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Novitiae florae cubensis No. 33

WERNER GREUTER[1], ROSA RANKIN[2] & ALEJANDRO PALMAROLA[2]

Hygrophila urquiolae (Acanthaceae), a new wetland species from Cuba

Abstract

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Hygrophila urquiolae is described in detail and compared with the second Cuban species of the same genus, *H. costata.* It appears to be a taxonomically isolated species without close known relatives. At present it is known from a single locality in Matanzas Province, close to the northern coast of Cuba, where it belongs to a wetland community with clear affinities to the flora of Florida. As a specimen of unknown provenance, found in a Cuban herbarium, also represents the new species, one may assume that it occurs in other similar habitats of the island as well.

Additional key words: hygrophilous flora, dispersal, Matanzas Province, Florida

Introduction

The aquatic and wetland flora of Cuba shares a fate of relative neglect with that of many other tropical and subtropical regions of the world, where botanists feel more strongly attracted by other types of habitat, with greater plant diversity and higher rates of endemism. As a result, it is still possible to discover previously unrecorded and sometimes plainly unknown plants in wet habitats. Such is the case we present in this paper.

The "Ciénaga de Majaguillar", in its widest sense, encompasses a surface area of 462 km^2. At its centre, if one excludes the drier peripheral areas and the coastal mangroves, is the Ciénaga proper: a roughly rectangular area of 13 by 6 km, consisting of subcoastal freshwater swamps, situated in the Cuban province of Matanzas and occupying the whole northwestern portion of the municipality of Martí, to the east of Cárdenas. At both ends drainage canal systems have been built in an attempt at melioration. The current use is mainly as pasture land for cattle.

This swamp area has recently been botanically studied by Nelvis Gómez Campo, who made it the subject of her thesis for a master's degree. The unpublished script, dated 2005, bears the title "Contribución al estudio de la flora y la vegetación de la Ciénaga de Majaguillar, Martí, Matanzas" and is kept at the library of the National Botanic Garden of La Habana. It was available for us to consult and includes, as an appendix, a tabular inventory of the flora of the area, with 303 species of vascular plants. That inventory includes a new addition to the flora of Cuba, *Toxicodendron radicans* (L.) Kuntze subsp. *radicans,* and records the presence of other significant elements of the woody flora such as *Salix caroliniana* Michx. (Blanco & Oviedo 2008), *Fraxinus caroliniana* subsp. *cubensis* (Griseb.) Borhidi (González 2008) and the newly described *Magnolia virginiana* subsp. *oviedoae* Palmarola & al. (Palmarola & al. 2008). All these elements provide links connecting the Cuban flora with that of the southeastern United States of America – a fact that does not come as a surprise in view of the area's relative proximity to the tropical wetlands of Florida.

During the authors' joint visits of the *Magnolia* locality, in February 2007 and again two years later, increased

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attention was paid to the herbaceous components of the flora. To our delight, we found that one of the species we collected was hitherto undescribed and new to science. It forms the subject of the present paper.

We are writing this text with a sad undertone, caused by the untimely and unexpected death, on 13.1.2009, of Cuba's foremost expert of the aquatic and wetland flora: our cherished friend and mentor, Armando Jesús Urquiola Cruz. It is to him that we dedicate both the paper and the new species.

Material and methods

The morphological analysis of the new species is based on the herbarium specimens we collected (see below), on the observation of juvenile plants germinated from seed at the National Botanic Garden of Havana University and grown in both the emerged and submerged state, and on FAA fixations of fresh flowers and flower buds made in the field. Details were observed under a Wild M5A binocular at up to 50× magnification. For photographic documentation of flowers and specimens, a digital camera Canon IXUS 55 was used.

Our analysis of *Hygrophila costata* is based on Cuban specimens in the herbaria of the Jardín Botánico Nacional (HAJB) and the Instituto de Ecología y Sistemática (HAC) in Havana, and on material originating from Florida, neighbouring states in the southeastern United States of America and Hispaniola, sent by the University of South Florida Herbarium (USF) and the University of Florida Herbarium (FLAS).

Results

When *Hygrophila bayatensis* Urb. (Urban 1923: 127) was transferred to *Dyschoriste* as *D. bayatensis* (Urb.) Urb. (Urban 1932: 35), a single *Hygrophila* species remained growing in Cuba:

Hygrophila costata Nees & T. Nees, Pl. Hort. Bonn. Icon. [= Amoen. Bot. Bonn. 2]: 7. 1824.

= *Ruellia brasiliensis* Spreng., Syst. Veg. 2: 822. 1825 ≡ *Hygrophila brasiliensis* (Spreng.) Lindau in Urban, Symb. Antill. 2: 183. 1900 [non Spreng. 1827].

