra La Tortuga" al lado occidental de la carretera, 3 May 1993 (fl), *A. Gröger 887* (MO-4374012 [photo!]); id., id., 14 July 1993 (fl, fr), *A. Gröger 974-B* (MO-4606031 [photo!]); id., en terreno algo humedo en los alrededores de las rocas, 88 m, 24 May 1940 (fl), *L. Williams 13099* (US barcode 00701880 [photo!]; id., granitic lajas just S of Puerto Ayacucho, 90–100 m, 7 July 1991 (fl, fr), *P.E. Berry 5065* (MO-3918774 [photo!], K002084947 [photo!], WIS v0339572 [photo!]); id., Puerto Ayacucho, 100 m, 18 May 1940 (fl, fr), *L. Williams 12967* (US barcode 00701888 [photo!]); id., Puerto Zamuro, bords de l'Orénoque, July 1887 (fl, fr), *A. Gaillard 118* (P02067882!).

Taxonomical notes:—*Cipura rupicola* is a bright yellow-flowered species from the region surrounding the Orinoco River, along the Colombia-Venezuela border. Although all known collections were made in Venezuela, further investigations are needed to determine whether the species also occurs on the Colombian side, especially within El Tuparron National Park, which lies adjacent to the river. The descriptions of *C. rupicola* and *C. paradisiaca* show very similar morphological measurements, and a comparative study is necessary to clarify the distinctions between both species.

12. *Cipura xanthomelas* Mart. ex Klatt (1882: 362) (Fig. 2I)

Lectotype (designated here):—BRAZIL. Piauí: São Gonçalo do Amarante, May [1819] (fl, fr), *K.F.P. Martius* (M-0244328 [photo!]).

= *Cipura xanthomelas* subsp. *flavescens* Ravenna, Onira 1: 40. 1988. Type:—BRAZIL. Goiás: Alto Paraíso, December 1966, *P. Ravenna 501* (Ravenna's Herbarium, missing).

= *Cipura flava* Ravenna, Revista Inst. Munic. Bot. 2: 52. 1964. Lectotype (designated here):—BRAZIL. Goiás: inter Natividadem et Porto Nacional, November 1962 (fl, fr), *P. Ravenna 155* (K000363177 [photo!]).

Conservation status:—Least Concern (LC). The species is widespread and populations typically consist of numerous individuals. Therefore, it does not meet the criteria for being considered threatened.

Examined material:—BRAZIL. Bahia: Abaíra, Agua Limpa, 1200 m, 8 March 1992 (fl, fr), *B. Stannard et al. H51774* (HUEFS 58794 [photo!], MO-1438513 [photo!]); Correntina, Fazenda Jatobá, estrada da fazenda Salgada, 4 March 1991 (fl, fr), *L.G. Viollati et al. 248a* (UB0013973!); Piatã, Abaíra, Campo de Ouro fino (baixo), 1600–1700 m, 6 February 1992 (fl), *E.M. Nic Lughadha et al. H51050* (HUEFS 58795 [photo!], MBM 267003!, MO-1438512 [photo!]); id., Chapada Diamantina, caminho para Três Morros Ponto 01, 1304 m, 2 May 2009 (fl, fr), *M.L. Guedes et al. 15133* (ALCB006276 [photo!]); Ceará: Aiuaba, Estação Ecológica de Aiuaba, 20 June 1984, (fr), *J.G.B. Oliveira s.n.* (EAC0012648 [photo!]); Aquiraz, Ferreira / Caponga da Bernarda, 10 June 2001, (fr), *A.S.F. Castro s.n.* (EAC0030783 [photo!]); Eusébio, APA do Rio Pacoti, trilha do Centro de Estudos Ambientais Costeiros (CEA/UFC), 24 April 2018, (fl), *S.T. Rabelo et al. 35* (EAC0063208 [photo!]); id., id., id., 30 May 2018, (fr), *S.T. Rabelo & F.V.S. Gomes 135* (EAC0063158 [photo!]); Fortaleza, Cidade dos Funcionários, 7 June 1993, (fl, fr), *I.M.B. Sá s.n.* (EAC0020792 [photo!]); id., fragmento de vegetação de cerca de 25 ha na zona urbana de Fortaleza, bairro Cambeba, 15 May 2008, (fr), *M.F. Moro 548* (EAC0043976 [photo!]); id., fragmento de vegetação de cerca de 25 ha na zona urbana, adjacente à Av. Oliveira Paiva, pertencente aos Correios, bairro Cambeba, 15 May 2008, (fr), *M.F. Moro 555* (EAC0043975 [photo!]); id., Parque Estadual Botânico do Ceará, 13 July 2018, (fl, fr), *V.S. Sampaio et al. 577* (EAC0064283 [photo!]); id., Sítio São José pertencente à EAC (Escola de Agronomia) / Campus do PICI, 6 June 1946, (fr), *P. Bezerra s.n.* (EAC0024852 [photo!]); id., Independência, Escola Família Agrícola Dom Fragoso, 9 May 2014, (fr), *A.C. Cavalcante 195* (CEN00086746 [photo!]); Distrito Federal: Brasília, à margem do Lago de Brasília, 5 December 1965, (fl, fr), *E.P. Heringer 10778* (UB0014371!); id., B.G.P. Brasília, 22 January 1966 (fl, fr), *E.P. Heringer 11009* (NY00910419 [photo!], UB0014368!); id., Bacia do rio São Bartolomeu, 19 January 1981 (fl, fr), *E.P. Heringer et al. 5988* (MO-1437411 [photo!]); id., Chapada da Contagem, 1300 m, 4 January 1974 (fl, fr), *E.P. Heringer 13071*

