



Four new species of the genus *Racinaea* (Bromeliaceae) from Ecuador

JOSÉ M. MANZANARES¹ & ERIC J. GOUDA²

¹ Herbario Nacional del Ecuador, Museo Ecuatoriano de Ciencias (QCNE) Naturales, Casilla Postal 17-09-7518, Quito, Ecuador. E-mail: manzanar@interactive.net.ec

² Botanic Garden, University of Utrecht (U), Utrecht, Netherlands. E-mail: E.J.Gouda@uu.nl

Abstract

Four new species belonging to the genus *Racinaea* (formerly *Tillandsia* subgenus *Pseudo-Catopsis*, Bromeliaceae) from Ecuador are described and illustrated here. The new species *R. condorensis* from the province of Zamora-Chinchipec in the southern region of Ecuador is similar to *R. contorta*. *Racinaea guacamayosensis* from the Cordillera de los Guacamayos, an area close to Tena in the province of Napo, has close affinity with *R. diffusa* and *R. penlandii*. *Racinaea terrestris* from the province of Morona-Santiago, southern Ecuador, is also similar to *R. diffusa*. The new species *R. tillii* from the cloudy, cool mountain forest on the Amazonian side of the Andes in Napo province, is very alike *R. penlandii*. Distinguishing characters between these species are provided.

Key words: Taxonomy, Flora of Ecuador, *Pseudo-Catopsis*, *Tillandsia*, *Tillandsioideae*

Resumen

Los autores, Manzanares y Gouda, describen e ilustran cuatro nuevas especies pertenecientes al género *Racinaea* (previo subgénero *Pseudo-Catopsis* en *Tillandsia*, Bromeliaceae) de Ecuador y proveen la información morfológica que las distinguen de las especies relacionadas. *Racinaea condorensis* de la provincia de Zamora-Chinchipec, región situada al sureste del Ecuador, y está relacionada con *R. contorta*. *Racinaea guacamayosensis* de la Cordillera de los Guacamayos, área cerca de Tena en la provincia de Napo, relacionada con *R. diffusa* y *R. penlandii*. *Racinaea terrestris* de la provincia de Morona-Santiago, al sureste del Ecuador, está relacionada con *R. diffusa*. *Racinaea tillii* del bosque nublado en la vertiente Amazónica de los Andes, en la provincia de Napo, esta relacionada con *R. penlandii*.

Palabras clave: Taxonomía, Flora del Ecuador, *Pseudo-Catopsis*, *Tillandsia*, *Tillandsioideae*

Introduction

During several expeditions to different parts of Ecuador, species of the genus *Racinaea* (Tillandsioideae), former subgenus *Pseudo-Catopsis* of *Tillandsia*, were studied in preparation for the publication of volume three in the 'Jewels of the Jungle, Bromeliaceae of Ecuador' series (previous vols.: Manzanares 2002, Manzanares 2005). Ecuador appears to be the center of biodiversity for this enigmatic genus, which has been poorly studied in the past due to the indistinguishability of species based on herbarium vouchers alone. Most *Racinaea* species have tiny flowers that look alike when dried. Recent field and cultivation studies, where the flowers could be studied fresh, have led to the description of many new species (Gouda & Manzanares 2008, Höpfel & Scharf 2008, Luther 2007, Manzanares & Till 2007). Four new species of *Racinaea* were recently discovered and are presented below.

Taxonomy

Racinaea condorensis Manzan. & Gouda, *sp. nov.* (Figs. 1, 2, 3)

A *Racinaea contorta* cui verisimiliter affinis, rosula haud subbulbosa (nec dense subbulbosa), vaginis foliorum orbicularibus (nec ovatis), laminis triangularibus (nec anguste triangularibus), pedunculo folia superante (nec foliis brevior), spicis 2 cm longis (nec 3–6 cm longis) et valde angulatis (nec teretibus), bracteis floralibus 0.3 cm longis (nec 0.4 cm longis) marginibus in parte distali leviter undulatis (nec marginibus rectis), sepalis 0.4 cm longis (nec 5–6 mm longis) differt.

Type:—ECUADOR: Zamora-Chinchipec: Cordillera del Condor, km 47 on the road Los Encuentros-El Destacamento, 03° 41' S, 78° 31' W, 1450 m, 11 April 1997, J.M. Manzanares, E. Girko, J. Raack, E. Doherty & M. Navarro 6358 (holotype QCNE).



FIGURE 1. Type of *Racinaea condorensis* Manzan. & Gouda in habitat.

Plant epiphytic, flowering ca. 31 cm tall. Leaves forming a rosette, erect, numerous, green and red maculate; sheaths ca. 5.5 cm long, 5.5 cm wide, orbicular, adaxially densely lepidote, lower part brown and the center brown-castaneous, upper part with violet spots. Blades ca. 8.5 cm long, 2.4 cm wide, narrowly triangular, attenuate and

recurved at apex, sparsely lepidote, green, with red-violet circular spots. Inflorescence ca. 13 cm long, 6 cm wide, once branched with about 11 branches; branches 0.4–1.5 cm apart, lax, glabrous, erect; axis green or red. Peduncle exceeding the leaves, ca. 16 cm long, 2 mm in diameter, erect, red, glabrous; peduncle bracts remote, the lower ones not foliaceous (all bractiform), 1–1.5 cm long, 0.6 cm wide, elliptic, apiculate, reddish, adaxially glabrous and abaxially sparsely lepidote, distinctly nerved. Primary bracts ovate, 0.4–1.2 cm long, ca. 0.3 cm wide, the lower ones shorter than and the upper ones equaling the stipe, tubular-involute, distinctly nerved, apiculate, sparsely lepidote, green to pink. Spikes with a stipe of 0.3–2.5 cm long bearing several sterile bracts, upper part dense and lower part sub-dense, ca. 2 cm long, 0.5 cm wide, 8–11-flowered; rachis geniculate, strongly angled, flowers 0.2 cm apart. Floral bracts ca. 3 mm long, 3 mm wide, ovate, rounded and acuminate, carinate, glabrous or lepidote, shorter than the sepals, incurved, green. Flowers distichous, not secund, sessile, spreading. Sepals ca. 4 mm long, 2 mm wide, asymmetrical, oblong, coriaceous, free, obtuse, ecarinate, glabrous. Petals ca. 5 mm long, white, the blade erect. Filaments ca. 1 mm long, flat; anthers 1 mm long, arranged around the stigma. Pistil reaching the middle of the anthers; ovary 1 mm long, globose; stigma and style 1 mm long.