= *Ruellia lacustris* Cham. & Schltdl. in Linnaea 5: 96. 1830 ≡ *Hygrophila lacustris* (Cham. & Schltdl.) Nees in Candolle, Prodr. 11: 86. 1830.

= *Calophanes cubensis* A. Rich. in Sagra, Hist. Fís. Cuba 11: 160. 1850.

This is a widespread and variable species, growing throughout the warmer parts of South America, through Central America and Mexico to the SE United States of America and on the Greater Antilles (Daniel 2005). It has been known under several different names, of which the above synonymy represents but a fraction. In Cuba it is found mainly in the western provinces, from Pinar del Río east to at least Matanzas, and reappears far east in the Guantánamo Province. A comparison of characters between *Hygrophila costata* and our new *H. urquiolae* was made, with the following results.

Habit. — Both species are (presumably perennial) tall herbs with decussate leaves and flowers borne in axillary, dense dichasia along the stems.

Epidermis. — In both, epidermal cystoliths abound: short linear streaks, clearly raised in the dry state, parallel and oriented lengthwise on the stem, petioles, along veins and on the outside of the calyx, but irregularly disposed on the (mainly upper) leaf surface. A variable indumentum of short to long, eglandular and sometimes glandular, simple hairs is found in both species, at least along the leaf veins.

Stems. — Both species have obtusely quadrangular stems furrowed on the sides. In *Hygrophila costata* they vary from completely glabrous to densely villous distally; in *H. urquiolae,* they are consistently glabrous.

Leaves. — The lamina is membranous, with a cuneate base decurrent into the petiole and entire, sometimes slightly undulate margin. At flowering, only the floral leaves are present. In *Hygrophila costata* they are widest at or below the middle and acuminate, exceed the flower cymes manifold, and usually have 15 or more regular pairs of lateral veins. In *H. urquiolae* they are comparatively short, often barely exceeding the flowers, widest above the middle and ± obtuse, and mostly have 5–9 pairs of lateral veins.

Inflorescence. — The flowers are sessile to subsessile, in compact axillary dichasia, (1–)3(–5)-flowered in *H. urquiolae* and mostly 5–9-flowered in *H. costata*.

Calyx. — The pentamerous, regular calyx is of the same overall size in both species, slightly increasing during maturation to reach a length of 10–11 mm in fruit (sometimes slightly less in *Hygrophila costata*). However there are clear differences. The calyx of *H. costata* is tubular for up to half of its length; the pubescent teeth are narrowly filiform distally, membranous-margined along the lanceolate base, with their green central part continuing into the tube to form 5 green stripes alternating with hyaline fissile zones. *H. urquiolae* (Fig. 1) has a long cylindrical calyx tube of homogeneous, whitish colour and firm texture; the teeth are at most half as long as the tube, narrowly triangular, flat, glabrous outside. Inside, the calyx of *H. costata* exhibits a minute antrorse scabridity, which in *H. urquiolae* gives way to a dense cover of tiny parallel strigillose bristles.

Corolla. — The corolla has a cylindrical tubular base which, distally from the stamen insertion, widens into a

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Fig. 1. Flowers and young fruits of *Hygrophila urquiolae,* showing the corolla under various angles. – Photograph taken by R. Rankin at the locus classicus on 28 Feb 2009.

throat and ends in a two-lipped limb with contorted aestivation; outside, above the tubular portion, it is densely patent-pubescent, the hairs being glandular in *Hygrophila urquiolae* but usually eglandular in *H. costata.* There are other, more striking differences. The corolla of *H. costata* is up to 10(–11.5) mm long, as long as or but slightly longer than the calyx, pale purplish pink, laterally split for about one third; that of *H. urquiolae* (Fig. 1) is 16–18 mm long, twice as long as the calyx, pale lavender blue and split halfway down. The upper lip, seen in profile, is slightly forward then upward curved in both species; in *H. costata* it is c. 3(–4.5) mm long, ligulate, shallowly notched to deeply bifid and with forward-pointing to spreading lobes; in *H. urquiolae* it is 8–9 mm long, broadly ovate and with two shallow (c. 1 mm), convergent, retuse-denticulate lobes. The lower lip, in *H. costata,* arches gradually downward, being split halfway into three divergent, spatulate lobes; it is glabrous adaxially and usually bears a flamed twin purple blotch near its base; in *H. urquiolae* the broad base of the lower lip is abruptly bent upward at a right angle and from there it is rolled backward both lengthwise and sideways, ending in three shallow (c. 1 mm), convergent, retuse-denticulate lobes; its undivided central portion forms a wide, low twin bulge, adaxially beset with long (1.2 mm), slender white hairs each arising from a minute purple spot; these hairs stretch across the transverse, slit-like opening of the throat, channelling flower visitors upward, where, under the upper lip's roof, the stigma and anthers are positioned.

