

THREE NEW SPECIES OF *ACIANTHERA* (ORCHIDACEAE: PLEUROTHALLIDINAE) FROM COSTA RICA

FRANCO PUPULIN,^{1,2,4} GUSTAVO A. ROJAS,^{1,3} AND JOSÉ D. ZUÑIGA^{1,3}

Abstract. Three new species of Pleurothallidinae (Orchidaceae) from Costa Rica, *Acianthera fecunda*, *A. hamata*, and *A. cabiriae*, are described and illustrated. *Acianthera hamata* is closely related to *A. cogniauxiana*, from which it differs mainly in the shape of the leaves; the hooked rachis of the inflorescence; the smaller flower size; the entire petals, provided with a rounded lobe on the lower side; and the broadly flabellate keels of the lip. *Acianthera fecunda* is distinguished by its cleistogamous flowers, reduced habit size, and 2-flowered, short inflorescence. *Acianthera cabiriae* is closely related to *A. fecunda*, from which it differs in plant size, the elliptic leaves, and the 3- to 4-flowered inflorescences.

Resumen. Se describen y se ilustran tres especies nuevas de Pleurothallidinae (Orchidaceae) de Costa Rica, *Acianthera fecunda*, *A. hamata*, y *A. cabiriae*. *Acianthera hamata* está estrechamente relacionada con *A. cogniauxiana*, de la cual difiere principalmente por la forma de las hojas, el raquis de la inflorescencia uncinado, el menor tamaño de las flores, los pétalos enteros con un lóbulo redondo en la parte inferior, y las quillas del labelo ampliamente flabeladas. *Acianthera fecunda* se distingue por sus flores cleistógamas, el tamaño reducido de la planta, y las inflorescencias cortas con dos flores. *Acianthera cabiriae* está estrechamente relacionada con *A. fecunda* de la cual difiere en tamaño de planta, las hojas elípticas, y la inflorescencia con 3 o 4 flores.

Keywords: Orchidaceae, Pleurothallidinae, *Acianthera cabiriae*, *Acianthera fecunda*, *Acianthera hamata*, *Acianthera cogniauxiana*, new species, Costa Rica.

In 1842, the Belgian botanist Michael Joseph François Scheidweiler (1799–1861) described the genus *Acianthera* to accommodate a Pleurothallid species with connivent sepals, the lateral ones connate and the superior one galeate with a dilated apex, the lip articulated with the column, which is winged, two pollinia, and a pointed anther. Alluding to the anther shape, the generic name was formed from the Greek words *akis*, point, and *anthera*, anther. The type species is *Acianthera punctata* Scheidw., described from a Brazilian plant provided with ovate, obtuse, and glaucous leaves and externally hairy sepals, with the inner surface spotted and ocellated with purple. No type specimen of *A. punctata* has been found, and Luer (1986) considered it synonymous with *Pleurothallis recurva* Lindl., described in 1841 from a specimen without known provenance but which the same author considered probably a

native of Brazil (Lindley, 1842). *Acianthera punctata* is neotypified with Lindley's *P. recurva* (Luer, 1986). As soon as 1859, John Lindley reduced *Acianthera* under *Pleurothallis*, coining the new name *P. acianthera* (Lindley, 1859) for Scheidweiler's *A. punctata* (the specific epithet was occupied in *Pleurothallis* by *P. punctata*, published by Ker Gawler in 1823 for a species now included in the distantly related genus *Notylia* Lindl.). From this time, the genus *Acianthera* was buried for nomenclatural purposes.

It was not until almost 130 years later that Carlyle A. Luer, in his systematic overview of the Pleurothallidinae, resurrected the name *Acianthera* as a subgenus of the polymorphic *Pleurothallis* to accommodate a large assemblage of allied species characterized by more-or-less fleshy flowers with connate lateral sepals that are borne singly or in a raceme terminally from the apex of the stem (Luer, 1986).

We are indebted to Adolfo Quesada Chanto, who kindly provided living specimens from his collection for this study. We acknowledge Gustavo A. Romero (AMES), for his help with historical literature.

¹Jardín Botánico Lankester, Universidad de Costa Rica. P.O. Box 1031-7050, Cartago, Costa Rica.

²Harvard University Herbaria, 22 Divinity Avenue, Cambridge, Massachusetts 02138, U.S.A.; Marie Selby Botanical Gardens, 811 South Palm Avenue, Sarasota, Florida 32436, U.S.A. Email: fpupulin@cariari.ucr.ac.cr.

