

Survey of Rubiaceae in the Golfo Dulce area, Costa Rica: new species, combinations and name changes since 2001

Investigaciones en Rubiaceae en el área de Golfo Dulce, Costa Rica: nuevas especies, combinaciones y cambios de nombre desde 2001

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Abstract: Since the publication of the last Rubiaceae treatment of the Golfo Dulce area in southern Costa Rica (WILL et al. 2001a), several new taxa have been described and changes in generic and species level within the family have been made. The new species, combinations and name changes are presented here and a new checklist of the Rubiaceae for the region is provided.

Key words: Costa Rica, Golfo Dulce, Rubiaceae, checklist.

Resumen: Desde la última publicación de Rubiaceas del área del Golfo Dulce en la zona Sur de Costa Rica (WILL et al. 2001a), nuevos taxa han sido descritos y también se han realizado cambios a nivel generico y específico dentro de la familia. En esta revisión se presentan las nuevas especies, combinaciones y cambios de nombre, así como la lista actualizada de las Rubiaceas de la región.

Palabras clave: Costa Rica, Golfo Dulce, Rubiaceae, lista actualizada.

Introduction

The Golfo Dulce region in southern Costa Rica (Osa Peninsula with Corcovado National Park, Piedras Blancas National Park and Golfo Dulce Forest Reserve with adjacent and connecting areas) is one of the most species-rich areas of Central America and worldwide (OBANDO 2002, KAPPELLE et al. 2003, HUBER 2005, WEISSENHOFER 2005). New collections and publications for the Rubiaceae (coffee, madder or quinine family) made after the last plant diversity survey of this region (WEBER et al. 2001) require several additions and changes, which are summarised in this paper. The resulting 156 species and subspecies are listed at the end.

The Rubiaceae are the fourth largest dicotyledonous plant family in the world, comprising approximately 650 genera and 13.000 species (DELPRETE 2004). They have a cosmopolitan distribution with a centre of diversity in the tropical regions. Almost one half of the Rubiaceae species occur in the Neotropics (DELPRETE 2004). Different species have adapted to many different habitats, such as high elevation 'páramo' in the South American Andes, premontane cloud to lowland ever-

green forests and wet rainforests, up to dry forests and desert environments.

Rubiaceae are mainly terrestrial trees, shrubs, or less frequently herbs, vines or lianas. Few species are epiphytic. Members of the family have opposite and entire leaves, and interpetiolar or more rarely intrapetiolar stipules of variable shape are present but often caducous. The flowers are commonly actinomorphic and bisexual (both with exceptions) and the fruits are dry capsules, fleshy berries or drupes with woody pyrenes.

There is ongoing research on species delimitations and intrafamilial relationships of Rubiaceae based on morphological and molecular data (e.g. BREMER & MANEN 2000, ANDERSSON 2001, ROVA et al. 2002, GUSTAFSSON & PERSSON 2002, RAZAFIMANDIMBISON & BREMER 2002, CHURCH 2003, ALEJANDRO et al. 2005, MOTLEY et al. 2005, ACHILLE et al. 2006, KÁREHED & BREMER 2007, DAVIS et al. 2007, KHAN et al. 2008, SMEDMARK et al. 2008). Recent major contributions for the New World are related to the 'Flora Mesoamericana' or 'Flora of Ecuador' research projects. These have resulted in some changes at the generic and spe-

cific levels which also affect Costa Rican species (TAYLOR 2001a, TAYLOR 2001b, TAYLOR 2001c, TAYLOR 2001d, TAYLOR & CLARK 2001, TAYLOR 2002a, TAYLOR 2002b, TAYLOR 2002c, TAYLOR 2002d, TAYLOR 2003, TAYLOR 2004a, TAYLOR 2004b, TAYLOR 2005, TAYLOR D.W. 2003).

