

Holoregmia Nees, a recently rediscovered genus of *Martyniaceae* from Bahia, Brazil

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Summary. The rediscovery of *Holoregmia* Nees, *Martyniaceae*, with its single species *H. viscida* Nees is reported from NE Brazil. Since its first collection in the early 19th century, the genus has been overlooked or considered dubious by recent workers. The locality where the type material was originally collected has been pin-pointed and a full description based on a recent collection, including pollen and previously unknown fruiting material, is provided. The authors conclude that the genus is a good one, showing a number of plesiomorphic characters, and perhaps closely related to *Craniolaria* L.

INTRODUCTION

While making a survey of the flora in the Chapada Diamantina area, in the interior of Bahia, Brazil, the first two authors encountered a very striking shrub, which they failed to recognize, although it appeared to be a member of the *Martyniaceae*. This family was included in the Old World *Pedaliaceae*, in the *Scrophulariales*, by Cronquist (1981), but is recognised as distinct by many authors, such as Ihlenfeldt (1967) and is treated as such in his forthcoming account of the family for Kubitzki's *Families and Genera of Vascular Plants* (Ihlenfeldt 2003). Recent molecular studies by Olmstead *et al.* (2001) provide further evidence to support this separation.

DETERMINATION OF MATERIAL

The plant in question was finally determined by comparing it with the plate and description by Nees & Martius (1823), in which the new species *Craniolaria unibracteata* Nees & Mart. is described, based on a specimen collected by Prince Maximilian of Wied (often cited as Wied-Neuwied, but see Behnke 1997) in March 1817. The specific epithet is superfluous, because Nees (1821) had previously published a new monotypic genus and species with the name *Holoregmia viscida* Nees, based on the same material. In describing their new species under *Craniolaria* L., Nees & Martius had included Nees' earlier name in synonymy. The epithet "*unibracteata*" refers to the supposed presence of only a single bracteole at the base of the flower — a character not found in the present material, which clearly possesses a pair of bracteoles, typical for the family. In spite of this difference, the

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great similarity in other respects between the original description and the new material, as well as their geographical correspondence, clearly indicates that they are the same taxon. The original material of *Holoregmia*, collected by Wied, which we examined in the Martius Herbarium at Meise (BR), proved to be very fragmentary, with no complete flowers or attached bracts, so the question of the bracteoles remains unresolved.

Until very recently, no other material of *Holoregmia* had been detected. However, examination of some other local herbaria has revealed further specimens, in the Biology Dept, Universidade Estadual de Feira de Santana (HUEFS), tentatively determined as *Craniolaria* sp. It is remarkable that this most striking plant has for so long remained unknown to the botanical community. Van Eseltine (1929), in his revision of the family, expressed ignorance of the plant, and was obliged to omit it from his main account, as were Bretting & Nilsson (1988) in their recent pollen survey. In view of the lack of information on this species, we consider it important to publish a detailed description, so that future workers may include it in their studies.

LOCATING THE TYPE-LOCALITY

Prince Maximilian of Wied was one of the earliest European travellers in the interior of Brazil whose prime interest was the country's natural history and native peoples, and his account (Wied 1821 – 2) is a rich source of information on its flora and fauna. His journey lasted from 1815 to 1817 and during this time he collected many species new to science. He collected the plant in question during a traverse of the interior of Bahia, and it is described briefly in an appendix to his account, where it is identified as *Holoregmia viscida* Nees.