³Escuela de Biología, Universidad de Costa Rica, Ciudad Universitaria, Rodrigo Facio, 2060 San José, Costa Rica.

⁴Author for correspondence.

On the basis of multiple analyses of DNA sequence data (Pridgeon et al., 2001; Pridgeon and Chase, 2001), Pridgeon and Chase (2001) gave *Acianthera* generic rank to group a distinct subset of Pleurothallidinae species previously included in *Pleurothallis* Sw. subgenera *Acianthera* (Scheidw.) Luer sections *Brachystachyae* Lindl., *Cryptophoranthae* Luer, *Phloeophilae* Luer, *Sicariae* Lindl., and *Tomentosae* Luer; *Sarracenella* (Luer) Luer; *Arthrosia* Luer; and some species of subgen. *Specklinia* (Lindl.) Garay sect. *Muscosae* Lindl. As circumscribed by Pridgeon and Chase (2001), *Acianthera* includes some 220 species centered in Brazil and distributed from Mexico to Argentina and Uruguay, and the Antilles, where they grow as humid-forest or cloud-forest epiphytes or lithophytes, at elevations ranging from 250 to over 2500 m (Pridgeon, 2005).

Luer (2002) noted the morphological similarity of *Acianthera* to other infrageneric taxa of *Pleurothallis*, as well as the existence of many intermediate forms, and considered that Pridgeon and Chase's (2001) cladograms did not support recognition of *Acianthera* at the generic level, favoring the treatment of this taxon as a subgenus of *Pleurothallis*. He included in the subgenus most of the taxa proposed by Pridgeon and Chase as members of *Acianthera*, among which was *Pleurothallis melanochthoda* Luer & Hirtz, previously assigned to subgenus *Specklinia*. The same position was adopted in Luer's revision of *Pleurothallis* subgen. *Acianthera* for 2004, where he basically maintained the circumscription of *Acianthera* (independently of the taxonomic rank) as suggested by Pridgeon and Chase (2001), but excluded *Brenesia* (previously subgen. *Acianthera* sect. *Brachystachyae*), subgen. *Sarracenella*, the species allied to *P. oscitans* Ames (segregated in subgen. *Didactylus* Luer), *P. aberrans* Luer (included in subgen. *Aberrantia* Luer) and *P. lepidota* L. O. Williams (previously assigned to subgen. *Acianthera* sect. *Brachystachyae*) (Luer, 2004a,c). That same year he eventually accepted the segregation of *Acianthera* from *Pleurothallis* (Luer, 2004b), publishing 64 new combinations in *Acianthera*, giving generic rank to *Didactylus*, *Aberrantia*, and *Unguella* Luer, and resurrecting *Brenesia* Schltr.

Up to the present, 14–17 species of *Acianthera* sensu lato have been recorded from Costa Rica

(Pupulin, 2002a,b; Dressler, 2003), where they mostly grow as epiphytes in the humid forests of high mountain chains up to 2500 m, although some taxa range to the basal belt of premontane forests at about 500 m (Pridgeon, 2005). Notwithstanding the current debate about generic circumscription within the Pleurothallidinae, botanical exploration continues to disclose new species close to the core of *Acianthera* that need to be described. Hereafter we will describe three new species from Costa Rica.

Acianthera hamata Pupulin & G. A. Rojas, *sp. nov.* TYPE: COSTA RICA. Without specific locality, a plant collected by Adolfo Quesada Chanto, flowered in cultivation at Jardín Botánico Lankester, Universidad de Costa Rica, accession No. JBL-11485, 22 September 2005 (Holotype: CR; Isotype: USJ-Spirit). Fig. 1.

Species Aciantherae cogniauxianae (Schltr.) Pridgeon & M. W. Chase *similis*, *folia lanceolata base rotunda erecta, multo angustioris, rhachidi hamata, floribus minoribus, petalis integris lobo rotundo parte inferna instructis, labelli disco duabus carinis magis late flabel-latis ornato dignoscenda.*