Material and methods

Data were collected during personal visits in Costa Rica, through checking of herbarium material at CR, INB, MO and WU and the use of the “Flowering Plants of the Osa Peninsula, Costa Rica” Rubiaceae checklist data of the New York Botanic Garden, of the Tropicos W³ database of the Missouri Botanical Garden and the Manual de Plantas de Costa Rica database of InBIO (Instituto Nacional de Biodiversidad, Costa Rica), the latter two based largely on the identifications of C.M. Taylor. Dissertations from HUBER (2005) and WEISSENHOFER (2005) as well as the masters thesis of WILL (2001b) served as additional sources for the Rubiaceae flora of the Golfo Dulce region in Costa Rica.

Results

The following Rubiaceae genera are new reports for the Golfo Dulce area since the publication of WEBER et al. (2001), or are affected by name changes:

Alseis. *Alseis costaricensis* C.M. TAYLOR is a new species which was found in Drake Bay (Osa Peninsula). It has previously been confused with *A. hondurensis* STANDLEY and *A. blackiana* HEMSL. The status of the newly described species, however, is still under discussion, and the taxon may be a distinct species, derived from a hybrid between its two relatives or the progeny of a formerly continuous population of the three taxa (TAYLOR 2002d). *Alseis costaricensis* differs from *A. blackiana*, which occurs from central Panama to north-western Colombia, by its branched and terminal inflorescences and from *A. hondurensis* in its longer calyx lobes and phenology.

Amphidasya. Species accounts of the Neotropical genus *Amphidasya* range from five (TAYLOR 2001a) and seven (BURGER & TAYLOR 1993) to thirteen (TAYLOR & CLARK 2001) species. The latter publication also transfers *Hoffmannia longicalycina* DWYER into the genus *Amphidasya*. *Amphidasya longicalycina* (DWYER) C.M. TAYLOR has shorter calyx lobes and usually the fused base of the stipules are shorter than in the morphologically variable *A. ambigua*, distributed from eastern Panama to north-western South America (TAYLOR & CLARK 2001). The name *A. ambigua* was mistakenly applied to all the Central American plants (DWYER 1980, BURGER

& TAYLOR 1993), but these can now be seen to be distinct species.

Carapichea. Due to molecular data and morphological studies, the genus *Carapichea* has been re-established by ANDERSON (2002). Species of this genus differ from the *Psychotria* complex, where they have previously been included, by the combination of persistent stipules, greenish to greyish drying leaves, pyrenes with distinct germination slits on abaxial ridges and a seed testa without ethanol-soluble pigment. *Carapichea affinis*, the species from the Golfo Dulce area affected by this change, was treated as *Psychotria borucana* (Ant. MOLINA) C.M. TAYLOR & W.C. BURGER in WEBER et al. (2001). TAYLOR (2006) mentioned a similarity of this species with *C. dolichophylla*, which could lead to another name change, since the epithet “dolichophylla” is the older of the two.

Chione. The number of recognised species of *Chione* has been continually reduced in recent years, from 15 (BURGER & TAYLOR 1993) to 10 (TAYLOR 2001a), and finally to one in the most recent and comprehensive treatment by D.W. TAYLOR (2003), describing *Chione* as a monotypic genus (*C. venosa*) with four varieties. The taxon occurring in the Golfo Dulce region is *C. venosa* (SW.) URB. var. *venosa*. Besides the distribution pattern, it is distinguished from the other three varieties by having membranous to coriaceous leaf blades with 4-13 pairs of secondary veins and larger fruits containing pyrenes which usually have prominent longitudinal ridges.

Coussarea. Changes in the genus *Coussarea* have been published as result of studies for the ‘Flora Mesoamericana’ by C.M. TAYLOR (TAYLOR 2001d). One new species, *C. grandifructa* C.M. TAYLOR, and one new subspecies, *C. loftonii* (DWYER & M.V. HAYDEN) DWYER subsp. *occidentalis* C.M. TAYLOR, occur in the Corcovado National Park on the Osa Peninsula. Two additional *Coussarea* species (*C. curvigemmia* DWYER, *C. impetio-laris* DONN. SM.) are reported in the Osa Peninsula Rubiaceae checklist of the New York Botanical Garden (NYBG). TAYLOR (2001d), however, in her treatment of *C. loftonii* subsp. *occidentalis*, comments on former misidentifications of *Coussarea* collections from the Osa region as *C. curvigemmia* and *C. impetio-laris*. The areas of distribution reported for both species by TAYLOR (2001d) are outside of the Osa area, and the collections in question most probably represent *C. loftonii* subsp. *occidentalis*.