(UB0014369!); id., id., 31 December 1974 (fl, fr), *E.P. Heringer 14253* (UB0014376!); id., id., ca. 15 km E of Brasília, 1000 m, 8 January 1966 (fl, fr), *H.S. Irwin et al. 11460* (MO-1434940 [photo!], NY00910374 [photo!], UB0013987!, UB0013988!); id., cidade satélite de Gama, 20 March 1967 (fl), *E.P. Heringer 11385* (UB0014367!); id., Cristo Redentor, 10 January 1990 (fl), *D. Alvarenga & E.C. Lopes 592* (UB0014374!); id., DF-3 rodovia, 6 November 1976 (fl), *A.C. Allem 375* (CEN00000375 [photo!]); id., estrada Anápolis a Brasília, km 50, 26 November 1976 (fl, fr), *G.J. Shepherd et al. 3620* (UEC056165 [photo!]); id., estrada para Sobradinho, 22 January 2003 (fl, fr), *J.F.B. Pastore et al. 302* (CEN00051022 [photo!]); id., Fazenda Água Limpa, arredores da sede, 10 November 1986 (fl), *L.E. Belmok 19* (UB0014375!); id., Fazenda Sucupira, 14 December 2010 (fl), *E.B.A. Dias et al. 732* (CEN00075197 [photo!]); id., id., 2 February 2007 (fl, fr), *G.D. Vale et al. 310* (CEN00085218 [photo!], UB0014365!); id., id., Cerrado ao lado da estrada, antes da ponte, 4 December 2006 (fl), *G.D. Vale et al. 239* (CEN00085202 [photo!]); id., id., na borda da mata do córrego Riacho Fundo, próximo à entrada das parcelas de fitossociologia, 1100 m, 20 December 2000 (fl), *E.S.G. Guarino et al. 546* (CEN00039645 [photo!], ESA 119229 [photo!]); id., id., lado direito da estrada principal da fazenda, beirando o córrego (perto das casas), 1070 m, 15 June 1999 (fl), *J.G. Faria et al. 200* (CEN00038443 [photo!]); id., id., Riacho Fundo I, 1050 m, 14 Fev 2004 (fl), *F.F.O. Pereira et al. 67* (UB0014381!); id., Fazenda Sucupira/Embrapa, 18 December 2007 (fl, fr), *C.A.S. Correia 178* (UB0014372!); id., Fundação Zoobotânica, 2 March 1961 (fl, fr), *E.P. Heringer 8048/239* (UB0014370!); id., id., 22 February 1961 (fl, fr), *E.P. Heringer 7982/174* (UB0014379!); id., immediately E of Lago Paranoá, 975 m, 9 December 1965 (fl, fr), *H.S. Irwin et al. 11155* (NY00910366 [photo!], UB0014378!); id., lado direito da estrada que liga o Riacho Fundo ao restaurante da Fazenda Sucupira, 1100 m, 18 February 2000 (fl, fr), *E.S.G. Guarino & J.B. Pereira 29* (CEN00039129 [photo!], ESA 119952 [photo!]); id., Lago Norte, 1 February 2001 (fl, fr), *Z.J.G. Miranda 69* (CEN00037230 [photo!]); id., Memorial das Idades do Brasil, 2 December 2009 (fl, fr), *M.L. Ianhez & T. Nogales 62* (UB0014366!); id., Morro da Igrejinha, ca. 5 km, SSE of Planaltina, 1000 m, 18 February 1970 (fl, fr), *H.S. Irwin et al. 26378* (NY00910429 [photo!], UB0014373!); id., Parque do Gama, Centro Oeste, 30 November 1999 (fl, fr), *C. Proença et al. 2140* (UB0014380!); id., Parque Nacional de Brasília - estrada em frente ao portão 4, 1120 m, 1 December 2006 (fl), *J.R. Santos et al. 599* (CEN00076114 [photo!]); id., id., próximo à casinha verde - portão 8, 14 December 2006 (fl), *E.B.A. Dias et al. 323* (CEN00074832 [photo!]); id., id., 14 December 2006 (fl), *E.B.A. Dias et al. 331* (CEN00074840 [photo!]); id., id., área de coleta no entorno da antiga pista de ultraleve, 17 December 2011 (fl, fr), *C.R. Martins 1183* (CEN00080141 [photo!]); id., Parque Olhos d'Água, 20 February 1997 (fl), *A. Pires & K. Calago 220* (CEN00057157 [photo!]); Goiás: [Sanclerlândia], Estrada São Luis de Montes Belos - Córrego do Ouro, 3 March 1978 (fl, fr), *H. Magnago 47* (RB00627307 [photo!]); Abadiânia, Serra dos Pirineus, ca. 14 km S of Corumbá de Goiás, 975 m, 30 November 1965 (fl), *H.S. Irwin et al. 10779* (NY00910372 [photo!], UB0014454!); Água Fria de Goiás, Estação Repetidora de Telebrasília de Roncador, 1200 m, 30 November 1992 (fl), *G.G. Hatschbach et al. 58321* (MBM161587!); id., rod. DF-17, 35 km S de São João da Aliança, 18 March 1982 (fl, fr), *G.G. Hatschbach 44783* (MBM075961!); Alto Paraíso de Goiás, 43 km ao norte de Alto Paraíso de Goiás, Chapada dos Veadeiros, 1200 m, 24 January 1978 (fl), *G. Martinelli & P.P. Jouvin 3803* (RB00627283 [photo!]); Alvorada do Norte, Fazenda Cachoeira do Campo, 400 m, 5 December 2003 (fl), *G. Pereira-Silva et al. 8221* (CEN00077230 [photo!]); id., Fazenda Irmãos Gravia, 430 m, 6 December 2003 (fl, fr), *G. Pereira-Silva et al. 8239* (CEN00077243 [photo!]); Barro Alto [Santa Rita do Novo Destino], estrada de terra que sai da GO-342 para a Barra dos rios, Rios Maranhão e Almas, rumo a fazenda Pontal, área de influencia do AHE Serra da Mesa, 480 m, 8 February 1996 (fl, fr), *B.M.T. Walter et al. 3123* (CEN00027766 [photo!]); id., área da mineradora Anglo American Brasil, 663 m, 19 June 2008 (fl, fr), *F.G. Aquino et al. 51* (CEN00079312 [photo!]); id., área da mineradora Anglo American Brasil, 663, 29 May 2008 (fl, fr), *F.G. Aquino et al. 166* (CEN00079422 [photo!]); id., site 1, collected from the vicinity of the mine works, about 22 km SSW of B.A. on the dirt road (or 30 km via the sealed highway), 820–850 m, 20 January 2005 (fl), *R.D. Reeves et al. 2841* (CEN00079566 [photo!]); Caiapônia, abandoned fazenda, ca. 45 km S of Caiapônia, on road to Jataí, 800–1000 m, 28 October 1964 (fl), *H.S. Irwin & T.R. Soderstrom 7485* (COL 134068!, NY00910367 [photo!]); id., arredores, 19 November 1975 (fl, fr), *G.G. Hatschbach 37712* (MBM048114!); id., id., ca. 40 km S of Caiapônia on road to Jataí, 800-1000 m, 31 October 1964 (fl), *H.S. Irwin & T.R. Soderstrom 7654* (UB0014450!); id., Serra dos Caiapós, a 40 km de Amorinópolis para Rio Verde, 22 January 1972 (fl, fr), *J.A. Rizzo & A. Barbosa 7499* (UFG0007800 [photo!]); Caminho de Serra Dourada, 26 January 1968 (fl), *Eunice et al. s.n.* (UB0013965!); Campinaçu, assentamento Vale do Bijuí, área nativa próxima à estrada de terra no sentido Assentamento - Campinaçu, 561 m, 9 February 2011 (fl, fr), *B.M.T. Walter et al. 6085* (CEN00077941 [photo!]); Catalão, ca. 25 km NE of Catalão, 875 m, 21 January 1970 (fl, fr), *H.S. Irwin et al. 25052* (NY00910431 [photo!], UB0013978!); id., GO-330, km 285, 10 February 2000 (fl), *G.G. Hatschbach et al. 69964* (MBM250737!); Cavalcante, 2 km a leste da ponte sobre o rio Tocantins, em direção à Cavalcante, área de influência da futura Hidrelétrica de Cana Brava, 350 m, 20 February 2002 (fl, fr), *G. Pereira-Silva et al. 5872* (CEN00044151 [photo!]); id., após o canteiro de

