Harpalyce greuteri (Leguminosae: Brongniartieae), a new species from eastern Cuba, with a synopsis of and key to the Cuban species of the genus

Authors: Rodríguez, Rosa Rankin, and González Gutiérrez, Pedro Alejandro

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Novitiae florae cubensis No. 55

ROSA RANKIN RODRÍGUEZ[1*] & PEDRO ALEJANDRO GONZÁLEZ GUTIÉRREZ[2]

Harpalyce greuteri (*Leguminosae*: *Brongniartieae*), a new species from eastern Cuba, with a synopsis of and key to the Cuban species of the genus

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Abstract: *Harpalyce greuteri* is described as a new species from the serpentine outcrops of Holguín in eastern Cuba. It differs from other Cuban species of the genus by having leaflets alternate along the rachis, an elliptic, rounded or slightly acuminate standard petal, mostly black keel petals and broadly linear wing petals. An illustration and a distribution map of the new species are presented, as well as a synopsis of and an identification key to all 14 recognized species of *H.* sect. *Cubenses*. Lectotypes are designated for nine species names in *Harpalyce*.

Key words: *Brongniartieae*, Cuba, endemism, *Fabaceae*, *Harpalyce*, *Harpalyce* sect. *Cubenses*, *Leguminosae*, serpentine, taxonomy

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Introduction

Harpalyce Sessé & Moc. ex DC. is a neotropical legume genus that occurs in Mexico, Mesoamerica, Cuba and Brazil (Arroyo 1976). *Harpalyce* species are shrubs or trees, with multicellular glandular trichomes, imparipinnate leaves and papilionaceous flowers with a strongly bilabiate calyx, dimorphic anthers (five larger and basifixed and five smaller and dorsifixed), internally septate and usually compressed pods, and strophiolate seeds (Arroyo 1976; São-Mateus & al. 2016, 2018b). Phylogenetic studies (e.g. Queiroz & al. 2010, 2017) place the monophyletic *Harpalyce* as the sister group to *Tabaroa* L. P. Queiroz & al. plus *Amphiodon* Huber in *Brongniartieae*, a geographically disjunct tribe comprising a group of tropical American genera along with a group of Australian genera (Ross & Crisp 2005) and the African *Haplormosia* (Cardoso & al. 2017). The number of *Harpalyce* species has increased substantially since Arroyo's (1976) monograph, which recognized 20 species. Field work and herbarium studies have added newly described species. Currently there are

1 Jardín Botánico Nacional, Universidad de la Habana, Carretera "El Rocío", km 3.5, Calabazar C.P. 19230, Boyeros, La Habana, Cuba; *e-mail: rosarankin@fbio.uh.cu; r.rankin@bgbm.org (author for correspondence).
2 Centro de Investigaciones y Servicios Ambientales de Holguín (CISAT), CITMA, Calle 18 sn, entre 1ª y Maceo, Reparto "El Llano", Holguín 80 100, Cuba; e-mail: pagg@cisat.cu; pagg74@yahoo.es

eight species recognized in Mexico and Mesoamerica (São-Mateus & al. 2018b), 12 in Brazil (São-Mateus & al. 2016, 2018a, 2019) and 14 in Cuba (Borhidi & Muñiz 1977, updated here), so that the total number of *Harpalyce* species is now 34.

Arroyo (1976) recognized three sections in *Harpalyce*: *H.* sect. *Harpalyce* (Mexico and Mesoamerica), *H.* sect. *Brasilianae* Rydb. (Brazil) and *H.* sect. *Cubenses* Rydb. (Cuba). She commented that the Cuban representatives, i.e. *H.* sect. *Cubenses*, are characterized by minute, thick bracteoles that are inserted on the pedicel at least 1 mm beneath the calyx, while the flowers exhibit an extraordinary variation in shape, size and texture. The Cuban species show a great diversity in petal colour (Fig. 1).

Arroyo (1976) recorded seven species from Cuba. Borhidi & Muñiz (1977), who did not refer to the work of Arroyo (1976), recognized 17 Cuban species. The Cuban *Harpalyce* grow in all three Cuban phytogeographic subprovinces: western, central and eastern Cuba (Borhidi 1991, 1996), but most of them are endemic to serpentine outcrops (or rarely to limestone) of what we here consider as northeastern Cuba, extending from Sierra de Nipe (Holguín Province) to Baracoa (Guantánamo Province), and typically growing in the formations known as "cuabales" and "charrascales" (xeromorphic, thorny or sub-thorny thickets on serpentine soils) (Arroyo 1976; Borhidi & Muñiz 1977; Capote & Berazaín 1984; Borhidi 1991, 1996). In eastern Cuba, only two species are not exclusive to serpentine subsoil: *H. maisiana* León & Alain (from southeastern Cuba) grows only on soils derived from limestone, while *H. nipensis* Urb. has populations growing on serpentine and limestone substrates. Northeastern Cuba is characterized by extensive serpentine outcrops, of c. 1 million to c. 30 million years of age, which form "islands" separated by geographic barriers, such as rivers, and different kinds of substrates, such as limestone. The geological diversity of Cuba, among other factors, is believed to be a major cause of the island's floristic diversity, which is particularly high in northeastern Cuba, the area that has the highest number of Cuban endemics (Borhidi 1991, 1996).

In 2009, a *Harpalyce* population located near Bahía de Naranjo was studied, but all plants were sterile, as were other collections from the same and neighbouring localities of the serpentine outcrops of Holguín Province. In May 2019, the Bahía de Naranjo population was encountered in flower for the first time (Fig. 2) and in June 2021, in fruit. The flowers, when studied morphologically and compared with specimens and photographs of all other *Harpalyce* species stored in Cuban herbaria, confirmed that the Bahía de Naranjo plant was an undescribed species. Here we revise the published information on *Harpalyce* in Cuba. The new species is described below and its differences from other Cuban species are set out, and a synopsis of and an identification key to the 14 Cuban species is presented.

Material and methods

Protologues of all Cuban species of *Harpalyce*, as well as all relevant taxonomic literature (León & Alain 1951; Arroyo 1976; Borhidi & Muñiz 1977) were consulted.