Prince Maximilian's exact itinerary across the interior of Bahia in early 1817, is very difficult to track, as most of the places mentioned no longer exist and the maps of this period were unreliable. Much of the country crossed by him was still unspoiled forests or deserted thorn scrub, so that his descriptions give a vivid picture of what the native vegetation must once have been like. The area had originally, and until sixty or seventy years previously, been occupied by the Camaçã indians. By the early 19th century, the whole area was still extremely sparsely inhabited, so that, once the main centres were left behind, few place names were available to indicate one's whereabouts. Maximilian's itinerary shows that he left Arraial da Conquista (now Vitória da Conquista), probably in March, to travel north about 500 km, to Salvador, the state capital of Bahia on the coast, staying en route in or near several isolated farms. Using his journal and the *Enciclopédia dos Municípios brasileiros* (IBGE 1958), which contains much early history about the towns that later sprung up in the region, it has been possible to trace his journey during this period. It is hoped to publish these details elsewhere, as they may help to localize some of his other collections. It is clear that the specimen of *Holoregmia* was collected shortly before he reached the river Rio de Contas, where the modern town of Jequié now stands, after he travelled north from what today is the town of Manuel Vitorino, near where he spent the previous night.

SYSTEMATIC DATA

Holoregmia viscida Nees, Flora 4: 300 (1821); van Eseltine (1929). Typus: Brazil, Bahia, between Faz. Cachoeira and Jequié, March 1817, *Wied* s.n., (BR holotype).

Craniolaria unibracteata Nees & Mart., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 11: 67 (1823), nom. superfl. illeg.

Martynia spathacea Spreng., Syst. 4: Cur. Post. 238 (1827), nom. superfl. illeg.

Proboscidea unibracteata (Nees & Mart.) Decne., Ann. Sci. Nat. Bot., Sér. 5, 3: 325 (1865), nom. superfl. illeg.

Robust shrub to 3 m, stems perennial, erect, much branched, main stems terete to 5 cm diameter, pale brown, branches spreading to ascending, younger stems fleshy, green, stout, sometimes purple-tinged. Whole plant, except older stems, glandular-viscid and densely covered with patent gland-tipped trichomes 0.3 – 0.5 mm long. Leaves irregularly opposite, lamina broadly cordate, often broader than long, 14 × 20 – 21 cm, apex acute, base cordate, margin shallowly and irregularly lobed and toothed, overall densely glandular-hairy, with upper surface green, with finely reticulate venation, veins impressed, lower surface paler with prominent veins, long-petiolate with petioles c. 25 cm long or more. Inflorescences terminal or axillary, simply racemose, elongate, to 50 – 70 cm long, with numerous flowers subtended by linear-lanceolate bracts c. 2.5 cm long, soon deciduous, pedicels erect, c. 1.5 cm long at anthesis, ± parallel to inflorescence axis, elongating to 2 cm long and 2 mm in diameter when in fruit. Flowers with a pair of narrowly lanceolate bracteoles at base, 1.5 × 0.5 cm, persistent until fruit set. Calyx with sepals connate, 3.8 × 1.7 cm (at widest part), spathaceous, split almost to base on anterior side, 5-lobed with lobes displaced to posterior side of calyx, with the 2 small lobes on either side of posterior lobe smaller than the others, calyx tube inflated and almost urceolate except for gaping sinus on anterior side, reticulately veined with c. 11 longitudinal veins, glandular-hairy on outer and inner surfaces, circumscissile in fruit. Corolla zygomorphic, ± 2-lipped ($\frac{2}{3}$), limb spreading, with lobes very broad and rounded, anterior lobe c. 1.5 × 2.0 cm, longer than the others, tube c. 4.5 cm long, with diameter c. 2.0 cm at throat, infundibuliform-campanulate, weakly constricted in mid-tube, then strongly constricted to form a very short, narrow tube, c. 1 cm above the slightly bulbous base, corolla glandular-hairy throughout, more densely so on outer surface, corolla pale ochraceous yellow, inner surface with many small reddish-purple dots, sometimes coalescing into lines on the lobes and becoming denser within tube, external surface of corolla similar, but dots much fewer and fainter, basal bulb of corolla-tube white. Fertile stamens 4, with a 5th posterior staminode curved, linear and c. 1 cm long, fertile stamens directed under upper lip of corolla, inserted below middle of tube, only slightly exerted from tube, filaments 2.5 to 2.8 cm long, strongly curved and thickened at base, anthers c. 8 mm long, ditheous, thecae strongly divaricate with thecae elliptic and coalescent at apex, posterior stamens with anthers at first connate. Pollen whitish. Style terminal, c. 4 cm long, curved upwards and inserted between the 2 pairs of stamens, stigma lobes 2, ± lingulate, with posterior lobe longer and broader than anterior, style