Plant epiphytic, erect to repent, with a thick rhizome concealed by scarious sheaths, producing secondary stems (ramicauls) every 12–15 mm. *Roots* flexuous, glabrous, 1.0–1.5 mm in diam. *Stem* stout, compressed, broadened toward the apex, triangular in section, with sharp margins, centrally grooved, 5.5–10.5 cm long, 0.6–0.9 cm wide at apex, basally provided with 3 slightly loose sheaths, apically monophyllous. *Leaf* fleshy, sessile, lanceolate, acute, tridenticulate, the base rounded, suberect to erect, 8–14 cm long, 2.4–3.7 cm wide. *Inflorescence* an abbreviated, few-flowered (to 5 flowers) raceme, to 6.5 cm long, the rachis uncinat, produced at the base of the leaf from a papyraceous spathe 10–12 mm long, the spathe fugacious. *Floral bract* infundibuliform, acute, 2.0–2.5 mm long. *Pedicel* cylindric, to 1.5 mm long. *Ovary* articulate with the pedicel, glabrous, 2 mm long. *Flowers* with greenish cream sepals, spotted with dark purple, the petals translucent cream, spotted purple, the lip whitish to pale yellow, spotted purple. *Dorsal sepal* oblanceolate, obtuse to rounded, 5.5 mm long, 2.7 mm wide. *Lateral sepals* connate almost to the apex into an obovate-suborbicular synsepal, emarginate