Stamens. — The median stamen is absent, the two lateral pairs are of unequal length, the anterior (lower) ones overtopping the posterior by an anther's length. On either side the neighbouring stamens are fused at the base by their filaments. In *Hygrophila costata* the fused filament bases are jointly decurrent along the corolla tube and include a membranous pouch between them, but they are not linked with the filaments on the opposite side. In *H. urquiolae,* however, the filaments on each side are inserted on the edge of an obliquely transversal membranous border, and that border stretches upward to meet its mirror twin from the other side; at the meeting point on the dorsal line, the cross ridge may form a minute tooth, taking the place where the missing median stamen (or staminode) would have stood.

Anthers. — Both species have dorsifix, bithecic anthers with parallel thecae that are free from each other in their proximal third and are blunt at both ends, lacking basal awns. In *Hygrophila costata* the anthers are whitish, broadly ellipsoidal and smallish (c. 0.8 × 0.5 mm); in *H. urquiolae* they show a lavender hue, are longer (c. 2 mm) and narrower in shape .

Style. — The style is usually glabrous in *Hygrophila costata* but minutely glandular- and eglandular-pubescent in *H. urquiolae,* where it is apically inrolled in the flower bud. In the latter species the upper (posterior) stigmatic branch is completely reduced and the stigma appears to be simple, elongate; in *H. costata* there is a small but distinct tooth holding the place of the upper branch, and the lower branch, while prevalent, is but 3–4 times longer than the upper.

Fruit. — As is typical for the genus, the fruit is a straight cylindrical bilocular acutely mucronate loculicidal capsule, narrowly furrowed along the suture on the back of each valve; it is glabrous in both species, same as the ovary. In *Hygrophila costata* it barely exceeds the calyx, being 9–11 mm long and dark brown; in *H. urquiolae* it is twice that size (15–20 mm) and of a lighter shade. The jaculators or retinacula – acute and upward curved, robust funicular excrescences that support each seed and help to disseminate it when the capsule splits open – are arranged in two regular rows along the median partition visible in each valve, starting right at the bottom and extending to the tip; they permit an easy count of seed number: (14–)16 (rarely more) in *H. costata,* (28–)32 in *H. urquiolae.*

Seeds. — The seeds of both species are lenticular in shape, with a truncate hilar base and broadly oval outline. They appear to be glabrous when dry, but upon wetting a dense pelt of patent white viscid hairs immediately unfolds, both along the seed margin and on the sides where it appears to radiate outward from near the hilum. In *Hygrophila urquiolae,* the seeds appear to be bordered by a pale, translucent wing, which later becomes restricted to the apical portion; perhaps this phenomenon is caused by

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Table 1. Some morphological features of the two Cuban species of *Hygrophila.*

Character	***H. costata***	***H. urquiolae***
Calyx		
tube	≤ as long as teeth	2–3× as long as teeth
teeth shape	filiform from a lanceolate base	triangular
Corolla		
length	≤ 10(–11.5) mm	16–18 mm
divided for	one third of its length	half of its length
upper lip	c. 3(–4.5) mm long	8–9 mm long
lower lip base	straight	bent upward at a right angle
lower lip	glabrous, with twin purple blotch	with slender white hairs arising from purple spots
Stamens	fused pairwise, without a cross ridge	on membranous folds meeting dorsally as a cross ridge
Anthers	c. 0.8 mm long, whitish	c. 2 mm long, pale lavender
Stigma	with tooth-like dorsal branch	lacking a dorsal branch
Capsule length	9–11 mm, barely exceeding the calyx	15–20 mm, twice as long as calyx
Seed		
number	mostly 16	mostly 32
size	1 × 0.8 mm	1.5 × 1.2 mm

the embryo not filling out the testa completely, leaving an empty peripheral zone. The seeds differ in size, those of *H. costata* (1 × 0.8 mm) being smaller than those of *H. urquiolae* (1.5 × 1.2 mm).