obras da barragem de Cana Brava, cerca de 2,5 km do eixo da barragem, na direção do Rio do Carmo, futuro reservatório da hidrelétrica Cana Brava, 170 m, 23 January 2001 (fl), *B.M.T. Walter et al. 4756* (CEN00058695 [photo!]); id., Chapada dos Veadeiros, ca. 10 km south of Cavalcante, 1000 m, 7 March 1969 (fl, fr), *H.S. Irwin et al. 23968* (MO-1434937 [photo!], NY00910363 [photo!], U.1343732 [photo!], UB0014443!); id., id., 1800 m, 21 December 1968 (fl, fr), *M. Graziela et al. 626* (UB0013960!); id., Cidade Ocidental, 990 m, 12 December 1982 (fl, fr), *R.A.C. Neto 5* (UB0013985!); Cocalzinho de Goiás, 25 km N of Corumbá de Goiás on road to Niquelândia, in valley of rio Corumbá, 1150 m, 13 January 1968 (fl, fr), *H.S. Irwin et al. 18503* (MO-2434978 [photo!], NY00910430 [photo!], RB00627293 [photo!], UB0014444!); id., Fazenda Bombaça, proprietário Isidóreo, 1115 m, 23 March 2002 (fl), *M.L. Fonseca et al. 3291* (ESA 85140 [photo!]); id., localidade de Areias, ca. 20 km da BR 414, 1262 m, 23 November 2011 (fl), *R.C. Forzza et al. 6726* (CEN00082731 [photo!], RB00730406 [photo!]); Colinas do Sul, estrada Serra da Mesa/Colinas, ca. de 10 km do portão do canteiro de obras, 500 m, 11 March 1992 (fl), *T.B. Cavalcanti et al. 1188* (CEN00018039 [photo!], RB00628291 [photo!]); id., Rod. GO-327, rio Tocantinzinho, 21 January 1992 (fl, fr), *G.G. Hatschbach et al. 56318* (MBM148465!, MO-1437404 [photo!]); Corumbá de Goiás [Pirenópolis], topo do Pico dos Pireneus, serra do Catingueiro, 6 km de Cocalzinho, 1380 m, 14 January 1981 (fl, fr), *E. Nogueira et al. 63* (UB0013984!, UB0014447!); id., 15 km N of Corumbá de Goiás on road to Niquelândia, Goiás in valley of Rio Corumbá, 1150 m, 15 January 1968 (fl, fr), *H.S. Irwin et al. 18629* (MO-1434939 [photo!], NY00910433 [photo!], RB00627235 [photo!], U.1343731 [photo!], UB0014445!); id., Serra dos Pirineus, ca. 20 km E of Pirenópolis, 1000 m, 14 January 1972 (fl), *H.S. Irwin et al. 34081* (NY00910434 [photo!], UB0014451!); Cristalina, 3 km N of Cristalina, 1250 m, 3 March 1966 (fl, fr), *H.S. Irwin et al. 13367* (NY00910426 [photo!], UB0013977!); id., estrada para Cachoeira do Arrojado, 24 January 1988 (fl), *G.G. Hatschbach & J. Cordeiro 51806* (MBM125578!, MO-1437409 [photo!]); id., RPPN Linda Serra dos Topázios, centro oeste, 6 January 1996 (fl, fr), *C. Proença & G.L. Moretto 1357* (UB0014174!); estrada de Goiânia a Anápolis, km 42, 26 November 1976 (fl), *G.J. Shepherd et al. 3585* (UEC056167 [photo!]); estrada rio Traíras/rio Custódio, km 2, 280 m, 28 November 2006 (fl, fr), *G. Pereira-Silva & G.A. Moreira 11147* (UFG0046709 [photo!]); Faina, Serra de Santa Rita, no distrito de Jeroaquara, 29 January 1972 (fl), *J.A. Rizzo & A. Barbosa 7524* (UFG0007797 [photo!]); Flores de Goiás, 22 December 2012 (fl), *A.J.C. Aguiar 9* (UB0014441!); id., 22 December 2012 (fl, fr), *A.J.C. Aguiar 10* (UB0014440!); id., rod. BR-020, 2-3 km S de JK, 22 January 1997 (fl), *G.G. Hatschbach et al. 66100* (MBM210387!); Formosa, 1 km W of Formosa, 925 m, 20 November 1965 (fl), *H.S. Irwin et al. 