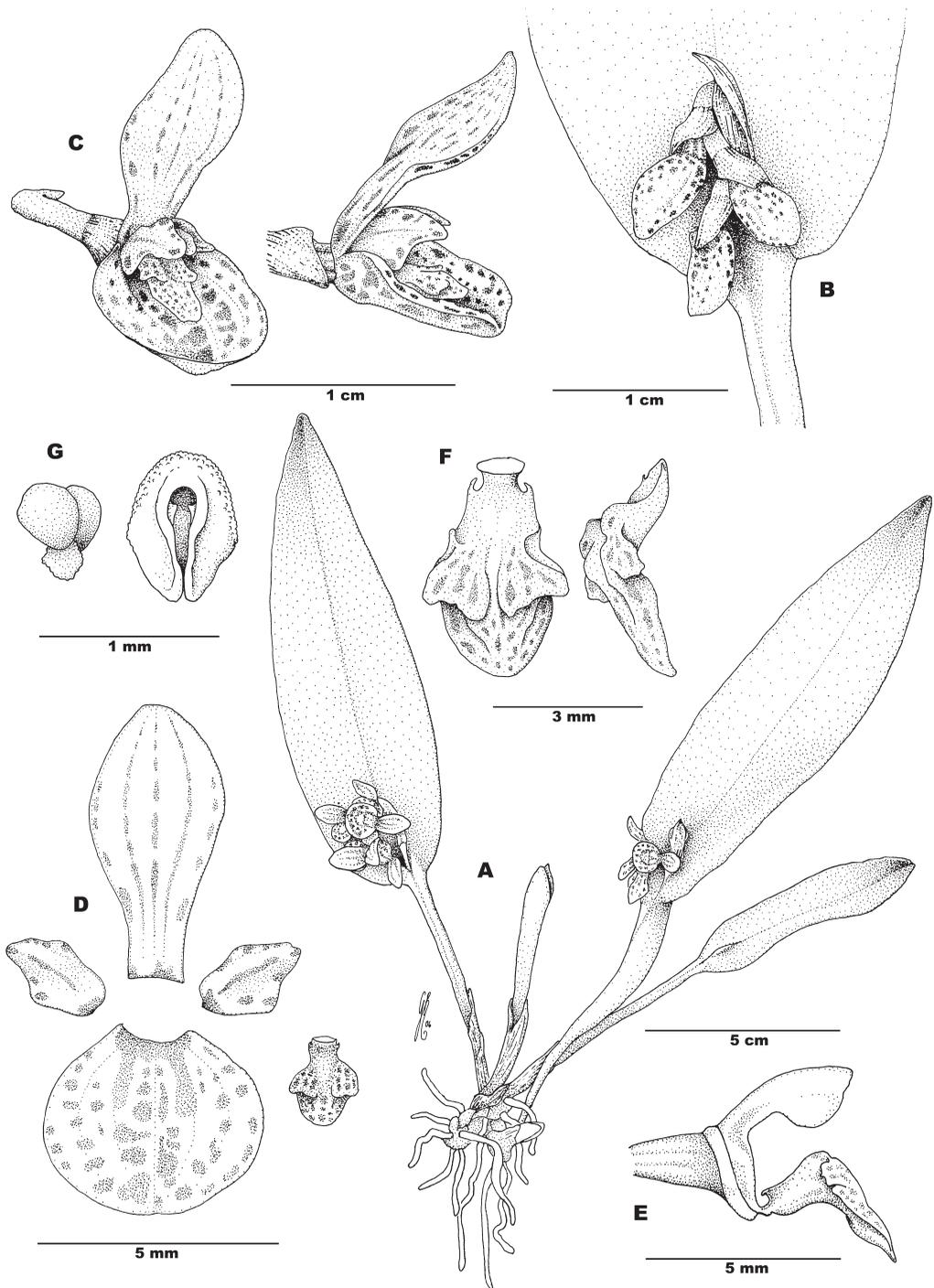


FIGURE 1. *Acianthera hamata* Pupulin & G. A. Rojas. **A**, habit; **B**, detail of the inflorescence; **C**, flower, three quarters and lateral views; **D**, dissected perianth; **E**, column and lip, lateral view; **F**, lip, adaxial and lateral views; **G**, pollinarium and anther cap. Drawn by G. Rojas from the holotype.

at apex, 3.7 mm long, 4.4 mm wide. *Petals* obovate-rhombic, subacute, asymmetric, the inferior side provided with a rounded lobe, 2.3 mm long, 1.4 mm wide. *Lip* clawed, obovate, obtuse-subrounded, 4.5 mm long, 3 mm wide, provided at the base with two small, retrorse horns; the disc with 2 thin, sharply edged, trapezoidal-flabellate, spreading, emarginate-erose keels. *Column* slender, terete, with a short foot, 4 mm long, provided at apex with 2 broad, rounded wings. *Anther cap* cucullate, elliptic, 2-celled. *Pollinia* 2, obovate-suborbicular, with caudicle.

Paratype: COSTA RICA. Without specific locality, flowered in cultivation at Jardín Botánico Lankester, Universidad de Costa Rica, accession No. JBL-11484, 1 December 2005 (JBL-Spirit).

Etymology: from the Latin *hamatus*, hooked, in reference to the characteristically barbed rachis of the inflorescence.

Distribution: known only from Costa Rica.

A specimen of *Acianthera*, collected somewhere in Costa Rica by the staff of Jardín Botánico Lankester at the beginning of the 1990s, and somewhat reminiscent of an aberrant form of *A. cogniauxiana*, has flowered in the living collection of the center for many years now. This accession shows consistent differences in vegetative and floral morphology when compared with *A. cogniauxiana*, but we were reluctant to name a new taxon on the sole basis of a single, cultivated specimen. Now, three more plants from a different source, unfortunately without collecting locality, were obtained from the collection of Costa Rican orchids of Adolfo Quesada Chanto, and we feel therefore more confident in describing it as a new species. *Acianthera hamata* is closely related to *A. cogniauxiana*, with which it shares general habit and flower morphology. However, *A. hamata* has distinctly lanceolate, erect leaves (vs. broadly ovate, horizontal to slightly decumbent in *A. cogniauxiana*), rounded at the base (vs. cordate), less than 4 cm wide (vs. more than 6 cm), a characteristically hooked rachis (vs. straight), with up to 5 flowers (to 14 in *A. cogniauxiana*), smaller flowers (the sepals < 6 mm vs. > 10 mm long), the dorsal sepal obtuse-rounded (vs. acute), the petals entire (vs. serrulate at the apical margins), provided with a rounded lobe on the lower margin, and the disk of the lip with two

large, flabellate keels (vs. small, linear). The original locality data associated with the new species remain, unfortunately, unknown, but we hope the formal description of *A. hamata* will reveal more plants in cultivation and help to gather further information on its ecology.

Acianthera fecunda Pupulin, G. Rojas & J. D. Zúñiga, *sp. nov.* TYPE: COSTA RICA. Cartago: Turrialba, La Suiza, road between Pacayitas and La Suiza, 2 km South of Pacayitas, 9°52'29.9" N 83°35'03.6" W, 1150 m, premontane rain forest, epiphytic in secondary vegetation along pastures, 8 March 2006, *D. Bogarín 2650, R. L. Dressler, A. Karremans & F. Pupulin* (Holotype: CR; Isotype: JBL-Spirit). Fig. 2.

Herba epiphytica perpusilla ramicaulibus quam foliis brevioribus, folia anguste ovata, inflorescentia biflora, flores semper cleistogami, sepalum posticum oblongum, synsepalum late ovatum, petalis lanceolatis, labellum 3-lobatum, hastatum, lobulis lateralibus rotundatis, lobo intermedio obtuso, dauabus carinis subquadratis ornato.