FIGURE 2. Detail of the inflorescence of *Racinaea condorensis* Manzan. & Gouda

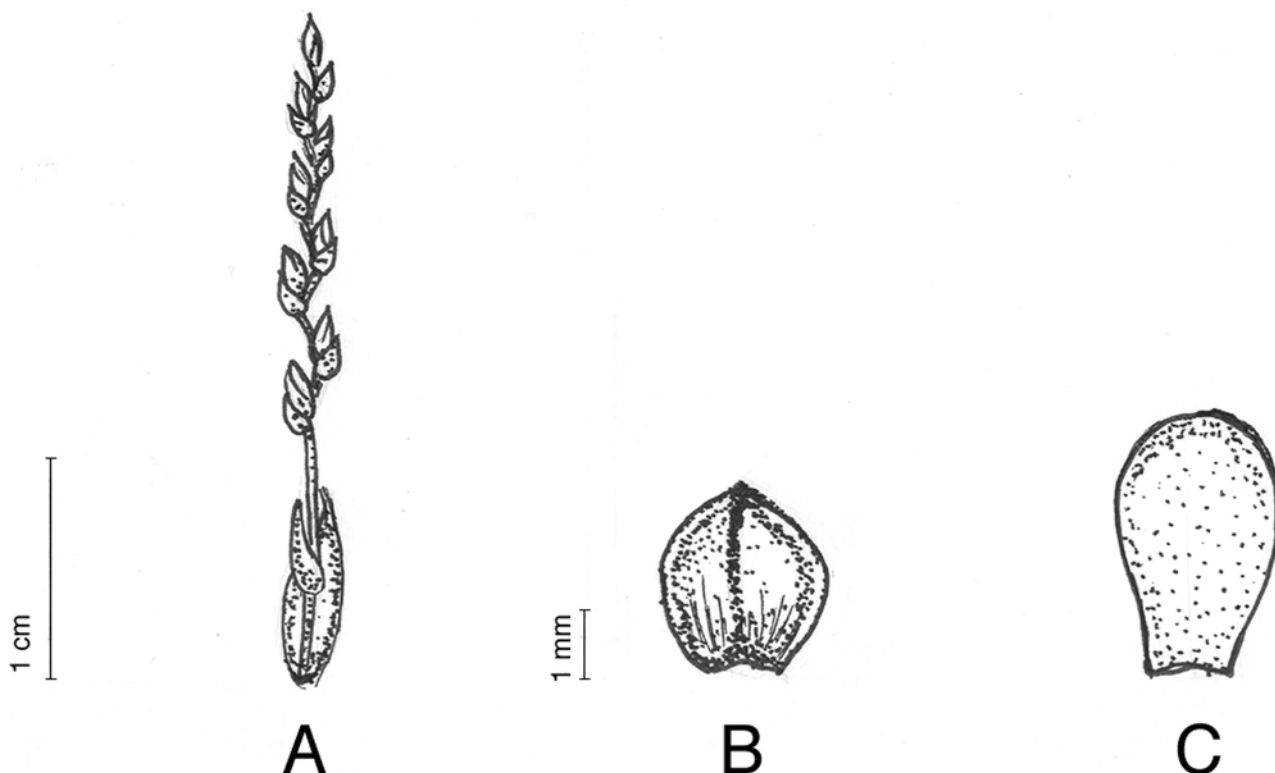


FIGURE 3. *Racinaea condorensis* Manzan. & Gouda. **A.** Spike. **B.** Flower bract. **C.** Sepal.

Distribution:—Ecuador, province of Zamora-Chinchipe.

Etymology:—Referring to the Cordillera del Condor, where the type specimen was collected.

Observations:—*Racinaea condorensis* is related to *R. contorta* (Mez) Spencer & Smith (1993: 153), but it can be distinguished by: a cyathiform rosette (vs. forming an ellipsoid pseudobulb), leaf-sheaths orbicular (vs. ovate); leaf-blades narrowly triangular with an attenuate recurved apex (vs. very narrowly triangular, involute, subulate with a long attenuate apex); a peduncle much exceeding the leaves (vs. shorter than the leaves); the inflorescence is erect (vs. a pendulous inflorescence), always once branched (vs. twice branched in most cases); spikes ca. 2 cm long (vs. 3–6 cm long) and rachis strongly angled (vs. rachis terete); the floral bracts 3 mm long (vs. 4 mm long) and the margins in the upper part slightly undulate (vs. strait) and the sepals 4 mm long (vs. 5–6 mm long). It can sometimes be confused with the once branched *Racinaea euryelytra* Grant (1994: 284) that forms a bulbous rosette with narrower leaf-blades and has only 15–20 leaves in a rosette (vs. about 25 in *R. condorensis*). The blades are relatively longer in *R. euryelytra* (vs. about as long as the sheaths), with acute floral bracts (vs. rounded and acuminate) and the sepals are ca. 3 mm wide (vs. ca. 2 mm in *Racinaea condorensis*).

In general *Racinaea condorensis* can be distinguished from all other species of *Racinaea* by the following combination of characteristics: plant forming a cyathiform rosette; leaf blades narrowly triangular ca. 2.4 cm wide near the base, with an attenuate apex; inflorescence laxly once branched on a peduncle much exceeding the leaves; spikes dense, only the lower ones long stipitate; floral bracts 3 mm long, exceeded by the 4 mm long sepals, carinate, rounded, and acuminate.