As can be seen from the preceding comparison, there are considerable differences between the two species in question, the most important of which are summarised in Table 1. We therefore formally describe and name the new species, as follows:

Hygrophila urquiolae Greuter, R. Rankin & Palmarola, **sp. nov.**

Holotype: Cuba, Prov. Matanzas, municipio Martí, Ciénaga del Majaguillar al NO de Martí, Ciénaga de Gonzalito cerca del Canal de Blanquizal, 5 m, 22°59'39"N, 80°58'06"W, herbazales de ciénaga, 28.2.2009, *Greuter 27013, Rankin, Berazaín, González & Palmarola* (HAJB; isotypes: B, JE, NY, PAL-Gr). – Fig. 2.

Herba annua vel potius perennans, ultra metralis. *Epidermis* undique cystolithis linearibus in sicco conspicuis, in ramis calycibusque parallelis longitudinalibus, in foliis chaotice dispositis obtecta. *Caules* obtuse quadrangulares, sulcati, glabri vel subglabri, ad nodos incrassati. *Folia* decussatim disposita, homomorpha, indivisa, inferiora florendi tempore emortua, floralia membranacea, obovato-lanceolata, ad 6 cm longa et 1.5 cm lata, obtusa vel subacuta, basi in petiolum brevem sensim angustata, margine integra, plana vel leviter undulata, utrinque praesertim ad nervos breviter rigide pubescentia, juventute secus costam et in petiolo longius pilosa. *Flores* pseudoverticillati, nam in dichasia axillaria densa pauciflora dispositi, sessiles vel subsessiles; bracteae paucae cito diminutae, bracteolae inconspicuae, lineares vel spathulatae. *Calyx* 7–8 dein 10–11 mm longus, per $^{2}/_{3}$ vel $^{3}/_{4}$ longitudinis in tubum cylindricum evenium, virentem serius pallidum saepe vinaceo-suffusum, maturitate facile fissilem concretus, in dentes 5 aequales virides planos anguste triangulares acutos desinens, extus praeter dentes ciliolatos glaber, intus minute appresse antrorse striguloso-pubescens. *Corolla* valde zygomorpha, ad medium bilabiata, aestivatione contorta, calycem subduplo superans nam secus lineam dorsalem 16–18 mm longa, pallide lavandulacea, basi excepta undique dense breviter (0.2 mm) patule glanduloso-pubescens; tubus in parte proximali rectus glaber cylindricus, inde in faucem ampliatus; labium posterius sensim pronus curvatum apice leviter recurvum; anterius ad basin latam geniculatim sursum flexum inde regulariter recurvum orbem quasi completum percurrens, palato late impresse bigibboso et pilis tenuibus eglandulosis longis (1.2 mm) patulis rectis faucem quasi occludentibus barbato; labiis ambis apice in lobulos (superius 2 inferius 3) convergentes 1–2 mm tantum profundos minute bidenticulato-retusos fissis. *Stamina* 4; filamenta glabra, binatim approximata, corollae tubo inserta, ubi margine membranae seu plicae transversalis continuae insident; staminodium nullum vel ad denticulum plicae illius transversalis reductum; antherae bithecicae, dorsifixae, anguste ellipsoideae, c. 2 mm longae, sub labio posteriore parallelae, anticae posticas ipsius longitudine superantes; thecae parallelae, in tertia parte proximali liberae, basi muticae subacutae. *Ovarium* glabrum cylindricum biloculare; stylus eglanduloso- et prope basin glanduloso-pubescens, apice in alabastro spiraliter involutus dein corollae apicem attingens; stigma anterius elongatum lineare, posterius nullum. *Capsula* loculicida recta cylindrica, acuta et mucronata, 15–20 mm longa et c. 1.2 mm crassa, (28–)32-sperma; valvae pallide brunneae, sutura placentari anguste sulciformi; jaculatores brunnei robusti apice acuto incurvi, ab ima basi ad apicem placentae regulariter bifariam dispositi. *Semina* lenticularia, e basi truncata late elliptica, 1.5 mm longa et 1.2 mm lata, brunnea, ala pallidiore praesertim apicem versus latiuscula cincta, in sicco glabra videntur, sed in aquam inmersa undique sed praesertim secus marginem pilis densissimis tenuibus viscidis patenter albovillosa.

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Fig. 2. Isotype specimen of *Hygrophila urquiolae* (B). – Photograph by I. Will, courtesy of the Botanical Museum Berlin-Dahlem.

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Other specimens seen. — Cuba: Prov. Matanzas: Ciénaga de Majaguillar al NO de Martí, Ciénaga de Gonzalito cerca del canal de Blanquizal, 5 m, 22°59'45"N, 80°58'45"W, bosque secundario de ciénaga, 10.2.2007, *Palmarola, González & Cruz HFC 84651* (HAJB); same locality, flores lila pálido con tubo blancuzco, 27.2.2007, *Greuter 26662, Palmarola & Rankin* (B, HAJB, JE, PAL-Gr). – Cuba, *"Dyschoriste bayatensis"* [lacking label data] (HAC).