About 170 specimens (including duplicates) of Cuban *Harpalyce* housed in the Cuban herbaria BSC, HAC, HACC, HAJB, HMC and at the herbarium of the Botanical Garden of Holguín (lacking a herbarium code) were studied, particularly the type specimens in HAC and HAJB. Duplicates of some materials housed in HAJB were also seen in B and PAL-Gr. Images of other specimens (including types) belonging to the collections of A, F, GH, GOET, JE, K, MO, NY, P, S, UC and US were consulted online or as photographs sent by the curators of some of the herbaria. Herbarium codes follow Thiers (2019+). For information about all specimens seen, see Appendix 1 in the Supplemental content online.

Some species were studied in the field or in cultivation, or from photographs kindly provided by colleagues to complement previous incomplete descriptions, some based on almost sterile specimens. IUCN (2017) categories and criteria were used to evaluate the conservation status of the new species.

Results and Discussion

Taxonomy of the new species

Harpalyce greuteri R. Rankin & P. A. González, **sp. nov.** – Fig. 2–4.

Holotype: Cuba, Prov. Holguín, municipio Rafael Freyre, al este de la Bahía de Naranjo, camino al restaurante "conuco de Mongo Viña", matorral xeromorfo espinoso sobre serpentina, 21°06'00.78"N, 75°52'14.60"W, 10 m a.s.l., 30 May 2019 [flowers], *P. A. González 1905-1* (HAJB #1216!; isotypes: B #101115510!, PAL-Gr #128204!, herbarium of Botanical Garden of Holguín!).

Description — Shrubs or small trees, 2–3 m tall; young branches ferruginous tomentose, old branches glabrous, grey. *Stipules* c. 1 mm long, ferruginous pubescent, caducous. *Leaves* 7–9 cm long, imparipinnate; petiole 8–12 mm long, ferruginous pubescent; rachis 6–8 cm long, ferruginous pubescent; *leaflets* 9–17 per leaf, alternate or subopposite (Fig. 2B, 3A), with a 0.5–1.5 mm long petiolule, lamina oblong or elliptic, 1.5–2.5 × 0.7–1.5 cm, pale green in living plants, ferruginous pubescent on both surfaces when very young, later glabrescent, abaxially covered with shiny, orange glands (Fig. 3B) and ferruginous hairs, later glabrescent except on midvein, subcoriaceous, pale brown abaxially and greyish brown adaxially when dry, base cuneate, rounded or slightly cordate, margin entire, slightly revolute, apex rounded to emarginate; midvein abaxially prominent and ferruginous pubescent, adaxially immersed, sec-

Fig. 1. Flowers of some Cuban species of *Harpalyce*. – A: *H. macrocarpa*, cultivated in the Botanical Garden of Villa Clara, Feb 2014; B: *H. suberosa*, cultivated in the National Botanical Garden of Cuba in La Habana, Feb–Mar 2012; C: *H. ekmanii*, Prov. Holguín, Moa, Cayoguan, Nov 2020; D: *H. acunae* (old flower), Prov. Holguín, Mayarí, Sierra de Nipe, Jan 2020; E: *H. villosa*, Prov. Holguín, Moa, El Toldo, Apr 2015; F: *H. nipensis*, Prov. Holguín, Sierra de Nipe, Aug 2020. – Photographs: A by Alejandro Pérez Obregón; B by Nils Köster; C–F by Pedro A. González Gutiérrez.

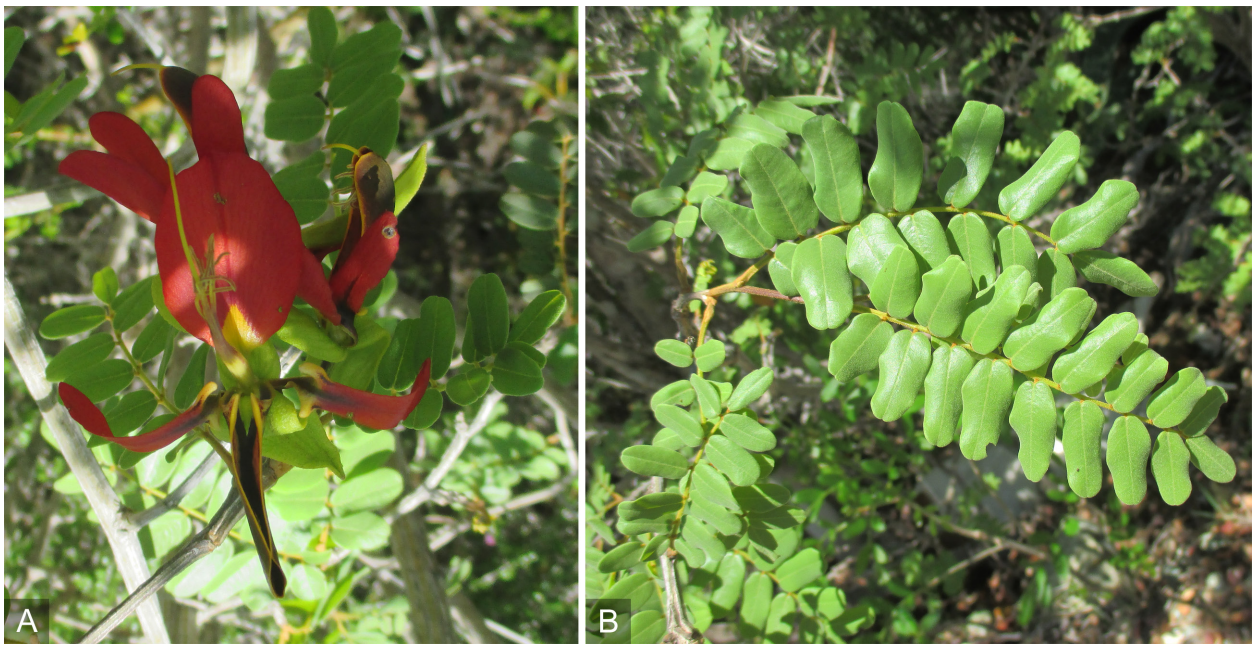

Fig. 2. *Harpalyce greuteri* – A: flower; B: leaves. – Cuba, Prov. Holguín, Bahía Naranjo, 30 May 2019, photographs by Pedro A. González Gutiérrez.