Plant epiphytic, caespitose, small, up to 2.5 cm tall. *Roots* slender, flexuous, 0.5 mm in diam. *Stem* short, subtriangular in section, grooved, dilated toward the apex, 6–10 mm long, enclosed at the base by 2–3 infundibuliform, tubular, membranaceous bracts to 5 mm long. *Leaf* narrowly ovate, acute, minutely emarginate, provided with a small abaxial apicule, 16–17 mm long, 5–6 mm wide. *Inflorescence* a 2-flowered, suberect raceme borne at the base of the leaf from a membranaceous spathe 2 mm long. *Floral bract* membranaceous, globose-infundibuliform, acuminate, to 0.5 mm long. *Pedicel* clavate, to 1 mm long. *Ovary* elliptic, longer than the pedicel, to 5 mm long, 2 mm wide. *Flowers* always cleistogamous, yellowish green, sparsely spotted purple on the petals and the keels of the lip. *Dorsal sepal* oblong, acute, 2.7 mm long, 1.2 mm wide, abaxially carinate. *Lateral sepals* connate in the basal two-thirds into a broadly ovate synsepal, obtuse to subacute, 2.8 mm long, 2 mm wide. *Petals* lanceolate, acute, the distal margins irregularly erose-denticulate, 1.5 mm long, 0.6 mm wide. *Lip* articulate with the column foot, clawed, obscurely 3-lobed, hastate, 1.6 mm long, 1 mm wide, the lateral lobes rounded, the midlobe obtuse, subcrenulate,