10572* (NY00910435 [photo!], UB0013964!); id., Río Paraná, ca. 35 km N of Formosa on road to São Gabriel, 950 m, 29 March 1966 (fr), *H.S. Irwin et al. 14216* (UB0014182!); Fralda da Serra Dolrada [Dourada], 10 January 1966 (fl, fr), *E.P. Heringer 10867* (in part) (UB0014180!); Goiânia, à direita da GOM-9, para Nerópolis 15 km de Goiânia, 1 January 1969 (fl, fr), *J.A. Rizzo & A. Barbosa 3296* (UFG0000936 [photo!]); id., estrada velha para Guapo, 16 December 1975 (fl), *E.F. Guimarães et al. 294* (RB00627318 [photo!]); Goianira, a 2 km da margem esquerda do Rio Meia Ponte, na fazenda Louzandira, 21 February 1970 (fl, fr), *J.A. Rizzo & A. Barbosa 4721* (UFG0004980 [photo!]); id., km 14 da rodovia Goiânia para Inhumas, 27 December 1968 (fl, fr), *J.A. Rizzo & A. Barbosa 3099* (UFG0001697 [photo!]); Goiás Velho, Serra Dourada, 18 December 1968 (fl), *M. Graziela et al. 765* (UB0013959!); id., id., 20 km SE of Goiás Velho, 800 m, 19 January 1966 (fl), *H.S. Irwin et al. 11769* (MEXU 225439 [photo!], MO-1434938 [photo!], NY00910428 [photo!], UB0013961!); id., id., 21 January 1966 (fl), *E.P. Heringer 10947* (NY00910371 [photo!], UB0013986!); id., id., 21 January 1966 (fl, fr), *E.P. Heringer 10932* (UB0013962!); Hidrolândia, Morro Feio, 903 m, 5 January 2007 (fl), *J.F.B. Pastore & I.C. Nascimento 1710* (HUEFS0117519 [photo!]); Hidrolina, Rod. Belém-Brasília, km 194, 30 January 1976 (fl, fr), *G.G. Hatschbach & Ramamoorthy 38201* (MBM048111!); Ipameri, in aeródromo, 16 January 1940 (fl), B. Rambo SJ s.n. (PACA 3403!); Luziânia, Estrada Luziânia - Vianópolis, 14 March 1978 (fl, fr), *H. Magnago 237* (RB00627279 [photo!]); Minaçú, estrada Minaçú - Usina, subindo a esquerda, logo antes da guarita a mais ou menos 2 km para baixo, na usina da Serra da Mesa, 28 January 1997 (fl), *M.C. Assis et al. 400* (CEN00034779 [photo!]); Morrinhos, Est. Morrinhos, 28 November 1970 (fl), *J.A. Rizzo & A. Barbosa 5750* (UFG0005850 [photo!]); Mundo Novo, assentamento Escarlete, sítio São Francisco, lote 41, proprietário Paulo Francisco de Oliveira, área de reserva do assentamento, contigua ao sítio, 420 m, 10 February 2011 (fl, fr), *B.M.T. Walter et al. 6089* (CEN0077945 [photo!]); Niquelândia, Bucaina, 19 January 1992 (fl, fr), *G.G. Hatschbach et al. 56237* (MBM156920!, MEXU 990144 [photo!], NY00910421 [photo!]); id., ca. 15 km S of Niquelândia, 1000 m, 22 January 1972 (fl), *H.S. Irwin et al. 34788* (NY00910376 [photo!], UB0014184!); id., ca. 8 km S of Niquelândia, 750 m, 23 January 1972 (fl), *H.S. Irwin et al. 34859* (COL 159074!, MO-1434934 [photo!], NY00910377 [photo!], UB0013939!); id., Companhia de Níquel Tocantins, 6 January 1993 (fl), *R.C. Mendonça 2074* (MO-1437401 [photo!]); id., km 17 da rodovia para Colinas, 19 January 1992 (fl), *G.G. Hatschbach et al. 56262* (MBM156929!); id., lago em processo de enchimento no AHE Serra da Mesa, áreas sobre o trecho final do rio Tocantinzinho, reservatório em formação do AHE Serrada Mesa, 420 m, 29 November 1996 (fl, fr), *B.M.T. Walter et al. 3609* (CEN00031767 [photo!], ESA 49214 [photo!]); id.,