ondary veins in 6–8 pairs, conspicuous abaxially. *Inflorescence* 1- or 2-flowered (Fig. 3A), in axils of distal leaves; peduncle c. 2 mm long, ferruginous tomentose; bracts 2–2.5 mm long, thick, ferruginous tomentose; pedicels 2–2.5 cm long, with ferruginous hairs. *Flowers* zygomorphic; *calyx lobes* long triangular, acute, with scattered, ferruginous hairs on outer surface, slightly ferruginous pubescent on inner surface, vexillary calyx lobe 2.4–2.5 × 1–1.2 cm, carinal calyx lobe 2.8–2.9 × c. 1.3 cm (Fig. 3F, G); *petals* membranous; *standard petal* elliptic, c. 2 × 1.4 cm, apically rounded or slightly apiculate, red, basally narrowed and yellow (Fig. 2A, 3A, C), with a pale green, c. 2.5 mm long claw; *wing petals* linear-spatulate, 2–2.3 × 0.3–0.4 cm, apically rounded, red tinged black toward 2-auriculate base, auricles yellow, vexillary auricle c. 2.5 mm long, carinal auricle 1–1.2 mm long, claw 4.5–5 mm long, black (Fig. 2A, 3A, E); *keel petals* connate along most of their length, c. 2.5 × 0.5 cm, apically rounded, mostly black and yellow-margined on outer surface, equally black and yellow on inner surface, basal auricle yellow, 1–2.5 mm long, claw c. 3.3 mm long, black (Fig. 2A, 3D). *Stamens* 10; filaments 2–2.2 cm long, fused into a basally pale green and apically pale red tube, free at apex for 1.5–2 mm (Fig. 2A); anthers linear, 4–6 mm long. *Pistil* 3.5–3.7 cm long; ovary fusiform, laterally compressed, c. 12 × 1.5 mm, glabrous, 5-ovulate; style filiform, curved, c. 2.5 cm long, glabrous (Fig. 3H). *Legume* linear-spatulate, 4–5 cm long, 0.6–1 cm wide distally, mucronulate, brown, 5–7-seeded. *Seeds* flattened, elliptic in outline, c. 4 × 3–3.5 mm, brown.

Note — Arroyo (1976: 69) recorded the presence of *Harpalyce cubensis* Griseb. in the region of Holguín in eastern Cuba, based on the sterile specimen *Ekman 7601* (NY, S, US). This specimen, collected by Ekman at El Paraíso, has leaflets mostly subopposite or alternate and belongs to *H. greuteri*. True *H. cubensis* has opposite leaflets.

Phenology — Collected in flower in May, in fruit in June.

Distribution, ecology and conservation status — *Harpalyce greuteri* is a narrow endemic of the phytogeographic Holguin district (districto holguinense, Borhidi 1991, 1996), in the province of Holguín in eastern Cuba (Fig. 4). It has been collected on the serpentine outcrops located east of Bahía de Naranjo, El Mocho, El Paraíso, Las Margaritas and San Marcos de Aura, in the municipalities of Báguanos, Gibara, Holguín and Rafael Freyre (Fig. 4, and see details in Appendix 1). The species occurs in xeromorphic, thorny thickets on serpentine bedrock, a formation known as "cuabales" in Cuba (Capote & Berazaín 1984), at elevations from 10 to 150 meters above sea level.

The recently sampled population of *Harpalyce greuteri*, located east of Bahía de Naranjo, comprises approximately 50 mature and immature individuals growing by a path that leads to a restaurant (conuco de Mongo Viña). Associated species include other Cuban endemic small trees or shrubs: *Buxus* L. spp., *Catesbaea* Gronov. spp., *Guettarda echinodendron* C. Wright, *Poitea* Vent. sp., *Stenostomum aristatum* Britton and *Tabebuia trachycarpa* (Griseb.) K. Schum. This is a tourist area and the whole population is potentially at risk from building work.

We also visited the other four areas where *Harpalyce greuteri* was previously collected, with the aim of accurately locating plants of the new species. San Marcos de Aura was visited in February 2020, but no plants of *H. greuteri* were found in the patches of "cuabales" oc-