Habitat and ecology. — In the study area, which roughly coincides with that portion of the Ciénaga in which the *Magnolia* trees grow, *Hygrophila urquiolae* is not infrequent in the open marshy grassland strips that separate the patches of woodland. Among the accompanying herbaceous and shrubby flora the following species are of note: *Ampelopsis arborea* (L.) Koehne, *Baccharis halimifolia* L., *Hydrocotyle verticillata* Thunb., *Ludwigia peruviana* (L.) H. Hara, *Phyla nodiflora* (L.) Greene, *Rhynchospora colorata* (Hitchc.) H. Pfeiff., *Sagittaria lancifolia* L., *Sisyrinchium graminoides* Bickn. and *Symphyotrichum bahamense* (Britton) Nesom. *H. urquiolae* is not an aquatic plant, even though it does not mind temporary flooding and readily germinates from seed in the submerged state. Capsules, judging from their dehiscence in the plant press, open xerochastically rather than hygrochastically. The viscid seed hairs that unfold by wetting appear to provide a sophisticated means of long-range dispersal by animals treading on wet mud. The very limited known distribution of the species does, however, contrast with the assumption that it is a highly effective long-range disperser.

Discussion

When collecting our *Hygrophila* and finding that it did not match any plant known from Cuba, our first thought was that it might represent a species from Florida, perhaps accidentally introduced by waterfowl. The only possible candidate among the four *Hygrophila* species mentioned for Florida by Wunderlin & Hansen (2008) appeared to be *H. difformis* (L. f.) Blume, a popular aquarium plant with ornamental, much dissected submerged leaves. When raising our plant from seed, we found that its leaves, both submerged and aerial, are homomorphic, undivided and with entire margins. In contrast, the type specimen of *Ruellia difformis* L. f. (herb. Linn. 804.20, LINN [photograph!]) and the single known Florida gathering of *H. difformis,* obtained on loan, have floral leaves with sharply toothed margins. The latter, *Hansen 12893 & Wunderlin* (FLAS, USF), collected May 1999 in Hillsborough County, is of a flowering plant that lacks fruit set, pointing to its being self-incompatible and forming a single clone.

A survey of material kept in Cuban herbaria brought to light a historical specimen with five fruiting branches of entirely typical, well preserved *Hygrophila urquiolae,* that had been misidentified as *Dyschoriste bayatensis*. It bears a printed label "HERBARIO DE LA SALLE ... Plantas de Cuba" but, unfortunately, no label data whatever. It is likely that the new species can be found in other places in western Cuba, including the Havana Province, having been overlooked by botanists in the past.

Since Lindau's (1895) revision of the *Acanthaceae* for the "Pflanzenfamilien" no general reassessment of generic and tribal limits in that family has taken place. In spite of several improvements of detail, that revision still provides the basis for our current understanding of that family. Nevertheless, one cannot safely assume that all of Lindau's genera, often based on a small number of salient characters, will stand unchallenged. This is especially true for pantropical genera such as *Hygrophila* R. Br., which may well prove to be heterogeneous unless redefined (either split or perhaps partly combined with other genera). In addition to molecular sequence work, essential to guide any new attempt at testing natural relationships and improving the classification, careful morphological analysis of many taxa will be necessary. We hope that the present paper can be seen as a positive if small contribution to such analysis.

On the basis of the currently accepted definition of the genus *Hygrophila,* there can, however, be no doubt that the new species belongs here. Crucial criteria are the regular pentamerous calyx, the zygomorphic, strongly two-lipped corolla with contorted aestivation, the presence of four fertile, dithecic stamens lacking basal awns, and an elongated, cylindrical, many-seeded capsule.

The position of *Hygrophila urquiolae* within the genus is unresolved. It is not by any standard closely related with *H. costata,* with whom we have compared it; but neither could we find any other New World *Hygrophila* species showing a marked resemblance and possible affinity with it. Until further notice, we consider *H. urquiolae* as a taxonomically isolated species of unclear affinity.

Note added in proof. — Among the Florida material of *Hygrophila costata* examined, we found a single specimen from near Pensacola (*Burkhalter 5388,* FLAS) that deviates from that species in several respects. Its flowers, in all their parts, are about twice the size of those found in *H. costata,* its corolla is glabrous outside but densely and prominently papillose within, the capsules are shorter and with fewer (c. 10) seeds. While unrelated to *H. urquiolae* and certainly close to if not conspecific with *H. costata,* this plant deserves further study. We commend it to the attention of local botanists.

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