Comment:—In 1997 an expedition to southern Ecuador to study Bromeliaceae in the wild was organized. The participants of the expedition were: Elizabeth Patterson (vice-president of the Bromeliad Society of Dallas), Jerry Raack (president of the Bromeliad Society International), Ed Doherty (president of the Bromeliad Society of Dallas), Monica de Navarro (president of the Orchid Society of Quito) and the first author (curator of the Bromeliaceae at QCNE). During this trip we had the opportunity to study many species, especially *Puya* and *Racinaea*. Many of them were flowering at the time, which is unusual especially for *Puya*, which stays in a vegetative state for most of its life. During the 7th day of the expedition in the Cordillera del Condor,

we studied the bromeliads in an area from Los Ecuenteros to El Destacamento. This road starts at the main road Zamora-Gualaquiza and enters into the most beautiful area that exists in Ecuador, the Cordillera del Condor. It terminates at a military camp that prevents visitors from going any further, which is just as well, because this area is loaded with land mines. In this area we found specimens of *Racinaea undulifolia* (Mez) H.Luther, *R. schumanniana* (Wittm.) J.R.Grant, *R. penlandii* var. *pedunculata* (L.B.Sm.) M.A.Spencer & L.B.Sm., and *R. spiculosa* (Griseb.) M.A.Spencer & L.B.Sm., among several species of *Aechmea*, *Guzmania*, *Mezobromelia*, *Tillandsia*, and *Vriesea*.

***Racinaea guacamayosensis* Manzan. & Gouda, sp. nov.** (Figs. 4, 5, 6)

A *Racinaea diffusa*, cui verisimiliter affinis, differt statura minore inflorescentia ad 80 cm longa (versus 100 cm longa vel ultra), pseudobulbo nullo (versus foliis in pseudobulbum incrassatis), lamina triangulari apice longe attenuata (versus subligulata apice acuminata), inflorescentia trichomatibus ferrugineis (versus cinereis), bracteis floralibus 0.35 mm longis orbicularibus apice obtusis (versus 0.5 cm longis ovatis apice acutis), floribus secundis (versus non secundis) petalis cremeis (versus albis); a *Racinaea penlandii* differt statura majore inflorescentia inclusa 80 cm alta (versus 60 cm alta), pseudobulbo nullo (versus foliis in pseudobulbum ellipsoideum incrassatis), lamina triangulari 30–40 cm longa et 4 cm lata (versus lamina 10–15 cm longa et 0.7–1 cm lata), spicis 3–6 cm longis, laxis (versus 1–1.5 cm longis, densis), rhachidi flexuosa (versus geniculata), bracteis floralibus sepalis dimidio brevioribus (versus sepalis paulo brevioribus), floribus secundis (versus non secundis), sepalis 0.6–0.7 cm longis (versus 0.5 cm longis).

Type:—ECUADOR: Napo: Cordillera de los Guacamayos, sector of Guacamayos, 00°37'22''S, 77°49'54''W, 2228 m, flowered in cultivation March 2006, *J.M. Manzanares 8175* (holotype QCNE, isotype U).

Plant stemless, epiphytic, flowering 80 cm tall, forming a funnel-form rosette. Leaves subcoriaceous, numerous, about 25, lepidote, purple-spotted; sheaths 14 cm long, 8.5 cm wide, erect, elliptic, venation evident, lepidote, adaxially brown reddish and abaxially brown, the upper part with purple circular spots on both sides; blades 30–40 cm long, 4 cm wide, triangular, recurving and pendent, nearly flat, with long attenuate apex, lepidote, adaxially green with purple spots and abaxially reddish-purple. Inflorescence erect, (fertile part) 40–50 cm long, 13 cm wide, twice branched, lax, ellipsoid, brown, covered with ferruginous indument, with 15–17 primary branches, branches 2–2.5 cm apart, branches polystichous; axis flexuous, stout, red to purple, ferruginously lepidote. Peduncle exceeding the leaves, 25–30 cm long, 5 mm in diameter, erect, reddish to purple, densely lepidote; peduncle bracts the lower ones subfoliaceous; the upper ones exposing the peduncle in part, sheathing part erect and about equaling the internodes, ovate, closely clasping the peduncle, with triangular 8–10 cm long pendent attenuate blade, reddish to purple, densely lepidote. Primary bracts membranaceous, elliptic, 1–9 cm long, 1.3 cm wide, spreading, shorter than the branches, exceeding and loosely enfolding the stipe of the branches, distinctly nerved, the lower ones with attenuate apex and the upper ones more apiculate and cucullate, densely lepidote, green with purple circular spots. Branches on a long stipe of 1–3 cm long, straight and spreading; primary branches 7–10 cm long, lax, consisting of 3–6 pale brown and densely lepidote spikes; secondary bracts 6 mm tall, 4 mm wide, ovate, obtuse, shorter than the stipe of the spikes, adaxially glabrous, abaxially densely brown lepidote. Spikes short-stipitate (stipe 0.5–1 cm long) spreading and ascending, lax, 3–6 cm long, 1 cm wide, 9–16-flowered, pale-brown, densely lepidote, without sterile bracts; rachis flexuous, wholly exposed, slender, transversely triangular with the widest side adaxial. Floral bracts spreading, becoming secund with the flowers, 3.5 mm long, 0.5 mm wide, shorter than the sepals and exposing them for the most part, remote, orbicular, obtuse, adaxially glabrous, abaxially densely lepidote, brown. Flowers spreading to a right angle, slightly downward secund, sessile, the lower internodes longer than the flowers and the upper shorter. Sepals 6 mm long, 4 mm wide, strongly asymmetric (winged at one side), obovate, carinate, free, sub-truncate, adaxially glabrous, abaxially densely lepidote, pale brown. Petals 8 mm long, cream, the blade spreading.



FIGURE 4. Type of *Racinaea guacamayosensis* Manzan. & Gouda in habitat.



FIGURE 5. Detail of the inflorescence of *Racinaea guacamayosensis* Manzan. & Gouda