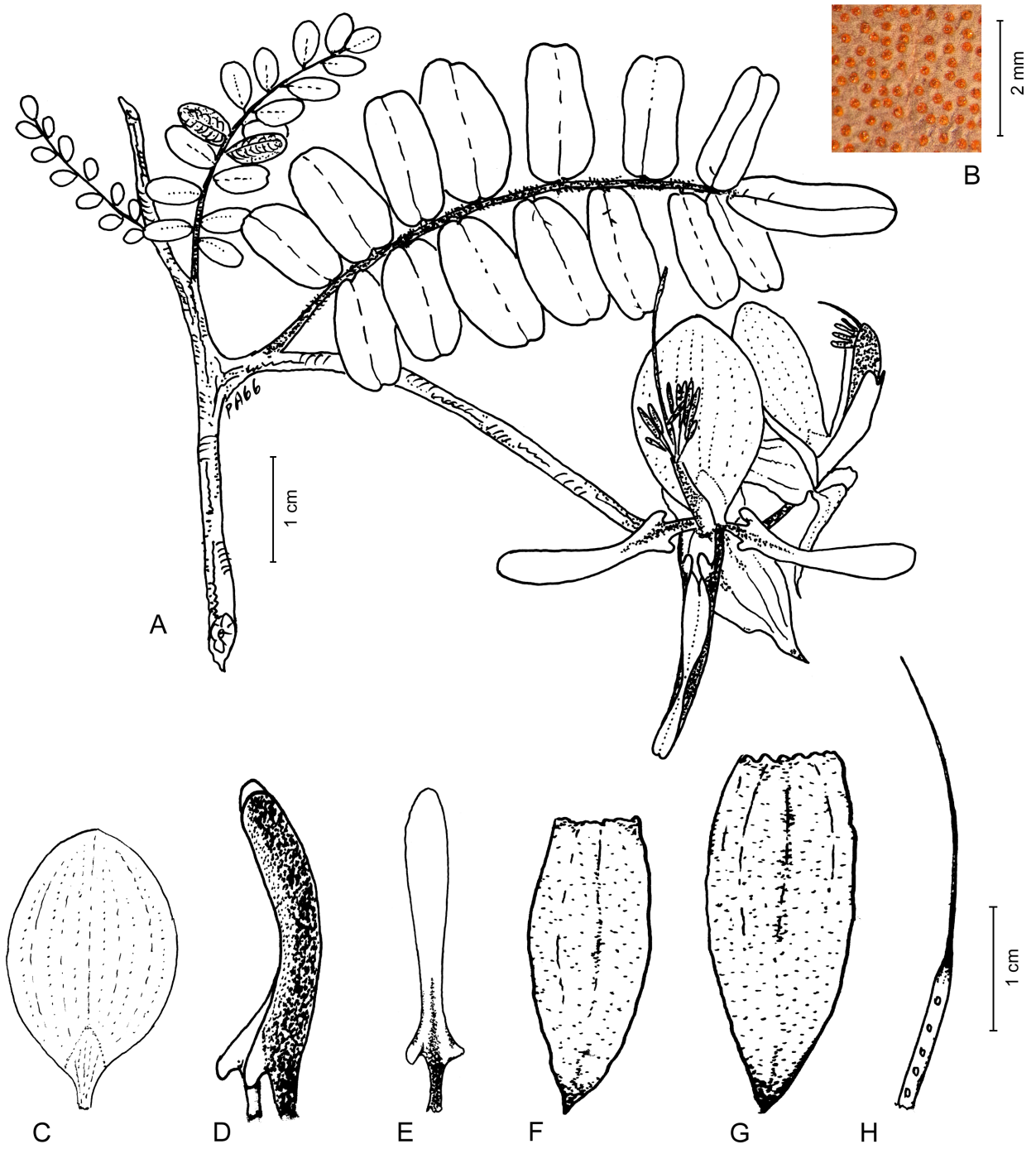

Fig. 3. *Harpalyce greuteri* – A: flowering branch; B: detail of a leaflet abaxial surface showing glands; C: standard petal; D: keel petals; E: wing petal; F: vexillary calyx lobe; G: carinal calyx lobe; H: pistil. – A, C–H: drawn by Pedro A. González Gutiérrez based on the holotype; B: photograph by Rosa Rankin Rodríguez, from *HFC 38180* (B).

curring there, which had been partially affected by selective logging and grazing. The locality El Paraíso was explored in September 2020; the whole area had been seriously damaged by fire and, unfortunately, we did not find a single plant of *H. greuteri* in the surviving patches of thicket. The localities Las Margaritas and El Mocho were explored in October and November 2020; in both places, the "cuabales" vegetation covers extensive areas and is well preserved, but, although several narrow endemics of Holguín's serpentine outcrops were seen, we did not spot any plants of *H. greuteri*. We surmise that the species has disappeared at El Paraíso due to human activities including fire, and it may have disappeared from San Marcos de Auras due to the effects of human impact. The good state of preservation of the vegetation at the localities Las Margaritas and El Mocho suggests that the species might survive there but, if so, it is very restricted in its distribution.

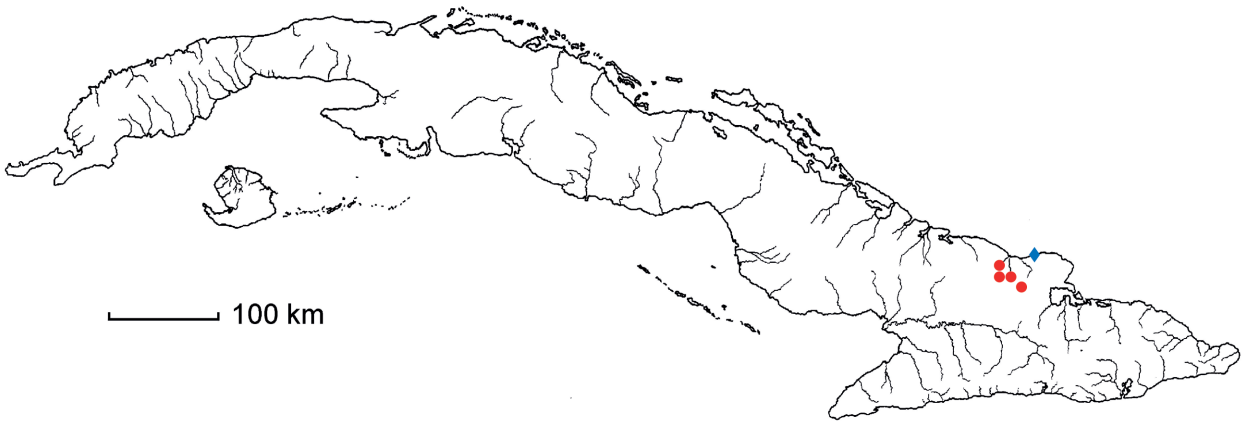

Fig. 4. Distribution of *Harpalyce greuteri*. The red dots indicate the localities where the species was previously collected but not relocated during our field work. The blue diamond indicates Bahía Naranjo, the type locality where the species has been relocated.

The distribution area of the species is very fragmented, and apparently very reduced from its former extent. The area of occupancy (AOO) in Bahía de Naranjo, where approximately 50 individuals occur, is less than 2 km^2. At the localities El Paraíso and San Marcos the species probably no longer exists. We estimate that in the other two well-preserved localities Las Margaritas and El Mocho there could be a similar number of plants as at Bahía de Naranjo, and we predict that the total number of surviving individuals of *Harpalyce greuteri* is approximately 150 and that the AOO in these two other well-preserved localities is each less than 2 km^2. Applying IUCN conservation assessment criteria (IUCN 2017), *H. greuteri* can be considered Endangered (EN) under the criteria B1ab (i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v). The existence of *H. greuteri* together with other narrowly restricted Cuban endemics, mentioned above, on this small patch of serpentine outcrop, deserves urgent conservation attention.

Etymology — The specific name honours Werner Greuter, supporter of investigations into the Cuban flora for over 20 years. He has contributed to more than 20 fascicles of *Flora de la República de Cuba* and is co-author of *Vascular plants of Cuba: a preliminary checklist* (Greuter & Rankin Rodríguez 2017).

Diagnostic characters — The partly red flower colour of *Harpalyce greuteri* groups the species with *H. cubensis*, *H. suberosa* Urb. and *H. macrocarpa* Britton & P. Wilson, from which it differs in having an oval, apically rounded standard petal (versus an oblong-spatulate, usually apically emarginate, bilobed or triangular-incised standard in *H. cubensis*, *H. suberosa* [Grisebach, 1866: 71; Urban 1926: 356] and *H. macrocarpa* [see Fig. 1A]). The black keel and partially black wings of *H. greuteri* have not been seen in flowers of *H. macrocarpa*, *H. suberosa* (Fig. 1A, B) or *H. cubensis* (herbarium specimen *HFC 46030* [HAJB] and others, listed in Appendix 1). The wing petals of *H. greuteri* are distinctly narrower than those of *H. macrocarpa*, *H. suberosa* (Fig. 1A, B) and *H. cubensis* (herbarium specimen *HFC 46030* [HAJB] and others, listed in Appendix 1). The leaflets of *H. greuteri* are typically alternate or subopposite, whereas in *H. macrocarpa*, *H. suberosa* and *H. cubensis* they are mostly in opposite pairs. The presence of alternate leaflets is not frequent in *Harpalyce* (Arroyo 1976), but is an outstanding characteristic of *H. greuteri*.