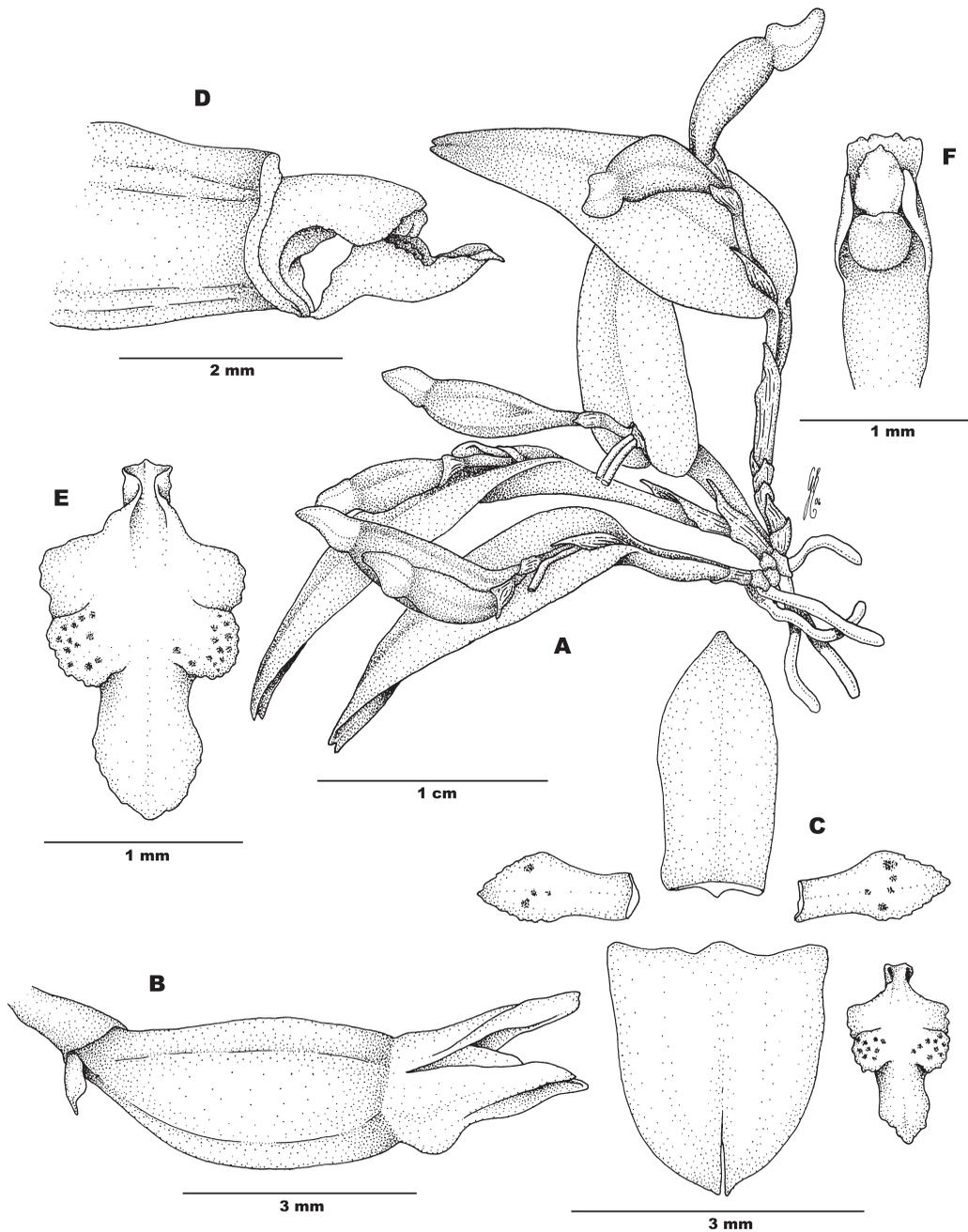


FIGURE 2. *Acianthera fecunda* Pupulin, G. Rojas & J. D. Zuñiga. A, habit; B, ovary and flower; C, dissected perianth; D, column and lip, lateral view; E, lip, adaxial view; F, column, ventral view. Drawn by G. Rojas from the holotype.

provided with 2 subquadrate, crenulate, diverging, laminar keels. *Column* slender, terete, 1.2 mm long, with a short foot, provided with 2 elliptic wings, the apex with a truncate, erose, petaloid clinandrium. *Anther cap* cucullate, obovate.

Etymology: from the Latin *fecundus*, fruitful, in reference to the autogamous nature of the species.

Distribution: known only from Costa Rica.

Ecology: epiphytic on remnant patches of very wet premontane secondary forest at 1150 m elevation. The cleistogamous flowers have been observed during October and November, corresponding to the rainy season.

Acianthera fecunda has apparently no close relatives within the genus, with the exception of the species described hereafter as *A. cabiriae*. It can be recognized by the very reduced habit size (less than 3 cm tall), the 2-flowered, short inflorescence, and the cleistogamous nature of the flowers. The broadly ovate synsepal, the lanceolate petals with irregularly erose-denticulate margins, and the hastate, obscurely 3-lobed lip provided with subquadrate, laminar keels easily distinguish the flower among *Acianthera* species.

Acianthera cabiriae Pupulin, G. Rojas & J. D. Zúñiga, *sp. nov.* TYPE: COSTA RICA. Cartago: Turrialba, CATIE, in the Cabiria fruit trees collection, ca. 600 m, with blossoms and developing fruits at Jardín Botánico Lankester, 26 September 2006, A. Karremans 1433 (Holotype: CR). Fig. 3.

Species Aciantherae fecundae Pupulin, G. Rojas & J. D. Zúñiga *similis, atque illae floribus cleistogamis, sed statura duplo majore, foliis ellipticis, inflorescentia tribus vel plus floribus, sepalo dorsalibus elliptico, synsepalo ovato, labello ovato-sublanceolato obscure 3-lobato truncato marginibus lateralibus integris carinis diminutis, columna elliptica-subrhombica clinandrio reducto differt.*

Plant epiphytic, caespitose, small, up to 6 cm tall. *Roots* slender, flexuous, less than 1 mm in diam. *Stem* subequal to the leaf, triangular in section, grooved, dilated toward the apex, distinctly keeled abaxially, 1–3 cm long, enclosed at the base by 3–4 infundibuliform, tubular, membranaceous bracts to 12 mm long. *Leaf* elliptic, acute, minutely emarginate, provided with a small abaxial apicule, 3.0–3.5 cm long,