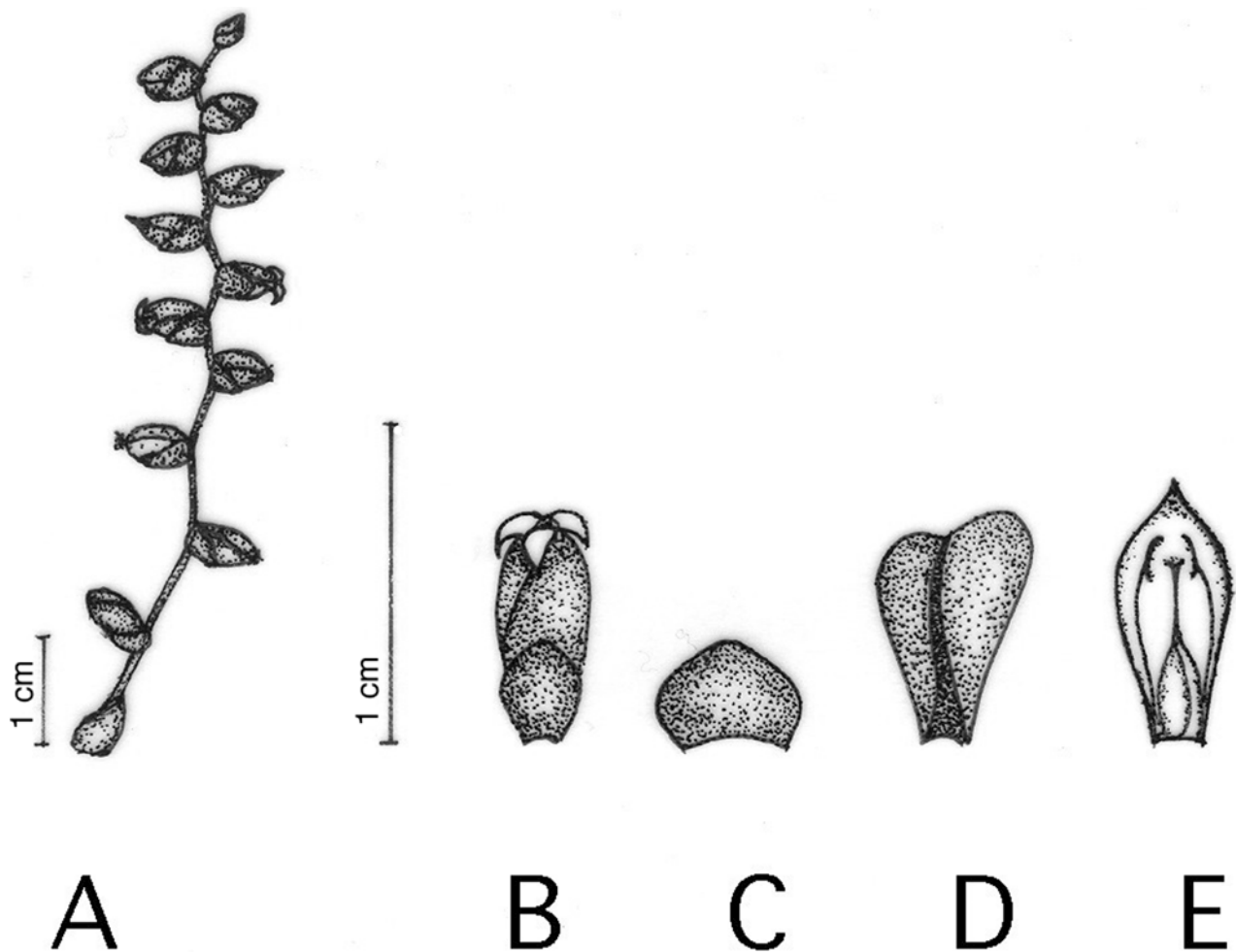


FIGURE 6. *Racinaea guacamayosensis* Manzan. & Gouda –A. Spike –B. Flower –C. Flower bract. –D. Sepal. –E. Petal.

Distribution:—Ecuador, province of Napo.

Etymology:—It is named after the Cordillera de los Guacamayos, the area where the type was collected.

Additional specimens examined (paratypes):—ECUADOR: Napo: Tena, Cordillera de los Guacamayos, 2200 m, July 1991, *J.M. Manzanares 5961* (QCNE); Tena, Cordillera de los Guacamayos, Chacana Urcu, 2200 m, *J.M. Manzanares 5662* (QCNE), 8 June 1996; Archidona, sector Guacamayos, 00°37'22''S, 77°49'54''W, 2228 m, 20 November 2005, *J.M. Manzanares & E. Gouda 7797* (QCNE, U).

Observations:—The general appearance of the inflorescence of *Racinaea guacamayosensis* is like that of *R. diffusa* (L.B.Sm.) Spencer & Smith (1993: 153), from which it can be distinguished by: its smaller size up to 80 cm (vs. over 100 cm long), its ferruginous indument (vs. a cinereous indument); plant not forming a pseudobulb (vs. forming a pseudobulb); leaf-blades triangular with a long attenuate apex (vs. sub-ligulate with acuminate apex); floral bracts 3.5 mm long, orbicular with obtuse apex (vs. 5 mm long, ovate with acute apex); sepals 6–7 mm long (vs. 4.5 mm long); flowers secund (vs. not secund) and petals cream (vs. petals white). Following the key on page 694 in the monograph of Smith & Downs (1977), this species keys out as *Racinaea penlandii* (L.B.Sm.) Spencer & Smith (1993: 156), but *R. guacamayosensis* can be distinguished from this species by its larger size: up to 80 cm long including inflorescence (vs. 60 cm long); plant not forming a pseudobulb (vs. forming a long ellipsoid pseudobulb); leaf-blades triangular, 30–40 cm long, 4 cm wide (vs. 10–15 cm long, 0.7–1 cm wide); spikes 3–6 cm long and lax (vs. 1–1.5 cm long and dense); rachis flexuous (vs. geniculate); floral bracts reaching half of the length of the sepals (vs. slightly inferior to the sepals); sepals 6–7 mm long (vs. 5 mm long) and flowers secund (vs. flowers not secund).

According to Smith's key and description, *R. penlandii* can have secund flowers, but after studying the type and the plants in habitat, this seems not to be the case.

Comment:—In June 1996 PROBONA (Programa de Bosques Nacionales Andinos) financed the study of the Bromeliaceae of Cordillera de los Guacamayos, an area close to Tena, in the eastern province of Napo, with the idea of selecting the most ornamental bromeliads, teaching the local communities how to cultivating and market them, with the aim to provide the communities with an alternative income to logging, in the hope to prevent further destruction of primary forests. During the expedition in Chacana Urcu, we found, for the first time, this beautiful new species (*Manzanares* 5662, QCNE). My first impression was that it was closely related to *R. diffusa*, but more material was needed for an objective evaluation. Unfortunately we could not repeat the expedition immediately. Time passed and in November 2005 we travelled to Tena, crossing the Cordillera de los Guacamayos. The second author found this new *Racinaea* species in fruiting stage growing in a tree close to the road. Later we had the opportunity to study the plant in flower, confirming its affinity with *R. penlandii* and *R. diffusa*. After studying the types of both species carefully, we are now convinced that this *Racinaea* represents a new species.