Additional specimens seen — Cuba: Holguín Province: Municipality Báguanos, "Las Margaritas, lomas al norte del pueblo", 150 m a.s.l., 5 Jun 1983 [sterile], *Bisse HFC 50791* (HAJB); *Bisse HFC 50798* (HAJB); Municipality Gibara, "loma de San Marcos de Aura", 6 Nov 1971 [sterile], *Bisse & al. HFC 20738* (HAJB); Municipality Holguín, "Oriente, Holguín, in carrascales at El Paraíso, solo eruptive", 26 Aug 1916 [sterile], *Ekman 7601* (NY #1619597); Municipality Rafael Freyre, "El Macho [Mocho], loma al S. O. del cerro Galano, cerca del arroyo Salvado", 30 Jan 1984 [sterile], *Bisse & Gutiérrez HFC 51808* (HAJB); "Loma del Naranjo, al este de la Bahía de Naranjo, serpentina (noreste de R. Freyre [= Sta Lucía])", 17 Oct 1978 [sterile], *Bisse & al. HFC 38180* (B #100362077, HAJB); [same locality] "Bahía de Naranjo, thickets on serpentine soils (cuabales)", 8 Jun 2021 [fruits], *González 2106-1 & Gómez* (B, HAJB, PAL-Gr, hebarium of Botanical Garden of Holguín).

General comments on Cuban *Harpalyce* species

The first species of *Harpalyce* described from Cuba was *H. cubensis* (Grisebach 1866). Five other species were subsequently described, two by Britton (1920) and three by Urban (1926). Urban (1926: 359), stated that unfortunately it was impossible to identify most of the specimens collected and sent from Cuba by Ekman, because they had been collected without flowers. He added that, due to the reduced number of leaflets, these sterile specimens did not fully match *H. cubensis*, and wondered whether they might perhaps correspond to new species. Among

the sterile specimens collected by Ekman is the one collected at El Paraíso, Holguín (*Ekman 7601*), which is here identified as *H. greuteri*.

León & Alain (1950) described three more species, based on specimens with inflorescences, flowers and fruits, except for *Harpalyce angustiflora* León & Alain that lacked fruits. In the second volume of their *Flora de Cuba*, León & Alain (1951) recognized all nine previously described species. León & Alain (1951: 303) also commented that the sterile specimen *León 11971* (HAC) collected at "Alto de la Mesa de Prada, Jauco, Oriente" (southeastern region of Cuba), with flexuous leaves and 27 leaflets per leaf evidently belongs to *Harpalyce*, but they never described that material as a new taxon.

Arroyo (1976) published the most complete treatment for *Harpalyce* to date. She commented (Arroyo 1976: 3) that the study of *H.* sect. *Cubenses* was based entirely on material in American and European institutions and excluded Cuban herbaria; she suggested that her treatment of *H.* sect. *Cubenses* be regarded as provisional. She recognized seven species from Cuba, proposed *H. angustiflora* as a variety of *H. ekmanii* Urb. and considered *H. suberosa* as a synonym of *H. cubensis*. The similarities and differences of *H. angustiflora* and *H. ekmanii* had previously been set out by León & Alain (1950: 13). Nevertheless, we agree with Arroyo (1976) in considering *H. angustiflora* and *H. ekmanii* as conspecific; further field work is necessary to assess the existence of varieties, or perhaps subspecies, within *H. ekmanii.*

While recognizing the close morphological similarity of *Harpalyce suberosa* with *H. cubensis*, we refrain from synonymizing them. In Cuban herbaria (HAC, HAJB) there are many specimens collected in Matanzas Province, often with flowers or fruits, that agree with the original description of *H. suberosa* and match the lectotype specimen of that name. There are also several specimens, collected in the locality Cajálbana in Pinar del Río Province, that show the species characteristics presented in the protologue of *H. cubensis* and match its lectotype specimen (*C. Wright 2303*, GOET #5024). Having compared the *H. cubensis* specimens from Pinar del Río Province with those identified as *H. suberosa* from the Matanzas and adjoining Mayabeque and La Habana Provinces, we note that *H. cubensis* has leaflets less ferruginous abaxially. A microscopic study of the abaxial leaflet surface showed that in *H. suberosa* the glands are much more abundant and more densely packed than in *H. cubensis*. Based on this difference, the discrete distributions and the morphological differences mentioned by Urban (1926: 357), we chose to maintain *H. suberosa* and *H. cubensis* as distinct species. Further field work, focused on the study of flowers, as well as molecular studies, will help to clarify their relationship.

Arroyo (1976) added data for, and improved the descriptions of, most of the species she recognized in her treatment; however, her description of *Harpalyce maisiana* is not fully accurate, because it includes characters of the specimen *León 11971* (NY), which is an isotype of *H. flexuosa*, a different species (see below).

Borhidi & Muñiz (1977) also published a sizeable contribution on Cuban *Harpalyce*. They described eight new species, two varieties and a forma, and accepted all Cuban species previously described. Their account includes a total of 17 species. They were probably unaware of, and did not cite, Arroyo's (1976) monograph published one year earlier. Unfortunately, among the eight new species published by Borhidi & Muñiz (1977), three are based on sterile specimens. Among the latter is *H. flexuosa* León & Alain ex Borhidi & O. Muñiz. The holotype of its name, *León 11971* in HAC, is a specimen of which the leaves were described by León & Alain (1951: 303). There are two sheets of *León 11971* in HAC, one originating from the herbarium La Salle (LS), the other from Herbarium Baker, Santiago de Las Vegas (SV) (Regalado & al. 2010); a third duplicate, in NY, was identified as *H. maisiana* by Arroyo (1976: 70). In B, HAJB and JE (under "HFC": Herbarium Florae Cubensis), there is material from the Jauco region of southeastern Cuba, matching the type of *H. flexuosa*: *HFC 5770*, *HFC 8006*, *HFC 17141* and *HFC 47735*. Two of these have axillary inflorescences with flower buds (*HFC 17141*) and flowers (*HFC 8006*) with a very small (2–3 mm long) obconic calyx and a corolla c. 1 cm long, clearly showing that they do not belong to *Harpalyce*, but to some other genus of *Leguminosae*. We therefore exclude *H. flexuosa* from the genus *Harpalyce*, leaving it unplaced generically for the time being. We similarly exclude *H. foliosa* Borhidi & O. Muñiz, another of Borhidi & Muñiz's (1977) sterile species, which shows obvious similarities with *H. flexuosa* and likely represents the same taxon. The third sterile species described by Borhidi & Muñiz (1977) is *H. moana* Borhidi & O. Muñiz, known only by the holotype specimen at HAC. This is a very weakly defined species, which in its sterile state cannot be reliably distinguished from the morphologically similar *H. baracoensis* Borhidi & O. Muñiz and *H. villosa* Britton & P. Wilson and is likely conspecific with one of them. We here provisionally treat *H. moana* as a synonym of *H. baracoensis*. Field work in the area of the *locus classicus* of *H. moana*, the former Potosí Mine, now severely degraded by mining, will hopefully result in the discovery of plants with flowers and/or fruits so as to test our hypothesis of synonymy.