Macedo, ca. 8 km da estrada a direita da mina de níquel, 1410 m, 28 November 1996 (fl), *M.L. Fonseca et al. 1370* (ESA 61735 [photo!]); id., id., ca. de 5 km a esquerda da mina de níquel, 1080 m, 22 November 1997 (fl, fr), *M.L.M. Azevedo et al. 1176* (MO-1437412 [photo!]); id., id., estrada à esquerda da mina passando por baixo do teleférico, 13 December 1995 (fl), *M.L. Fonseca et al. 697* (MO-1437403 [photo!]); id., site 1, southernmost ultrametric hill of Tocantins Complex, approx. 3 km N of centre of Niquelândia, 760 m, 1 February 2005 (fl), *R.D. Reeves et al. 2896* (CEN00079621 [photo!]); Nova Roma, Fazenda Patos, ca. 7 km da cidade em direção a Iaciara, entrada do lado esquerdo da estrada com mata burro, depois mais 2 km até o cerradão ao lado da sede da fazenda, 415 m, 2 March 2000 (fl, fr), *M.A. Silva et al. 4328* (ESA 93516 [photo!]); Olho d'Agua do Vente, dans le Chapadão de Porto Seguro, 27 December 1894 (fl, fr), *A.F.M. Glaziou 22198* (MO-1434935 [photo!], NY00910379 [photo!], P02065179!, P02065180!, P02065181!); Parque Estadual da Serra dos Pireneus, 20 December 2003 (fl), *S.C. Miranda et al.* 808 (UB0014438!); id., Pirenópolis, 4 February 1995 (fl, fr), *H.D. Ferreira 3134* (UFG0018072 [photo!]); id., 4 February 1995 (fr), *H.D. Ferreira 3135* (UFG0018073 [photo!]); id., no km 350, Serra dos Pireneus, 23 February 1995 (fl, fr), *G.H. Monteiro 112* (UFG0016752 [photo!]); id., Parque Estadual dos Pireneus, 15 km da base da Serra, 1273 m, 19 July 2007 (fr), *R.C. Forzza et al. 4521* (MBM343133!, RB00494997 [photo!]); id., id., 1230 m, 27 November 2002 (fl), *M.L. Fonseca et al. 3815* (UB0013968!); id., Serra dos Pireneus, 1350 m, 8 December 1987 (fl, fr), J. *Semir et al. 20531* (ESA 108197 [photo!], UB0014449!); id., id., 14 km do trevo de Anápolis e Goiânia em direção ao Parque, 1175 m, 19 January 2005 (fl, fr), *J. Paula-Souza et al. 4181* (ESA 89719 [photo!]); id., id., alto da serra, 14,5 km do centro da cidade, 20 March 1996 (fl), *R. César et al. 360* (UFG0019252 [photo!]); id., id., Fazenda Solar dos Pireneus, 12 February 2000 (fl, fr), *G.G. Hatschbach et al. 70012* (MBM250739!); id., trecho Pirenópolis/Serra dos Pireneus (saída da Serra), 740 m, 26 November 1987 (fl), *L.A. Skorupa et al. 221* (CEN00015214 [photo!]); Samamabaia, rio Corumbá, 120 km de DF, 8 January 1967 (fl), *E.P. Heringer 11275* (UB0013965!); Santa Rita de Araguaia, arredores, 16 November 1973 (fl), *G.G. Hatschbach & C. Koczicki 33289* (MBM028729!, MO-1437407 [photo!], NY00910423 [photo!]); São Domingos, Fazenda Flor do Ermo, Linha U, 22 January 2001 (fl, fr), *A.C. Sevilha & A.B. Sampaio 2086* (CEN00059785 [photo!]); id., saída da fazenda dos alagoanos, em direção à Estiva, beira da estrada, 12 March 2004 (fl, fr), *A. Amaral-Santos et al. 2325* (UFG0046716 [photo!]); São João d'Aliança, 10 km N São João d'Aliança, 18 February 1975 (fl), *G.G. Hatschbach et al. 36251* (COL 263780!, MBM036074!, NY00910410 [photo!]); Serra Dourada, 1968 (fl, fr), *A. Rizzo 4658* (RB00327276 [photo!]); Urutaí, Río Corumbá, estrada para Pires do Rio, 15 February 1964 (fl), *E.P. Heringer 9568/1747* (NY00910378 [photo!], RB00627284 [photo!], UB0014176!); Vianópolis, Granja Samambaia, rio Corumbá, 18 January 1967 (fl, fr), *E.P. Heringer 11297* (UB0013971!, UB0014190!); Maranhão: Balsas, Condomínio Kissy, Gerais de Balsas, lote 23, 470 m, 10 January 1982 (fl, fr), *G. Pereira-Silva 4198* (CEN00039999 [photo!], ESA 119083 [photo!], UFG0028818 [photo!]); Estreito, canteiro de obras da UHE Estreito (próximo ao porto da balsa), 150 m, 11 March 2007 (fl, fr), *G. Pereira-Silva & G.A. Moreira 11372* (CEN00067609 [photo!]); id., estrada Estreito - São Pedro dos Crentes, km 63, 350 m, 9 January 2008 (fl, fr), *G. Pereira-Silva & G.A. Moreira 12449* (CEN00068028 [photo!]); Imperatriz, "Bananal", 15 km south of Imperatriz along Belém-Brasília highway (BR-010), 290 m, 29 February 1980 (fl, fr), *T. Plowman et al. 9306* (MO-1437408 [photo!], NY00910411 [photo!]); Mato Grosso: Bom Jesus do Araguaia, 35 km to N along road from base camp, 18 October 1968 (fl), *R. Castro 10718* (NY00910425 [photo!], P01772548!, UB0014442!); BR-70 prox. Botoru, km 234, 23 November 1993 (fl), *M. Macedo et al. 3431* (INPA 177222 [photo!]); Cuiabá, Chapada, ca. km 23, 8 December 1974 (fl), *E.M. Lamonica Freire 38* (RB00627282 [photo!]); id., Coxipó, ca. 10 km depois da Chácara Roselândia, 18 October 1983 (fl), *N. Saddi et al. 3373* (RB00627259 [photo!]); id., Ribeirão da Motuca, 14 November 1975 (fl), *G.G. Hatschbach 37525* (MBM048105!, NY00679982 [photo!]); km 183, Xavantina-Cachimbo road, 20 November 1967 (fl), *D. Philcox et al. 3147* (NY00910424 [photo!]); km 247, Xavantina-Cachimbo road, 5 January 1968 (fl, fr), *D. Philcox & A. Fereira 3896* (UB0014458!); km 254, Xavantina-Cachimbo road, 18 December 1967 (fl), *D. Philcox et al. 3557* (UB0013976!); Nova Xavantina, 4.5 km S of Xavantina, 29 December 1967 (fl, fr), *D. Philcox & A. Fereira 3738* (NY00910370 [photo!], P01772583!, RB00627320 [photo!], UB0013970!); id., 5 km from Xavantina, near village of Olaria, 21 November 1967 (fl), *D. Philcox et al. 3197* (UB0014455!); região entre Barra do Garças e Campinápolis, 21 February 1997 (fl, fr), *G.F. Árbocz et al. 3293* (ESA 065338 [photo!]); Ribeirão Cascalheira, "Correga do Gato" c. 51 km along the road, South of "Base Camp", 17 October 1968 (fl), *R.M. Harley et al. 10704* (UB0014456!); id., Barra do Garças, 260 km along new road NNE of village of Xavantina, at Royal Society-Royal Geographic Society Base Camp, 450 m, 7 December 1969 (fl), *G. Eiten & L.T. Eiten 9797* (NY00910368 [photo!], P01772586!); id., near the base camp of the expedition (ca. 270 km N of Xavantina), October–November 1967 (fl), *J. Ramos & R. Sousa 135* (NY00910369 [photo!], P02067873!); Santa Cruz do Xingu, Parque Estadual do Xingu, limite norte do parque, 266 m, 3 March 2011 (fr), *D.C. Zappi et al. 3072* (RB00621626 [photo!]); Mato Grosso do Sul: Corumbá, Serra do Amolar, Fazenda Mandioré, 30 March 2003