***Racinaea terrestris* Manzan. & Gouda, sp. nov.** (Figs. 7, 8, 9)

A Racinaea diffusa, cui verisimiliter affinis, caule 20–50 cm longo (nec caule nullo) stolones emittente (nec stolonibus nullis), spicis indumento ferrugineo omnino obtectis (nec dense cinereolepidotis), bracteis floralibus 2 mm longis (nec 5 mm longis) sepalis brevioribus (nec sepala aequantibus), floribus secundis (nec patentibus) differt.

Type:—ECUADOR: Morona-Santiago: cantón Limón Indanza, Cerro Ijiach Naint, Cordillera de Huaracayo, to the east of the river Coangos, on a sandstone mesa « tepui », 03°15'47''S, 78°10'32''W, 1900 m, 20 March 2001, J.M. Manzanares, D. Neill, P. Berry, L. Jost, B. Patterson and Shuar participants from Tinkimints 7213 (holotype QCNE, isotypes MO, SEL, WU).

Plant terrestrial, flowering 120–150 cm tall; stem 20–50 cm long, lower part covered by old leaves; propagating by stolons. Leaves, the apical ones forming a dense sub-rosette, erect, numerous, coriaceous, green; sheaths 18 cm long, 8 cm wide, elliptic, large, adaxially densely lepidote, dark castaneous; blades 20–30 cm long, 3.5–4 cm wide, ligulate, apiculate, adaxially sparsely lepidote, abaxially densely lepidote, green. Inflorescence 50–70 cm long, 30 cm wide, 2-branched, lax, primary branches 5–7 cm apart, covered with ferruginous indument except the petals, erect; axis brown-purple, slightly flexuous, cinereous lepidote. Peduncle exceeding the leaves, 40 cm long, 4 mm in diameter, erect, brown-purple, cinereous lepidote, becoming glabrous with age; peduncle bracts all bractiform, remote, 5–7 cm long, 1 cm wide, elliptic, apiculate, green, adaxially glabrous and abaxially densely lepidote. Primary bracts ovate, 1.5–4 cm long, 0.8 cm wide, the lower ones shorter than the stipes of the branches, the upper ones equaling or slightly exceeding them, involute, elliptic, apiculate, adaxially sparsely lepidote, abaxially densely lepidote, brown-purple. Primary branches 34 cm long, lax, spreading, the upper ones ascending, the lower ones slightly arching downward, slender, consisting of 3–7 spikes, totally covered with ferruginous indument. Racemes with stipes of 2–3 cm long, with one or without sterile bracts, lax, the lateral ones 10–17 cm long, the terminal one to 22 cm long, 0.4 cm wide, 15–24-flowered, with the flowers 1–1.6 cm apart, spreading, ascending at anthesis, pendulous in fruiting stage, totally covered with ferruginous indument; rachis flexuous. Floral bracts 2 mm long, 3 mm wide, suborbicular, acuminate, ecarinate, secund with the flower, adaxially glabrous, abaxially totally covered with ferruginous indument, shorter than the sepals, nerved. Flowers secund, short pedicellate, pedicel 1 mm long. Sepals 4–5 mm long, 2 mm wide, asymmetrical, oblong, coriaceous, free, obtuse, concave, abaxially totally covered with ferruginous indument. Petals 7 mm long, yellow, recoiled. Capsules 1.8 cm long.

Distribution:—Ecuador, province of Morona-Santiago.

Etymology:—Referring to the terrestrial growth of the plant.



FIGURE 7. Type of *Racinaea terrestris* Manzan. & Gouda in habitat.



FIGURE 8. Detail of the inflorescence of *Racinaea terrestris* Manzan. & Gouda.