0.8–1.0 cm wide. *Inflorescence* a 3-(–4)-flowered, prostrate raceme borne at the base of the leaf from a membranaceous, eventually papyraceous, spathe to 3.5 mm long. *Floral bract* membranaceous, tubular-cylindric, amplexant, obtuse, to 1.8 mm long. *Pedicele* cylindrical, to 1 mm long. *Ovary* subclavate, longer than the pedicel, to 2.5 mm long, 1.3 mm wide. *Flowers* always cleistogamous, yellowish green. *Dorsal sepal* elliptic, acute, minutely subrounded, 3 mm long, 1.5 mm wide, abaxially carinate. *Lateral sepals* connate into an ovate synsepal, subacute, 3 mm long, 2.3 mm wide. *Petals* lanceolate, acute, the distal margins irregularly denticulate, 1.8 mm long, 1 mm wide. *Lip* articulate with the column foot, clawed, obscurely 3-lobed, ovate-sublanceolate, 2 mm long, 1.5 mm wide, the lateral lobes rounded, erect, forming a small cuniculus, the midlobe truncate, provided with 2 low, crenulate, laminar keels. *Column* semiterete, elliptic-subrhombic, 1.7 mm long, provided with 2 linear wings, the apex rounded-erose. *Anther cap* cucullate, obovate, minutely papillose.

Etymology: named from the Cabiria fruit trees collection of CATIE at Turrialba.

Distribution: known only from Costa Rica.

Ecology: epiphytic on cultivated trees at 600 m elevation. The climate of the area is warm and very wet, and the remnant woods can be assigned to the very wet tropical, transition to wet premontane forests. Flowering occurs in September and October, corresponding to the rainy season.

Acianthera cabiriae is closely related to *A. fecunda*, and like it, has cleistogamous flowers. A fresh blossom was opened to illustrate the type, in which the pollen was already extruded from the anther and beginning to germinate into the stigmatic fluid. The new species is at least twice the size of *A. fecunda*, it has elliptic leaves (vs. narrowly ovate), and the inflorescence bears three to four flowers (vs. two). The lateral sepals are connate to the apex into an ovate synsepal (vs. broadly ovate, the apex free in *A. fecunda*), and the lip is ovate-sublanceolate and truncate (vs. hastate, acute), with low, linear, and inconspicuous adaxial keels (vs. large, flabellate). Moreover, the column of *A. cabiriae* is elliptic-subrhombic, with a reduced clinandrium, whereas in *A. fecunda* it is terete with a distinctly petaloid clinandrium.