In conclusion, we recognize 14 species of *Harpalyce* in Cuba. We refrain from recognizing any infraspecific taxa, although some were previously proposed, because more field work to collect material with flowers and fruits and, if possible, molecular studies are required to assess infraspecific taxon limits in Cuban *Harpalyce*.

Most Cuban *Harpalyce* species (11 out of 14) are endemic to northeastern Cuba where it is frequent to find two or more species growing in the same area; whereas only four species (*H. cubensis*, *H. greuteri*, *H. macrocarpa* and *H. suberosa*) grow in other parts of Cuba, from the eastern central region to the west, and have distribution areas that do not overlap.

Nomenclatural synopsis of other Cuban *Harpalyce*, with synonyms and excluded names

Harpalyce acunae Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 137. 1977. – Holotype: Cuba, Prov. Holguín, "en los charrascos de La Cantera, finca La Caridad, Sierra de Nipe", 26 Nov 1954, *López Figueiras 1722 LS #13525* (HAC ex LS!; isotype: HAJB #496!). – Fig. 1D.

Distribution — Northeastern Cuba, Prov. Holguín: Sierra de Nipe and Prov. Santiago de Cuba: Sierra Cristal, on serpentine.

Harpalyce alainii León in Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" 9: 14. 1950 ['*alaini*']. – Holotype: Cuba, Prov. Holguín, "Cayo Coco, Moa", 15 Apr 1945, *Acuña SV #12439* (HAC ex SV!; isotypes: HAC ex SV!, US #3819 [photo!]).

Distribution — Northeastern Cuba, Prov. Holguín: Sierra de Moa, on serpentine.

Harpalyce baracoensis Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 139. 1977. – Holotype: Cuba, Prov. Guantánamo, "charrascal de La Cuaba, Baracoa, Oriente", 14 Apr 1960, *López Figueiras UO #814* (HAC ex SV!; isotypes: HAC ex LS #19734!, HAJB #497!).

= *Harpalyce moana* Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 138. 1977. – Holotype: Cuba, Prov. Holguín, "Mina Potosí, Moa, Oriente", May 1968, *Samek SV #26819* (HAC ex SV!).
Note — A doubtful species, known only from the sterile type material.

Distribution — Northeastern Cuba, Prov. Holguín and Prov. Guantánamo: mountains and lowlands of Moa and Baracoa, on serpentine.

Harpalyce borhidii O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 134. 1977. – **Lectotype (designated here):** Cuba, Prov. Holguín, "charrascales de La Cueva, Pinar de Mayarí", 25 Feb 1956, *López Figueiras 2504 LS #13554* (HAC ex LS!; isolectotypes: HAC ex SV!, HAJB #498!).

Distribution — Northeastern Cuba, Prov. Holguín and Prov. Santiago de Cuba: Sierra de Nipe and Sierra del Cristal, on serpentine.

Harpalyce cristalensis Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 133. 1977. – Holotype: Cuba, Prov. Santiago de Cuba, "Sierra Saca la Lengua, Cristal, Oriente", 26–27 May 1955, *Acuña & Zayas SV #19671* (HAC ex SV!; isotype: HAJB #499!).

Distribution — Northeastern Cuba, Prov. Holguín and Prov. Santiago de Cuba: Sierra del Cristal, on serpentine.

Harpalyce cubensis Griseb., Cat. Pl. Cub.: 71. 1866. – **Lectotype (designated here):** Cuba, Prov. Artemisa, "Cuba occ.", 1863, *Wright 2303* = *1001* (GOET #5024 [photo!]; possible isolectotypes: GH #66174 [photo!], GOET #5025 [photo!], K #500754 [photo!], MO #277130 [photo!], NY ##11930–11932 [photos!], P ##2141721–2141722 [photos!], S #R-9399 [photo!], UC #937102 [photo!], US ##3862–3863 [photos!]).

= *Harpalyce cubensis* var. *cajalbanensis* Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 136. 1977. – Holotype: Cuba, Prov. Pinar del Río, "La Pelada de La Cajálbana, en cañadas", 2 Feb 1951, *Acuña [& Roig] SV #16601* ["*15601*", in error, in protologue] (HAC ex SV!; isotype: HAC ex LS #13543!).

Distribution — Western Cuba, Prov. Pinar del Río and Prov. Artemisa, on serpentine.

Harpalyce ekmanii Urb. in Repert. Spec. Nov. Regni Veg. 22: 358. 1926. – **Lectotype (designated here):** Cuba, Prov. Guantánamo, "Minas de Iberia ad Taco Bay", c. 800 m a.s.l., 7–8 Dec 1914, *Ekman 3788* (S #R-9400 [photo!]; isolectotype: NY #11933 [photo!]). – Fig. 1C.

= *Harpalyce angustiflora* León & Alain in Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" 9: 13. 1950 ≡ *Harpalyce ekmanii* var. *angustiflora* (León & Alain) Arroyo in Mem. New York Bot. Gard. 26: 76. 1976. – **Lectotype (designated here):** Cuba, Prov. Holguín, "cerca de la Mina Cromita, Cayoguan, Pta. [Punta] Gorda", 24 Jul 1944, *Clemente [& Alain] NSC #4070* (HAC ex LS #13528!; isolectotypes: GH #66173 [photo!], HAC ex LS!, HAC ex NSC #13529!).

Distribution — Northeastern Cuba, Prov. Holguín and Prov. Guantánamo: mountains of Moa and Baracoa, on serpentine.