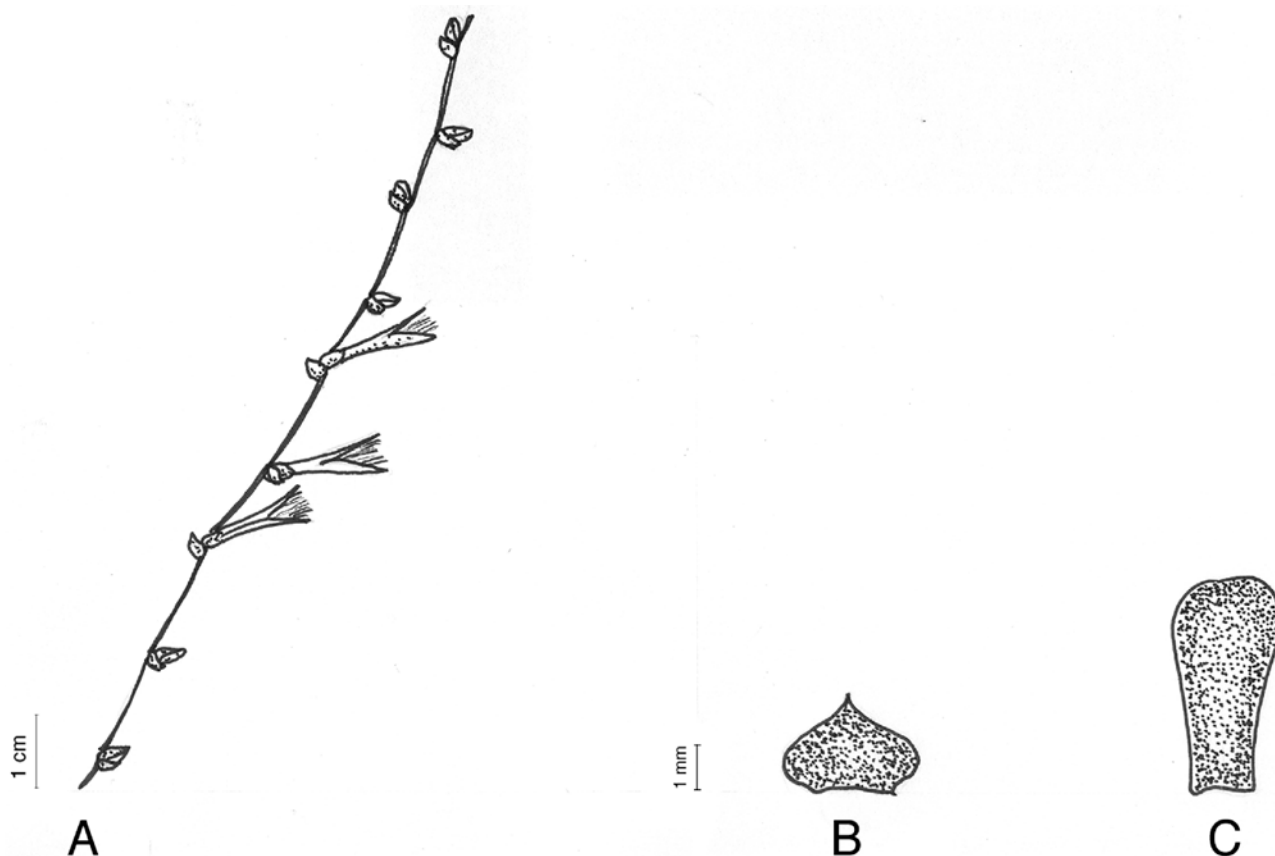


FIGURE 9. *Racinaea terrestris* Manzan. & Gouda –A. Spike –B. Flower bract. –C. Sepal.

Additional specimen examined (paratype):—ECUADOR: Morona-Santiago: cantón Limón Indanza, Cerro Ijiach Naint, Cordillera de Huaracayo, east of the river Coangos, on a sandstone mesa « tepui », 03°15'51''S, 78°10'13''W, 2000 m, 21 March 2001, J.M. Manzanares, D. Neill, P. Berry, L. Jost, B. Patterson and Shuar participants from Tinkimints 7238 (QCNE).

Observations:—*Racinaea terrestris* is similar to *R. diffusa*, but can be distinguished by the following characteristics: the stem 20–50 cm long (vs. stemless), propagating by stolons at the base of the sub-rosette after flowering (vs. propagating without stolons), the spikes are totally covered by ferruginous indument (vs. densely cinereous lepidote), floral bracts 2 mm long (vs. 5 mm long), exceeded by the sepals (vs. equaling to the sepals), flowers secund at anthesis (vs. spreading, but not secund at all). Following the key in the monograph by Smith & Downs (1972) ‘flowers turning downward secund; ligulate leaves and floral bracts turning secund with the flowers’, *R. terrestris* identifies as *R. pectinata* (André) Spencer & Smith (1993: 156), from which the new species differs by its stem and stolons (vs. stemless and not forming stolons); the spikes totally covered with ferruginous indument (vs. obscurely lepidote); the spikes 17–22 cm long (vs. 5–7 cm long); the floral bracts 2 mm long and shorter than the sepals (vs. 6–8 mm long and about equaling the sepals).

Racinaea terrestris only occurs at the summit of table mountains or “tepuis” in the Amazonian region of Ecuador, while *R. pectinata* only grows in the Inter-Andean valleys from southern Colombia to central Ecuador. In general, *R. terrestris* can be distinguished from all other species by the following combination of characteristics: plant forming a stem and propagating by stolons, growing terrestrially; spikes wholly covered by ferruginous indument except the sepals; flowers 1–1.6 cm apart and becoming secund at anthesis; floral bracts 2 mm long, exceeded by the 5 mm long sepals, suborbicular and apiculate. It can be confused with *R. commixa* (Mez) Spencer & Smith (1993: 153) and *R. flexuosa* (Baker) Spencer & Smith (1993: 154), that both have a 2-branched inflorescence as well, but they have distichous inflorescences, not at all becoming secund, and narrow triangular leaves with an attenuate apex and are thus quite unlike *R. terrestris*.

Comment:— Grants from the National Geographic Society gave us the opportunity of exploring the Cordillera de Huaracayos, a range close to the Cordillera del Cóndor in the province of Morona-Santiago, southern Ecuador. This area has previously not been botanically explored. The expedition began the 16th of March and ended the 25th of March 2001. The participants of this expedition were David Neill (MO), Paul Berry (MO), Lou Jost (orchid specialist), Elizabeth Patterson and the first author. From the community of Tinkimints, the Shuar participants were Raul Pitiur (the leader), Luis Chinkin, Luis Isamaraint, Rafael and Luis Pitiur, Adam Samik, and Pedro, Alfonso and Cristobal Sanchim. During this trip we had the opportunity to study many species growing in the dense low forest on the sandstone mesa of Cerro Injiach Naint. We found many species new to science, such as the recently described *Pitcairnia bakiorum* Manzanares & Till in Manzanares (2005: 479) and the new *R. terrestris* published here. We also found a new *Guzmania* that formed dense cushions at the summit, which is still undescribed.

After four days of climbing, we entered a low forest composed of shrubs and small trees. Walking on the elevated forest floor was like walking on a mass of tree branches covered with mosses and organic matter. If one did not take care, one could fall into a hole between the decaying trees and shrubs. This is the habitat of the wonderful *Guzmania gracilior* (André) Mez (1896: 937), where it forms dense cushions with long stems, sometimes over a meter long. *Racinaea terrestris* was also found growing here; it forms dense groups joined together by stolons that emerge from the forest floor on long stems, up to 50 cm long. We were very lucky to find a dense group of about 20 flowering plants in an open area surrounded by small trees and shrubs, with hundreds of second yellow flowers. During the expedition we also found *Racinaea* cf. *dielsii* (Harms) H.Luther, *R. parviflora* (Ruiz & Pav.) M.A.Spencer & L.B.Sm., *R. schumanniana* (Wittm.) J.R.Grant, *R. tetrantha* (Ruiz & Pav.) M.A.Spencer & L.B.Sm., *R. penladii* var. *pedunculata* (L.B.Sm.) M.A.Spencer & L.B.Sm., *R. miniata* (Rauh) J.R.Grant, and *R. spiculosa* (Griseb.) M.A.Spencer & L.B.Sm., along with many species of *Guzmania*, *Mezobromelia*, *Pitcairnia*, *Puya*, *Ronnbergia*, *Tillandsia*, and *Vriesea*. More information about this trip can be found in Manzanares (1999) and Neill (2005).