persistent after corolla fall and strongly curved upwards in upper part. Ovary small, c. 3–4 mm long, on a fleshy disc c. 5 mm in diam., 2-locular, 4-ovulate, with a broad placenta which divides each loculus into two, making a false 4-locular ovary, each chamber uni-ovulate. Fruit c. 4 × 2.3 cm, ovoid elliptic, slightly zygomorphic, constricted at base with apex obtuse, exocarp green, glandular-viscid, becoming caducous and splitting into 2 valves, endocarp 3.5–4 × 1.8 cm, ovoid-elliptic, slightly curved, smooth, with 4 shallow grooves, each element with a faint, slightly raised longitudinal ridge, with adaxial crests much reduced, inconspicuous, apex sharply acute, only very slightly bifurcate (that is to say, the endocarp minutely dehiscent at the tip), very hard and woody, dark brown, indehiscent and falling as a whole, the two halves eventually separating in the soil. Seed c. 2 cm, elongate, but structure difficult to interpret being invested by the horny/woody endocarp.

BRAZIL. Bahia. Município Itaberaba, BA046 highway, 25 km SSE of Itaberaba, 12°43'S, 40°12'W. 260 m, caatinga, 20 Nov. 1986, *de Queiroz* 1333 (HUEFS); c. 9 km E de Itaberaba on Ipirá road, caatinga, 27 Sept. 2001, *de Queiroz* 6642 (HUEFS). Município Iaçú, Fazenda Lapa, 12°42'S, 39°56'W, caatinga, 26 Feb. 1983, *Bautista* 730 (HUEFS). Município Jequié, c. 20 km from Jequié on road to Contendas do Sincorá, 13°45'S, 40°16'W, 500 m, 22 March 1989, *de Queiroz & Crepaldi* 2157 (HUEFS). Município Nossa Senhora do Livramento, on right of track leading from main Livramento – Rio de Contas road towards the bottom end of the Estrada Real, about 80 m from main road, 13°36'S, 41°48'W, *Caatinga*, several individuals, 25 Jan. 2001, (ripe fruit collected from same plant, 13 May 2001) *Harley & Giuliatti* 54073 (HUEFS); same locality, 30 March 2002, *Giuliatti & Harley* 2070 (HUEFS). Município Aracatu, a single plant growing in waste ground by a local pond, within the boundaries of the town, 20 Jan. 2002, *Giuliatti* s.n. (HUEFS).

NOTE. Field observations over several months indicate that the plant has a very long flowering period. No observations have yet been made on pollinators, although large bees seem probable. The hard, indehiscent fruits remain in the soil beneath the parent plant, although very recent observations indicate that, after about a year, the carpels separate into two mericarps, which probably persist for a considerable time before germination, as seedlings first appeared only in the second half of 2002.

Holoregmia Nees is one of the endemic genera of the *caatinga* region of NE Brazil. It appears to be restricted to the valleys of the Rio de Contas and the more northern Rio Paraguaçu, both rivers rising in the mountains of the Chapada Diamantina. This rare plant requires detailed study to observe its biology and ecological requirements prior to developing a strategy to ensure its conservation for the future.

POLLEN

Pollen grains of *Holoregmia viscida*, removed from material of *Giuliatti & Harley* 2070 (HUEFS) were examined and analysed, after acetolysis using the method described by Erdtmann (1960).

Pollen grains of *Holoregmia viscida* are large (c. 104 µm), apolar, spherical, covered by fields of circular to oval exine (24 × 18 µm) separated by sulci in which

the exine is considerably reduced and psilate. These exine fields are heterobroccate, with the smaller lumina situated on their periphery, and with free baculae in the interior of the lumina. The muri are broad and simplicolumellate. The exine is 6 μm thick, with the sexine thicker than the nexine. The grains are inaperturate, the sulci between the exine fields functioning as apertures, being more fragile and permitting germination of the pollen-tube (Fig. 1).