Harpalyce macrocarpa Britton & P. Wilson in Mem. Torrey Bot. Club 16: 67. 1920. – **Lectotype (designated here):** Cuba, Prov. Villa Clara, "Palm barren, Santa Clara, border of arroyo", 8 or 9 Apr 1912, *Britton & Cowell 13284* (NY #11934 [photo!]; isolectotypes: F #59302F [photo!], GH #66175 [photo!], HAC ex LS!, US #3857 [photo!]). – Fig. 1A.

Distribution — Central Cuba, Prov. Villa Clara, Prov. Cienfuegos, Prov. Sancti Spiritus, Prov. Ciego de Ávila and Prov. Camagüey, on serpentine.

Harpalyce maisiana León & Alain in Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" 9: 15. 1950. – **Lectotype (designated here):** Cuba, Prov. Guantánamo, "al sur de Maisí, Oriente", Jun or Jul 1939, *León [& Prudencio Matos] LS #19032* (HAC ex LS!; isolectotypes: GH #66176 [photo!], HAC ex LS!, HAC ex SV!).

Distribution — Northeastern Cuba, Prov. Guantánamo, on limestone.

Harpalyce nipensis Urb. in Repert. Spec. Nov. Regni Veg. 22: 357. 1926. – **Lectotype (designated here):** Cuba, Prov. Holguín, "Oriente: Sierra de Nipe, in charrascales at the Sojo trail, arbor parva", c. 700 m a.s.l., 16 Oct 1919, *Ekman 9962* (S #R-9401 [photo!]; isolectotype: NY #11935 [photo!]). – Fig. 1F.

= *Harpalyce nipensis* var. *lanceolata* Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 137. 1977 ['*lanceolatus*']. – Holotype: Cuba, Prov. Santiago de Cuba, "charrascos del río Miguel", 2–7 Apr 1956, *Alain 5880, Acuña & López Figueiras* (HAC ex LS #13541!; isotype: HAJB #500!).

Distribution – Northeastern Cuba, Prov. Holguín and Prov. Santiago de Cuba: several localities, on serpentine and limestone.

Harpalyce suberosa Urb. in Repert. Spec. Nov. Regni Veg. 22: 356. 1926. – **Lectotype (designated here):** Cuba, Prov. Matanzas, "Ceiba Mocha, in cuabales toward Canasí, in very sterile localities", 1 Mar 1924, *Ekman 18600* (S #R-9402 [photo!]; isolectotype: NY #11943 [photo!]). – Fig. 1B.

= *Harpalyce suberosa* f. *purpurea* Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 134. 1977. – Holotype: Cuba, Prov. Mayabeque, "Lomas de la Pita; San Miguel de Casanova (Habana), banks of a stream and hillsides", 12 Oct 1923, *León 11542* (NY #1619596 [photo!]).

Distribution — Western Cuba, Prov. La Habana, Prov. Mayabeque and Prov. Matanzas, on serpentine.

Harpalyce toaensis Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 138. 1977 – Holotype: Cuba, Prov. Guantánamo, "Pinales de Peña Prieta, La Magdalena, Toa", c. 600 m a.s.l., 22 Jul 1933, *Alain 3168 LS #13526* (HAC ex LS!).

Distribution — Northeastern Cuba, Prov. Guantánamo: mountains of Baracoa, on serpentine.

Harpalyce villosa Britton & P. Wilson in Mem. Torrey Bot. Club 16: 67. 1920. – **Lectotype (designated here):** Cuba, Prov. Holguín, "Vicinity of Camp San Benito, Oriente, among rocks, along river", 900 m a.s.l., 24 Feb 1910. *Shafer 4089* (NY #11944 [photo!]; isolectotype: A #66177 [photo!]). – Fig. 1E.

Distribution — Northeastern Cuba, Prov. Holguín: Sierra de Moa, on serpentine.

Excluded from *Harpalyce*

Harpalyce flexuosa León & Alain ex Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 136. 1977. – Holotype: Cuba, Prov. Guantánamo, "Jauco, alto de la Mesa de Prada", 17 Jul–4 Aug 1924, *León 11971 LS #13535* (HAC ex LS!; isotypes: HAC ex SV!, NY #1619607 [photo!]).

= *Harpalyce foliosa* Borhidi & O. Muñiz in Ci. Biol. Acad. Ci. Cuba 1: 136. 1977. – Holotype: Cuba, Prov. Guantánamo, "Bosque: Palenquito, Yateras", c. 550 m a.s.l., 20 Jul 1953, *Alain 3075 LS #13534* (HAC ex LS!; isotype: HAC ex LS!).

Identification key to the species of *Harpalyce* sect. *Cubenses*

1. Leaflets (especially when young) densely hairy, tomentose or pubescent abaxially, indumentum obscuring glands until leaflets are older and hairs are less dense **2**
– Leaflets glabrous, subglabrous or with scattered hairs, these never obscuring glands **7**
2. Bracts leaf-like (foliose), 1–1.5 cm long . . . . . ***H. toaensis***
– Bracts small, linear or triangular, < 3 mm long . . . **3**
3. Leaflets (on dried specimens) green or greyish green adaxially, abaxially covered with a brownish yellow tomentum **4**
– Leaflets (on dried specimens) brown or dark grey adaxially, abaxially pubescent or puberulous, with brown or reddish brown hairs **5**
4. Leaflet margin recurved or flat, or in some leaflets revolute; inflorescence 1–6-flowered . . . ***H. nipensis***
– Leaflet margin consistently revolute; inflorescence always 1-flowered . . . . . ***H. acunae***
5. Petiolule of terminal leaflet 1–3 mm long . . ***H. villosa***
– Petiolule of terminal leaflet 4–10 mm long **6**
6. Leaflets 5–11 per leaf; secondary veins conspicuous abaxially . . . . . ***H. alainii***
– Leaflets 11–17 per leaf; secondary veins inconspicuous abaxially . . . . . ***H. baracoensis***
7. Keel petals completely free from each other **8**
– Keel petals connate for most of their length or at least in apical third **9**
8. Petiole 1–2 cm long; wing petals c. 1.5 cm long . . . . . ***H. cristalensis***
– Petiole 2.5–5 cm long; wing petals 0.5–0.7 cm long . . . . . ***H. ekmanii***
9. Standard petal ≤ 1.5 cm long **10**
– Standard petal ≥ 2 cm long **11**
10. Petioles 1.5–2 cm long; standard petal c. 1.5 × 0.8–1 cm; wing petals c. 1.5 cm long, keel petals c. 1.7 cm long . . . . . ***H. borhidii***
– Petioles 0.6–1.2 cm long; standard petal c. 1 × 0.2–0.3 cm; wing petals 1–1.1 cm long, keel petals 1.2–1.3 cm long . . . . . ***H. maisiana***
11. Leaflets subopposite or alternate; wing petals black toward base, keel petals mostly black, with a yellow margin; legume 4–5 cm long . . . . . ***H. greuteri***