***Racinaea tillii* Manzan. & Gouda, sp. nov.** (Figs. 9, 10, 11, 12)

A Racinaea pelandii, cui affinis, differt lamina 20–22 cm (nec 10–15 cm) longa, inflorescentia 40–60 cm longa et 15 cm lata (nec 15–26 cm longa et 6 cm lata), stipite ramulorum 1.5–2 cm longo (nec 3–4 cm longo), spicis 3–6 cm longis, laxis (nec 1–1.5 cm longis, densis vel sublaxis), bracteis florigeris orbicularibus 0.4 cm longis et latis apice obtuso, mucronato et cucullato (nec transverse late ovatis vel triangularibus, 0.3 cm longis et 0.5 cm latis apice acuto vel obtuso non cucullato), pedicellis 2 mm longis, crassis curvatisque, floribus omnino secundis (nec floribus sessilibus nonnunquam secundis), sepalis apice obtuso in alam unilateralem producto, ecarinato (nec apice subtruncato, carinato).

Type:— ECUADOR: Napo: Quijos, near San Victor, along the road from Papallacta to Baeza, epiphytic on trees in a pasture, 00°22'S, 77°56'W, 2700 m, 9 February 2006. *Till: Iter Aequaorianum IV, Una cum M. Barfuss, M. Bernhard, M. Billensteiner, J. Kronister, E. Mayr, M. Plagg, A. Taurok & B. Wild 21091* (holotype WU, isotype QCNE).

Plant flowering 40–60 cm tall, rosulate, rosette forming an ovate pseudobulb. Leaves numerous, lepidote, the sheath erect and blades spreading; sheaths conspicuous, 10 cm long, 7.5–8 cm wide, ovate, densely lepidote, coriaceous, inflated, adaxially brown castaneous, abaxially lower part brown and upper part green with circular purple spots; blades 12–20 cm long, 0.5–0.8 cm wide, very narrowly triangular, apex long attenuate, involute, slightly curved to one side, green with circular purple spots, subglabrous, coriaceous. Inflorescence polystichous, fertile part erect, elliptic, 40–50 cm long, 15 cm wide, lax, twice branched of 12–15 branches at a distance of 2–3 cm, with 4–5 spikes in the apex, with brown branches and violet axis, densely cinereous lepidote. Peduncle slightly shorter than the leaves, 15–20 cm long, 0.4 cm in diameter, erect, lepidote; Peduncle bracts the lower ones subfoliaceous, 4–6 cm long, sheath ovate, blade attenuate, exceeding the internodes, the upper ones shorter and not imbricate, erect, green with circular purple spots. Primary bracts spreading, 0.7–1.6 cm long, 0.4–0.7

wide, ovate to oblong, acute or rounded and apiculate, with hyaline margins, exceeded by and sheathing the stipe, papyraceous, nerved, lepidote. Branches with a flat stipe 1,5–2 cm long; 8–10 cm long, spreading and then ascending, the lower ones lax, with 3–6 spikes, the upper not branched, axis densely cinereous lepidote. Spikes 3–6 cm long, 0,8 cm wide, brown, spreading, lax, 7–12-flowered 3–4 mm apart, apex with sterile bracts, rachis geniculate and densely cinereous lepidote; stipe 0,5–0,8 cm long, without sterile bracts. Floral bracts 4 mm long, 4 mm wide, broadly obovate, papyraceous, obtuse, mucronate and strongly cucullate when dry, with hyaline margins, erect, shorter than the sepals, carinate, abaxially densely lepidote, brown, exposing the rachis and sepals. Flowers cream, pedicel 2 mm long, thick, curved, all turning downward secund. Sepals 5 mm long, 3 mm wide, obovate, obtuse, asymmetrical with a wing at one side, free, adaxially glabrous, abaxially slightly lepidote, ecarinate, brown. Petals 6 mm long, the blade spreading. Fruits sub-cylindric, secund turning downward.

Distribution and habitat:—in trees bordering a pasture, this area belongs to the cloudy and cool mountain forest on the Amazonian side of the Andes, close to the city of Cuyuja, Napo province, Ecuador, 2461 m.

Etymology:—This *Racinaea* is named in honor of Walter Till (1956-) a professor of botany at the Fakultätszentrum für Biodiversität, Universität Wien, Austria (WU), our friend and specialist in the Bromeliaceae family, especially the subfamily Tillandsioideae.

Additional specimens examined (paratypes):—ECUADOR: Napo: Quijos, Cuyuja, pasture close to the River Quijos, Quijos, 00°24'34''S, 78°02'41''W, 2461 m, 19 November 2005, J.M. Manzanares & E. Gouda 7789 (QCNE, WU, U); 7790 (QCNE, WU, U); 7791 (QCNE, WU, U).

Observations:—*Racinaea tillii* is here classified as a close relative to *Racinaea penlandii*, because of the ovate rosette form of the pseudobulbs, with circular purple spots. A detailed study of the inflorescence showed many differences: the leaf-blades 12–20 cm long (vs. 30 cm long), inflorescence 40–50 cm long and 15 cm wide (vs. 30 cm long, 8 cm wide), spikes 3–6 cm long, lax (vs. 1–1.5 cm long, dense or sub-lax), floral bracts 0.4 cm long, 0.4 cm wide, obovate; apex obtuse, mucronate and cucullate (vs. 0.3 cm long, 0.5 cm wide, very broadly ovate or triangular, apex acute or obtuse, not cucullate), flowers pedicel 2 mm long, thick, curved, all flowers secund (vs. sometimes secund and sessile); sepals ecarinate, apex obtuse with a pronounced wing at one side (vs. carinate and apex subtruncate).

After closely studying the type specimens of *Racinaea penlandii* var. *penlandii* and *R. penlandii* var. *pedunculata*, we observed that these specimens do not show any secund flowers. In the description of Smith & Downs (1972) we read “flowers subspreading, sometimes secund,” this description is probably based on a mixture of characters from *R. penlandii* and *R. tillii*. *Racinaea tillii* however always has distinctly pedicellate and secund flowers. We also revisited living material of *R. penlandii* in the province of Loja and *R. penlandii* var. *pedunculata* in the province of Pastaza, and we have not observed any secund flowers in those specimens. *Racinaea tillii* is also similar to *R. guacamayosensis* in having secund flowers, but can be easily distinguished by the ovate pseudobulb (vs. not forming a pseudobulb) and the erect slightly spreading blades (vs. arching leaves).