(fl), *M.V.C. Santos et al. 118* (UFMT 26306!); Tocantins [Maranhão]: Tocantinópolis [Estreito], canteiro de obras da AHE Estreito, margem direita do rio Tocantins, 230 m, 18 February 2005 (fl, fr), *G. Pereira-Silva et al. 9299* (CEN00066461 [photo!]); Minas Gerais: Brasilândia de Minas, 6 January 2001 (fl), *S.M. Soares 320* (ESA 101691 [photo!]); Cabeceira Grande, região da ponte sobre o rio Preto, a 29 km do entroncamento BsB/Unai/Palmital, na direção de Palmital, divisa DF/MG, área de influência do futuro reservatório do AHE Queimado, 850 m, 14 February 2002 (fl, fr), *B.M.T. Walter et al. 5033* (CEN00043406 [photo!]); Capinópolis, 14 January 2001 (fl, fr), *M.C. Macedo s.n.* (MBM283369!); Delfinópolis, estrada para "Casinha Branca", próx. entrada Faz. Águas da Serra, 12 March 2003 (fr), *R.A. Pacheco et al. 507* (HUFU 30854 [photo!], UB0013972!); id., estrada para Sacramento, ca. 14 km de Delfinópolis, 630 m, 9 January 1996 (fl), *V.C. Souza et al. 9866* (ESA 27379 [photo!]); *Illegible*, 6 December 1944 (fl, fr), *A. Macedo 2425* (MO-1437413 [photo!]); Paracatú, 17 km E of Rio Paracatú, 850 m, 11 February 1988 (fl), *W.W. Thomas et al. 5892* (NY00910422 [photo!]); id., Serra da Anta, ca. 10 km N of Paracatú, 900 m, 6 Fev 1970 (fl), *H.S. Irwin et al. 26144* (MO-1434936 [photo!], NY00910432 [photo!], RB00627303 [photo!], UB0013975!); Pirapora, December 1937 (fl, fr), *C.E.M Burret & A.C. Brade 15957* (RB00627798 [photo!]); Prata, estrada entre a BR 153 e Campina Verde, 3 km da Rodovia em direção a Campina Verde, 660 m, 15 January 2005 (fl, fr), *J. Paula-Souza et al. 3825* (ESA 89339 [photo!]); Sacramento, Represa de Furnas, fazenda próxima à barragem de Estreito, 2 March 1992 (fl, fr), *M.A. Kawall 117* (NY00910420 [photo!]); Uberlândia, rod. BR-050, Tejuco, 850 m, 6 February 1994 (fl, fr), *G.G. 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Sampaio et al. 513* (CEN00042774 [photo!], MBM270541!, UB0013981!); Miracema [Divinópolis do Tocantins], 22 km a oeste de Monte Santo vira para o sul 9 km, perto do Rio Maroto, 28 September 1984 (fl), *M. Faulkner Bean 451* (UB0013969!); Palmas, margem da rodovia TO-010, km 20, 29 October 1996 (fl), *G.F. Árbocz 6184* (UB0013982!, UB0013983!); id., sub-bacia do Ribeirão São João, 26 October 2006 (fl), *C.B. Pereira & E.R. Santos 612* (HUTO 644 [photo!]); Palmeirante, Cascalheira na saída de Palmeirante, após a reserva, 186 m, 18 November 2010 (fl), *J.B. Pereira & J.P. Amaral 291* (CEN00087564 [photo!]); Palmeiras do Tocantins, estrada do rio Curicaca, a partir da BR-153, km 3,5, marcado do povoado, 200 m, 12 January 2008 (fl, fr), *G. Pereira-Silva & G.A. Moreira 12545* (CEN00068123 [photo!]); id., estrada vicinal à Ferrovia Norte Sul, km 18, 190 m, 21 February 2005 (fl, fr), *G. Pereira-Silva et al. 9479* (CEN00066622 [photo!]); Paranã, Fazenda São João, Prop. Aldair Freire, Ponto 15, 342 m, 26 March 2004 (fl), *A.C. Sevilha et al. 3781* (CEN00060940 [photo!]); id., ponto 27 da fitossociologia, Fazenda São João, Prop. Aldair Freire, 333 m, 29 March 2001 (fl, fr), *A.C. Sevilha et al. 3938* (CEN00061210 [photo!]); Pequizeiro, de Pequizeiro a Couto Magalhães, 30 km antes de Couto Magalhães, 12 November 1973 (fl, fr), *J.A. Rizzo 9435* (UFG0009435 [photo!]); Porto Nacional, 10 January 2007 (fl), *M.G. Joelma & T.L. Shirlene s.n.* (UFG0046683 [photo!]); São Felix do Tocantins, Chapada das Mangabeiras, 21 March 1978 (fl, fr), *J.G. Assis 34* (RB00627314 [photo!]).