– Leaflets opposite; wing and keel petals red, orange, yellow or white; legume either ≤ 2.3 cm or ≥ 5 cm long **12**
12. Legume 5–6.5 cm long . . . . . ***H. macrocarpa***
– Legume 1–2.3 cm long **13**
13. Leaflets abaxially with well-spaced glands, these not touching each other . . . . . ***H. cubensis***
– Leaflets abaxially with dense, partly contiguous or confluent glands . . . . . ***H. suberosa***

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References

Arroyo M. T. K. 1976: The systematics of the legume genus *Harpalyce* (*Leguminosae*: *Lotoideae*). – Mem. New York Bot. Gard. **26:** 1–80.

Borhidi A. 1991: Phytogeography and vegetation ecology of Cuba. – Budapest: Akadémiai Kiadó.

Borhidi A. 1996: Phytogeography and vegetation ecology of Cuba, ed. 2. – Budapest: Akadémiai Kiadó.

Borhidi A. & Muñiz O. 1977: Adiciones al conocimiento de la flora cubana (I). – Ci. Biol. Acad. Ci. Cuba **1:** 131–146.

Britton N. L. 1920: Descriptions of Cuban plants new to science. – Mem. Torrey Bot. Club **16:** 57–118.

Capote R. & Berazaín R. 1984: Clasificación de las formaciones vegetales de Cuba. – Revista Jard. Bot. Nac. Univ. La Habana **5(2):** 27–75.

Cardoso D., Harris D. J., Wieringa J. J., São-Mateus W. M. B., Batalha-Filho H., Torke B. M., Prenner G. & Paganucci de Queiroz L. 2017: A molecular-dated phylogeny and biogeography of the monotypic legume genus *Haplormosia*, a missing African branch of the otherwise American-Australian *Brongnartieae* clade. – Molec. Phylogen. Evol. **107:** 431–442.

Greuter W. & Rankin Rodríguez R. 2017: Plantas vasculares de Cuba: inventario preliminar. Segunda edición, actualizada, de Espermatófitos de Cuba con inclusión de los Pteridófitos. Vascular plants of Cuba: a preliminary checklist. Second updated edition of The Spermatophyta of Cuba with Pteridophyta added. – Berlin: Botanischer Garten & Botanisches Museum Berlin; La Habana: Jardín Botánico Nacional, Universidad de La Habana. – Published at https://doi.org/10.3372/cubalist.2017.1

Grisebach A. 1866: Catalogus plantarum cubensium exhibens collectionem Wrightianam aliasque minores ex insula Cuba missas. – Lipsiae: apud Guilielmum Engelmann.

IUCN Standards and Petitions Subcommittee 2017: Guidelines for using the IUCN Red List categories and criteria. Version 13. Prepared by the Standards and Petitions Subcommittee. – Published at http://www.iucnredlist.org/documents/RedListGuidelines.pdf

León Hno & Alain Hno. 1950: Novedades de la Flora de Cuba (II). – Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" **9.**

León Hno & Alain Hno. 1951: Flora de Cuba 2. – Contr. Ocas. Mus. Hist. Nat. Colegio "De La Salle" **10.**

Queiroz L. P. de, Lewis G. P. & Wojciechowski M. F. 2010: *Tabaroa*, a new genus of *Leguminosae* tribe *Brongniartieae* from Brazil. – Kew Bull. **65:** 189–203.

Queiroz L. P. de, São-Mateus W., Delgado-Salinas A., Torke B. M., Lewis G. P., Dorado Ó., Ardley J. K., Wojciechowski M. F. & Cardoso D. 2017: A molecular phylogeny reveals the Cuban enigmatic genus *Behaimia* as a new piece in the *Brongniartieae* puzzle of papilionoid legumes. – Molec. Phylogen. Evol. **109:** 191–202.

Regalado Gabancho L., Ventosa Rodríguez I. & Morejón Hernández R. 2010: Revisión histórica de los herbarios cubanos con énfasis en las series de especímenes. – Revista Jard. Bot. Nac. Univ. Habana **29:** 101–138.

Ross J. H. & Crisp M. D. 2005: Tribe *Brongniartieae*. – Pp. 252–259 in: Lewis G. P., Schrire B., Mackinder B. & Lock M. (ed.), Legumes of the world. – Kew: Royal Botanic Gardens, Kew.

São-Mateus W. M. B., Cardoso D. B. O. S., Queiroz L. P. de, Jardim J. G. 2016: A striking new species of *Harpalyce* (*Leguminosae*, *Brongniartieae*) from highland cerrado of Bahia, Brazil. – Phytotaxa **246:** 120–126.

São-Mateus W. M. B., Queiroz L. P. de, Jardim J. G. & Cardoso D. B. O. S. 2018a: *Harpalyce riparia* (*Leguminosae*, *Papilionoideae*), a new species from the Campos Rupestres of the Chapada Diamantina in Bahia, Brazil. – Syst. Bot. **43:** 206–211.

São-Mateus W. M. B., Simon M. G., Queiroz L. P. de, Jardim J. G. & Cardoso D. B. O. S. 2019: Two new species of *Harpalyce* (*Leguminosae*, *Papilionoideae*) from the Cerrado hotspot of biodiversity in Brazil. – Kew Bull. **74:** article 61.

São-Mateus W. M. B., Sousa M., Cardoso D. & Queiroz L. P. de. 2018b: Two new Mesoamerican species of *Harpalyce* (*Leguminosae*, *Papilionoideae*). – Phytotaxa **344:** 160–168.

Thiers B. 2019+ [continuously updated]: Index herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's virtual herbarium. – Published at http://sweetgum.nybg.org/science/ih/ [accessed Dec 2019].

Urban I. 1926: Sertum antillanum. XXVII. – Repert. Spec. Nov. Regni Veg. **22:** 355–372.

Supplemental content online

Appendix 1. Specimens seen (see https://doi.org/10.3372/wi.51.51204).

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