Comment:—In November 2005 we visited the area around Baeza searching for species of *Racinaea*. We chose the road from Papallacta to Baeza, which parallels the river Quijos. The area near the river was deforested and turned into pastures. There was very little native flora near the road, but you could see native forest on top of the mountains in the distance. The small trees planted as a hedge around the pastures were completely covered in bromeliads. Here we observed *Guzmania multiflora* André (the inflorescence had red primary and floral bracts with yellow sepals, or, with an inflorescence totally yellow), *Racinaea tetrantha* (Ruiz & Pav.) M.A.Spencer & L.B.Sm., *Tillandsia biflora* Ruiz & Pav., *T. complanata* Benth., *T. hirtzii* Rauh, *T. ionochroma* André ex Mez, *T. pastensis* André (with a spectacular red inflorescence), and *Vriesea tequendamae* André, just to give an indication on the diversity of Bromeliaceae found in this small area. We spent hours scanning the trees from top to bottom and we were really surprised at the diversity of bromeliads growing here, which at a first glance all looked not very diverse at all. *Racinaea tillii* is very similar to *R. penlandii*, especially in habit and leaf shape. The plant forms an ovate pseudobulb with green leaves, spotted with round purple spots, like those on *R. penlandii*, but by studying them both more carefully, the specimen proved to be an species new to science and is therefore presented here.



FIGURE 10. Eric Gouda climbing the tree for a better look at the many bromeliads that cover the branches, especially *Racinaea tillii* Manzan. & Gouda.



FIGURE 11. Specimen of *Racinaea tillii* Manzan. & Gouda in habitat.



FIGURE 12. Detail of the inflorescence of the type specimen of *Racinaea tillii* Manzan. & Gouda.

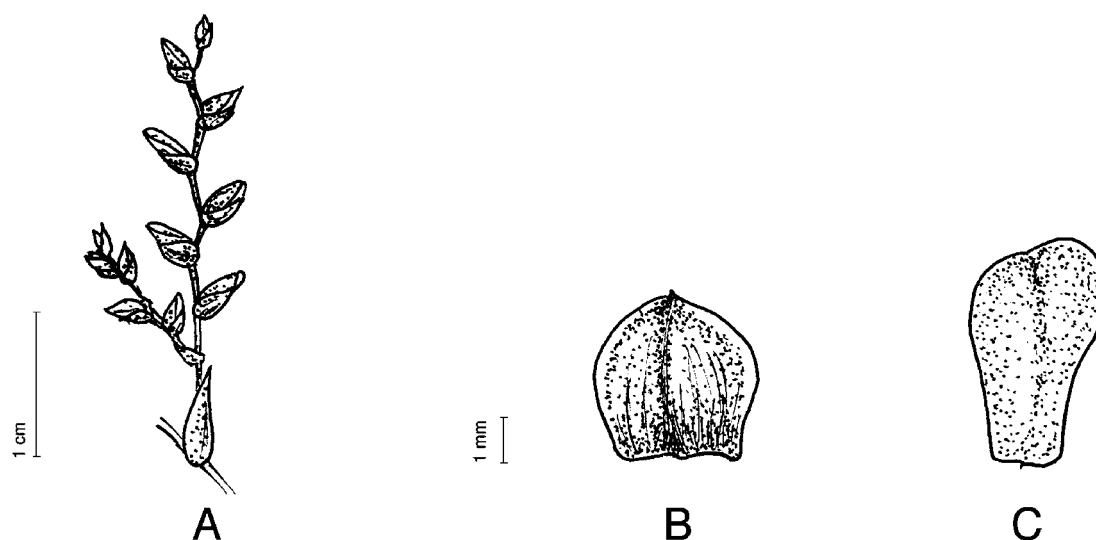


FIGURE 13. *Racinaea tillii* Manzan. & Gouda—A. Secondary branch—B. Floral bract—C. Sepal.

Acknowledgments

We thank Maarten Christenhusz and Betty Patterson for revising the manuscript, and Lubbert Westra in providing the Latin diagnoses. We also thank the Missouri Botanical Gardens (MO) and the Museo Nacional de Ciencias Naturales (QCNE).

References

- Gouda, E.J. & Manzanares, J.M. (2008) A new species of *Racinaea* (Bromeliaceae) from Peru. *Journal of the Bromeliad Society* 58: 156–158
- Grant, J.R. (1994) The *Tillandsia adpressa* assemblage: a review and new combination in *Racinaea* (Bromeliaceae: Tillandsioideae). *Novon* 4: 362–364.
- Höpfel, F. & Scharf, U. (2008) *Racinaea mariopotillae* - ene auffällige, neue Art aus Ekuador. *Bromelie* 2008(2): 96–100.
- Luther, H.E. (2002) *An alphabetical list of bromeliad binomials*, 8th ed. Sarasota, The Marie Selby Botanical Gardens.
- Luther, H.E. (2007) Miscellaneous new taxa of Bromeliaceae (XVIII). *Selbyana* 28: 5–12.
- Manzanares, J.M. (1999) *Expedición Bromelias del Cóndor*; Ministerio de Defensa Nacional, Fuerzas Armadas del Ecuador 40 (126): 67–73. Ecuador, Ministerio de Defensa Nacional.
- Manzanares, J.M. (2002) *Jewels of the jungle, Bromeliaceae of Ecuador, Part 1. Bromelioideae*. Quito, Imprenta Mariscal.
- Manzanares, J.M. (2005) *Jewels of the jungle, Bromeliaceae of Ecuador, Part 2. Pitcairnioideae*. Quito, Imprenta Mariscal.
- Manzanares, J.M. & Till, W. (2007) A New Species of *Racinaea* (Bromeliaceae) from the Province of Loja, in Southern Ecuador. *Journal of the Bromeliad Society* 57: 198–203.
- Mez, C. (1896) Bromeliaceae, in: C. de Candolle (ed.) *Monographiae Phanerogamarum* vol. 9. Paris, Masson & C.
- Neill, D. (2005) Cordillera del Cóndor. *Plant Talk* 41: 17–21.
- Smith, L.B. & Downs, R.J. (1977) Bromeliaceae (Tillandsioideae). *Flora Neotropica Monograph* 14(2): 663–1492.
- Spencer, M.A. & Smith, L.B. (1993) *Racinaea*, a new genus of Bromeliaceae (Tillandsioideae). *Phytologia* 74: 151–160.