Within the *Martyniaceae*, similar pollen grains to those of *Holoregmia* were observed in species of *Ibicella* and *Proboscidea* (Bretting & Nilsson 1988; Halbritter & Hesse, 1995). The pollen of *Holoregmia* can be distinguished from these genera, however, by size, as, according to the above-cited authors, the pollen of *Ibicella* and *Proboscidea* rarely attains a diameter of 100 μm , while the exine rarely exceeds a thickness over 4 μm . In the example of *Holoregmia viscida* analysed here, pollen diameter varied between 94 μm and 124 μm , while exine thickness was 5 – 7 μm .

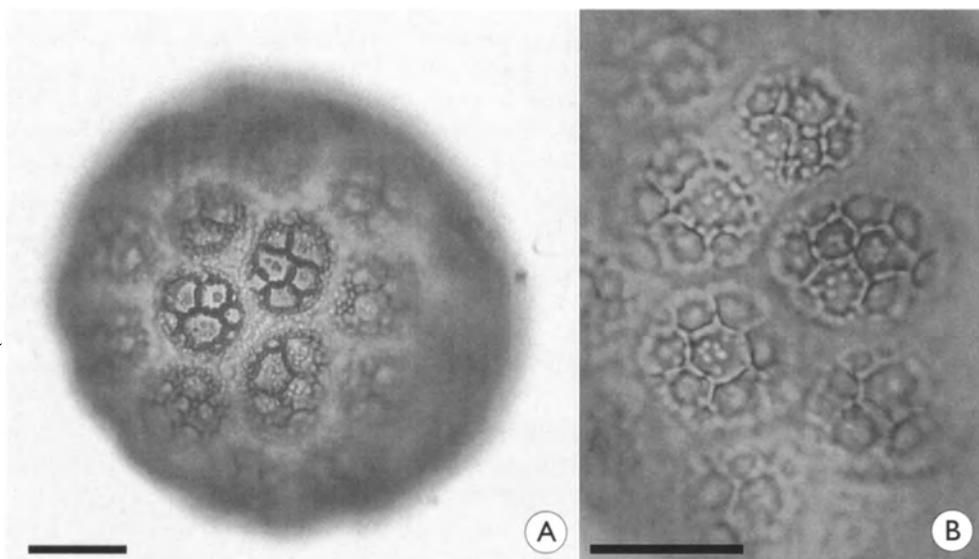


FIG. 1. *Holoregmia viscida* (Giulietti & Harley 2070): **A** general view; **B** detail of exine surface. Scale = 20 μm .

Halbritter & Hesse (1995) described the pollen of *Ibicella lutea* (Lindl.) Van Eselt., *Proboscidea fragrans* (Lindl.) Decne. and *P. parviflora* (Wooton) Wooton & Standl., which possess exine fields similar to those described above, as clypeate. Bretting & Nilsson (1988), however, used the term areolate to describe the same feature, which is the nomenclature generally recommended (Punt *et al.* 1994).

According to Halbritter & Hesse (1995), pollen of the type found in *Holoregmia* is encountered in only eight other families of Angiosperms: *Berberidaceae*, *Bignoniaceae*, *Euphorbiaceae*, *Fumariaceae*, *Gentianaceae*, *Iridaceae*, *Malpighiaceae* and *Xanthorrhoeaceae*. The ornamentation pattern of *Holoregmia* is most similar to that found in *Iris* (*Iridaceae*).