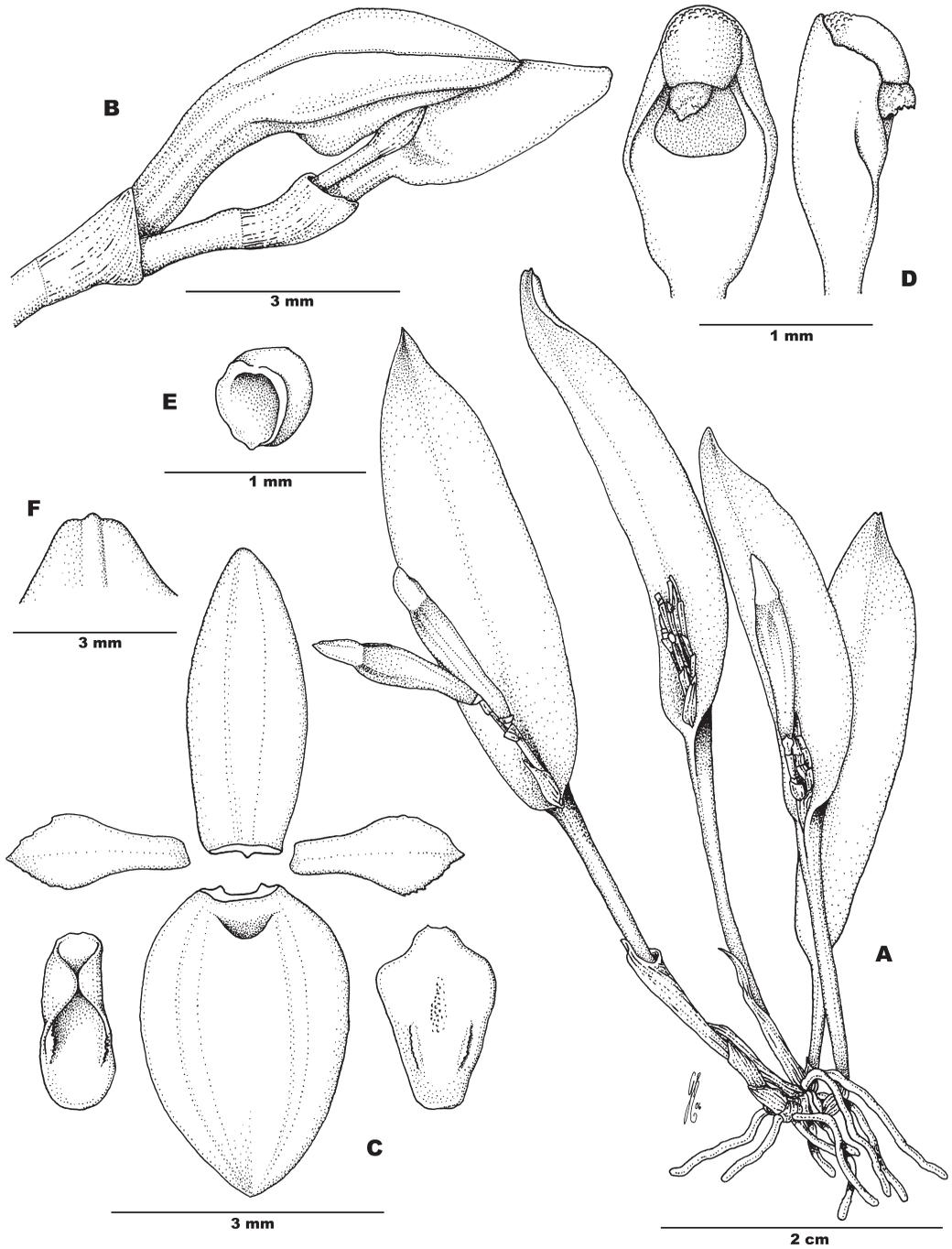


FIGURE 3. *Acianthera cabiriae* Pupulin, G. Rojas & J. D. Zuñiga. **A**, habit; **B**, apex of the inflorescence and buds; **C**, dissected perianth; **D**, column, ventral and lateral views; **E**, anther cap; **F**, apex of leaf, abaxial view. Drawn by G. Rojas from the holotype.

LITERATURE CITED

- DRESSLER, R. L. 2003. Orchidaceae. Pages 1–595 in B. E. HAMMEL, M. H. GRAYUM, C. HERRERA, AND N. ZAMORA, EDS., *Manual de Plantas de Costa Rica 3. Monocotiledóneas (Orchidaceae-Zingiberaceae)*. Monogr. Syst. Bot. Missouri Bot. Gard. 93.
- LINDLEY, J. 1842. *Pleurothallis*. Bot. Reg. n.s. 15: Misc. 67–84.
- . 1859. Folia Orchidacea, *Pleurothallis*: 23.
- LUER, C. A. 1986. Icones Pleurothallidarum 3. Systematics of *Pleurothallis*. Monogr. Syst. Bot. Missouri Bot. Gard. 20: 1–109.
- . 2002. A systematic method of classification of the Pleurothallidinae versus a strictly phylogenetic method. *Selbyana* 23(1): 57–110.
- . 2004a. Icones Pleurothallidarum 26. Systematics of *Pleurothallis* subgenus *Acianthera* (Orchidaceae). Monogr. Syst. Bot. Missouri Bot. Gard. 95: 1–75.
- . 2004b. New genera and combinations in the Pleurothallidinae. Monogr. Syst. Bot. Missouri Bot. Gard. 95: 253–265.
- . 2004c. Three new subgenera in *Pleurothallis*. Monogr. Syst. Bot. Missouri Bot. Gard. 95: 76–81.
- PRIDGEON, A. M. 2005. *Acianthera* Scheidw. Pages 2–11 in F. PUPULIN AND COLLABORATORS, *Acianthera-Kegeliella*. Vol. 1 of *Vanishing Beauty. Native Costa Rican Orchids*. Editorial de la Universidad de Costa Rica, San José.
- PRIDGEON, A. M., AND W. M. CHASE. 2001. A phylogenetic reclassification of Pleurothallidinae (Orchidaceae). *Lindleyana* 16: 235–271.
- PRIDGEON, A. M., R. SOLANO, AND M. W. CHASE. 2001. Phylogenetic relationships in subtribe Pleurothallidinae (Orchidaceae): Combined evidence from nuclear and plastid DNA sequences. *Amer. J. Bot.* 88: 2286–2308.
- PUPULIN, F. 2002a. Catálogo revisado y actualizado de las Orchidaceae de Costa Rica. *Lankesteriana* 2(2): 1–188.
- . 2002b. *Pleurothallis* en Costa Rica. Cambios en la nomenclatura. *Epidendrum* 13 (Suppl.): 1–4.