Taxonomical notes:—*Cipura xanthomelas* is the most widely distributed yellow-flowered species of *Cipura*. It occurs from North to Southeast Brazil, in the states of Pará, Tocantins, Bahia, Ceará, Maranhão, Pernambuco, Piauí, Distrito Federal, Goiás, Mato Grosso and Minas Gerais. The plants often produce multiple rhipidia and can be easily recognized by the inner tepals, which have an erect, inward-projecting limb with a revolute apex marked by conspicuous black spots on the distal tip.

Nomenclatural notes:—Klatt's publication quoted "*C. xathomelas* Mart. in Observ. Nº 2517" and two collections from Brazil, one made by Martius in São Gonçalo do Amarante (in the state of Piauí) and another by Regnell in Minas

Gerais. We were unable to locate Regnell's collection; however, we found Martius' collection at M (M-0244328 [photo!]), which includes his handwritten notes on the species' morphology, and referring to the observation 2517 of the unpublished manuscript *Observationes botanicae, Plantae in itinere Brasiliensi annis 1817–1820 a Car. Frid. Phil. Martio descriptae*, vol. 1–6. This specimen was designated as the lectotype of *C. xanthomelas*, according to the *Code* (Turland *et al.* 2018, Art. 9.12, Recommendation 9A.3).

Cipura xanthomelas subsp. *flavescens* was described based on the absence of carotenoids in the flowers and the possible presence of flavonoids, in contrast to the typical subspecies, which flowers contain carotenoids (Ravenna 1988). The type specimen was registered at Ravenna's Herbarium, with isotypes available. However, since the entire collection of Ravenna's personal herbarium should be considered lost (García *et al.* 2024) and no additional collections or experimental data were available to support the recognition of this taxon, we regarded the subspecies as a synonym of *C. xanthomelas.*

A single collection (*Ravenna 155*) from Goiás (Brazil) and held at Ravenna's Herbarium was cited in the protologue of *Cipura flava*, with one isotype at K. Due to the unavailability of specimens from Ravenna's Herbarium, the collection available at K (K000363177 [photo!]) was designated as the lectotype (Turland *et al.* 2018, Art. 9.12).