RELATIONSHIPS AND STATUS

Stapf (1895) who first recognised the family *Martyniaceae*, accepted only three genera: *Martynia* L., *Proboscidea* Schmidel (with two sections *Eu-Proboscidea* and *Ibicella* Stapf), and *Craniolaria* L. He considered *Holoregmia* to be a doubtful genus, possibly synonymous with *Craniolaria*. Van Eseltine (1929), however, recognized *Holoregmia* as a distinct genus, at the same time raising *Ibicella* to generic status. He thus raised the number of genera of *Martyniaceae* to five. Unfortunately, due to the very fragmentary and incomplete nature of the type material of *Holoregmia*, housed at Meise (BR), it has been, for a long time, impossible to determine whether it truly belonged to *Martyniaceae*, and therefore its status has long remained in doubt. Ihlenfeldt (1967), in his paper on the delimitation and classification of the *Pedaliaceae*, discusses briefly the characteristics of the *Martyniaceae*, but, in his current study on the family (Ihlenfeldt 2003), will now recognise five genera, including the rediscovered *Holoregmia*, and estimates a total of about 16 species. Two of the five genera: *Craniolaria* and *Ibicella* (Stapf) Van Eselt. are almost entirely restricted to South America, while the primarily N American genus *Proboscidea* is represented in S America by a single species: *P. peruviana* Van Eselt. *Martynia* is monotypic and represented by only a single species, *M. annua* L., from the Caribbean and Mexico.

With the very complete material of *Holoregmia* now available, it is for the first time possible to confirm that it is a member of the *Martyniaceae*. It possesses a glandular-villous indumentum over all parts of the plant and shows the typical inflorescence type of the family, with long terminal racemes and bibracteolate flowers. The flowers have a 5-lobed, spathaceous calyx, the corolla is 5-lobed and weakly 2-lipped, while the androecium consists of four fertile stamens and a posterior staminode. The ovary is bicarpellate with four ovules and is surrounded by a fleshy, annular disc. The ripe, elongate fruit displays a caducous exocarp, characteristic of the family, which peels into two valves, and, beneath it, a very woody endocarp. This 4-seeded structure is initially indehiscent, except minutely so at the apex. Other characters that confirm the position of *Holoregmia* as a member of the *Martyniaceae* are provided by the pollen.

Nevertheless two characters that are found in all other members of the family are absent. Most *Martyniaceae*, including the three known species of *Craniolaria* are said to be annual herbs, whereas *Holoregmia* is a robust, much branched shrub to 3 m tall, with a rather softly woody stem to 5 cm in diameter. Also, the characteristic horns borne at the apex of the endocarp, are almost imperceptible, so that the fruit shows no features to suggest that it is epizoochoric, as in other members of the family. In view of these differences, there is ample justification in accepting *Holoregmia* as a good, if aberrant genus within the *Martyniaceae*. The characters which it uniquely possesses, mentioned above, are probably plesiomorphic as suggested by comparison with other related families, such as *Pedaliaceae*.

Holoregmia is also geographically isolated from other members of the family, being so far restricted to Bahia in NE Brazil where it behaves as a typical *caatinga* species, endemic to the deciduous, thorn-forests of the region where there is a semi-

arid, tropical climate. These facts taken together, suggest that it may be the most primitive extant genus in the family (Ihlenfeldt, pers. comm.).

Holoregmia shows many characters in common with *Craniolaria*, to which, on morphological grounds, it is apparently related, sharing with it the spathaceous calyx, the 4-seeded fruit and the absence of long apical horns on the endocarp, the apical horns all but imperceptible in *Holoregmia*. However, the low toothed crests found on the adaxial side of the endocarp of *Craniolaria* are greatly reduced. The corolla of *Holoregmia* also lacks the elongate, narrowed tube of *Craniolaria*, possessing instead a very short, narrowed, lower portion which soon becomes broadly campanulate above, suggesting a different pollination syndrome from the sphingophilous flowers of the latter genus (Ihlenfeldt 2003). While the form of the flower of *Holoregmia* is perhaps more reminiscent of *Proboscidea*, the few-seeded indehiscent fruit of the former and absence of the long, apical horns, at once distinguishes it from this genus.

In view of its extreme interest, it is to be hoped that further confirmation of its position may soon be obtained from a molecular study. Unfortunately, material of the recent collections is all still in Brazil, awaiting distribution, but it is hoped duplicates will soon be available for the study of specialists of the family, who will be able to draw their own conclusions as to the affinities of the genus.

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