13. Taxonomic key to *Cipura* taxa

1. Flowers yellow ..... 2.
- Flowers blue to violet, lavender or white ..... 6.
2. Basal leaves less than 5 mm wide ..... 3.
- Basal leaves more than 5 mm wide, usually more than 1 cm wide ..... 4.
3. Plants less than 24 cm tall; leaves filiform; terminal bract (1.5–)3.0–10(–12.4) cm long; rhipidium two-flowered; plants only known from Brazil ..... *Cipura kalunga*
- Plants 24–49 cm tall; leaves linear; terminal bract 15–26 cm long; rhipidium one-flowered; plants only known from Cuba ..... *Cipura insularis*
4. Style branches without crests or appendages; plants only known from Colombia or Venezuela ..... *Cipura rupicola*
- Style branches with abaxial and adaxial crests; plants only known from Brazil ..... 5.
5. Inner tepals much shorter than the outer; limb erect projected to the center of the flower; apex revolute with conspicuous black markings on the top ..... *Cipura xanthomelas*
- Inner tepals about 2/3 of the outer; limb concave, horizontal, projected to the outside of the flower; apex not revolute and without conspicuous black markings on the top ..... *Cipura paradisiaca*
6. Flowers white ..... 7.
- Flowers blue to violet or lavender ..... 10.
7. Outer and inner tepals of approximately the same length ..... *Cipura cubensis*
- Outer and inner tepals of different lengths, inner tepals at least 1/3 shorter than outer ..... 8.
8. Style arms 6.1–7.3 mm long; adaxial crests up to 2.5 mm long ..... *Cipura mestrensis*
- Style arms absent; adaxial crests absent or less than 1 mm long ..... 9.
9. Inner tepals erect and imbricate, strongly concave, hiding the androgynoecium and with yellow trichomal elaiophores ..... *Cipura paludosa*
- Inner tepals erecto-patent and not imbricate, not hiding the androgynoecium and without trichomal elaiophores ..... *Cipura inornata*
10. Inner tepals erect and imbricate, strongly concave ..... 11.
- Inner tepals porrect, not imbricate, geniculate-reflex ..... 13.
11. Plants usually less than 30 cm tall; bulbs 30–35 mm diameter, not resinous; stem less than 15 cm long ..... *Cipura paludosa*
- Plants more than 50 cm tall; bulbs 15–20 mm diameter, resinous; stem 20–84 cm long ..... 12.
12. Basal leaves 2.5–5 mm wide; cauline leaf 4–13 cm long; plants from Brazil and Bolivia ..... *Cipura paludosa* subsp. *robusta*
- Basal leaves 8–10 mm wide; cauline leaf 13–25 cm long; plants from Colombia and Venezuela ..... *Cipura gigas*
13. Leaves (6–)10.5–20.3(–26.5) cm long; terminal bract 2.4–5.1(–8) cm long; flower *ca.* 70 mm diameter; outer tepals patent to slightly reclinate ..... *Cipura formosa*
- Leaves (23–)31.5–54.8(–66.2) cm long; terminal bract 17.3–33.7(–47) cm long; flower 31.5–38.7(–50.3) mm diameter; outer tepals ascending ..... *Cipura mestrensis*

Discussion

This study presents the most comprehensive molecular phylogeny to date of the genera *Cipura* and *Larentia*, with a set of taxonomic samples covering most of the species diversity and range area of each genus. Both genera are monophyletic and form a sister clade to the remaining genera of Tigridieae included in clade A of the tribe (*sensu* Chauveau *et al.* 2012). Such phylogenetic placements are fully consistent with previous tree topologies (Goldblatt *et al.* 2008, Chauveau *et al.* 2012). Furthermore, combined phylogenetic analyses of plastid and nuclear markers clarify species

relationships within *Cipura*, revealing two major lineages distinguished by inner tepal morphology. The genus *Cipura* is currently represented by 12 taxa, including two subspecies of *C. paludosa* and the two species newly described (*i.e. C. kalunga* and *C. mestrensis*), all supported by molecular and/or morphological evidence. Species bearing exclusively white flowers, such as *C. cubensis* and *C. inornata*, present particularly complex taxonomies, complicated further by historical fluctuating synonymies. Reexamination of the *C. cubensis* type specimen and morphological reevaluation of associated specimens support the priority of this name over *C. campanulata*, while the taxonomic status of *C. inornata* remains uncertain. Nevertheless, *C. inornata* is provisionally maintained as distinct species, since no evidence has been provided to support its synonymy with *C. cubensis*. The observed morphological and molecular variation among specimens identified as *C. cubensis* (Fig. 1, Fig. 2C) and *C.* cf. *cubensis* (Fig. 1, Fig. 8), including Brazilian collections, suggests that this name may encompass several distinct taxa. The possibility of a species complex within *C. cubensis* calls for further investigations. Similarly, the morphological variations identified among different populations of *C. formosa* (Fig. 7), coupled with the clear phylogenetic distinction between samples of *C. formosa* and *C.* cf. *formosa* (Fig. 1), indicates previously underestimated diversity within this species. Understanding the mechanisms underlying the phenotypic plasticity registered among populations of *C. cubensis* and *C. formosa*, including potential adaptive and ecological shifts, can shed light on the diversification and evolution of these taxa. For instance, polyploidy, which is a significant driver of Iridaceae evolution, can lead to drastic changes in phenotypic traits or ecological preferences within a few generations (Stiehl-Alves *et al.* 2024). Different studies have highlighted the existence of polyploid series within four species of Tigridieae (Kenton & Heywood 1984, Alves *et al.* 2011, Moraes *et al.* 2015, Carvalho 2022), with phenotypic plasticity associated with ploidy variation in three of them (Alves *et al.* 2011, Stiehl-Alves *et al.* 2016, 2024, Carvalho 2022). Interspecific hybridization, another key process in Iridaceae diversification and speciation, has been particularly documented in *Crocus* (Mosolygó-Lukács *et al.* 2016, Raca *et al.* 2023) and *Iris* (Xiao *et al.* 2021, Park *et al.* 2022, Choi & Jang 2024). Such hybrids often exhibit intermediate morphological traits relative to their putative parents (Mosolygó-Lukács *et al.* 2016, Choi & Jang 2024). Future research incorporating broader sampling and integrating cytogenetic and ecological data will be crucial to refine our understanding of the intraspecific diversity observed within several species of *Cipura*. Overall, this study reveals substantial morphological and molecular diversity within the genus, often obscured by incomplete or historical inaccurate classifications. The recognition of new species, clarification of synonymies, and the unveiling of cryptic lineages highlight the evolutionary complexity of *Cipura* and underscore the need for integrative taxonomic approaches.

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