Fareamea. A new combination within the genus *Fareamea* from the Golfo Dulce area is *F. tamberlikiana* MUELL. ARG. subsp. *sessifolia* (P.H. ALLEN) C.M. TAYLOR (TAYLOR 2002c). The distinction between *F. tamber-*

likiana subsp. *tamberlikiana* and *Faramea tamberlikiana* subsp. *sessifolia* is based mainly on vegetative characters, differences between vegetative and generative stems, and distinct geographic ranges.

Gonzalagunia. *Gonzalagunia osaensis* C.M. TAYLOR is a new species discovered during the preparation work for the 'Flora Mesoamericana'. This species has been confused with *G. rudis* (STANDL.) STANDL. in the past, but can be distinguished by its habitat in wet forests (*G. rudis* usually occurs in seasonal or moist forest). *Gonzalagunia osaensis* also has longer corolla lobes, fruits with 2 pyrenes (vs. *G. rudis* with 4) and appears to be common in its habitat on the Osa Peninsula (TAYLOR 2002b). *Gonzalagunia bracteosa* (DONN. SM.) B.L. ROB., reported in the Osa Peninsula Rubiaceae checklist of the NYBG, has been transferred to the genus *Bertiera* (*Bertiera bracteosa* (J.D. SMITH) B. STAHL & L. ANDERSSON (ANDERSSON & STAHL 1999)).

Guettarda. An analysis of the variable species *G. crispiflora*, resulting in five subspecies, is presented by TAYLOR (2001c). Three subspecies occur in Costa Rica: *G. crispiflora* subsp. *poasana* (STANDL.) C.M. TAYLOR and *G. crispiflora* subsp. *cobanensis* (DONN. SM.) C.M. TAYLOR in northern Costa Rica, and *G. crispiflora* subsp. *sabiceoides* (STANDL.) C.M. TAYLOR in the Golfo Dulce Region. Taylor distinguished the subspecies based mainly on different pubescence densities and patterns. *Guettarda crispiflora* subsp. *sabiceoides* has densely strigillose to sericeous or pilosulous to hirsutulous petioles without visible petiole surface, while the other two subspecies have glabrous or hirsutulous to pilosulous petioles with the surface of the petiole visible. Another change affects *Guettarda conferta* BENTHAM, which had been accepted as separate species by BURGER & TAYLOR (1993). This taxon shares some characteristics of continuous variation with other species (including the relatively numerous secondary leaf veins and short peduncles) and therefore is now listed as a form of *Guettarda crispiflora* subsp. *sabiceoides* (TAYLOR 2001c).

Hoffmannia. Due to "wider than normal" morphological variations within most of the Costa Rican *Hoffmannia* SW. species, identification of these is often very difficult or even arbitrary (BURGER 1999). *H. pittieri* STANDL. and *H. arborescens* DONN. SM. are two very similar species occurring in the southern zone of Costa Rica. They have been separated based on the type and position of the inflorescence by BURGER (1999). The label of one single specimen found on the Osa Peninsula and identified as *Hoffmannia* sp. aff. *H. arborescens* L.O. WILLIAMS indicates "perhaps a new species, note small flowers + low elevat. W.L. 2003", but no further publication has been made yet. There is also one record of *H. pittieri* STANDL. on the Osa Peninsula, but the identifica-

tion is accompanied by a question mark. *H. nicotianifolia* (M. MARTENS & GALEOTTI) L.O. WILLIAMS is the most commonly collected species in Mexico and Central America. Species listed in WEBER et al. (2001) and previously identified as *H. longipetiolata* POL. and *H. woodsonii* STANDL., are now considered to represent *H. nicotianifolia*.

Margaritopsis. Species of the genus *Margaritopsis* have long been included in *Psychotria*. Following ANDERSSON (2001), *Margaritopsis* is now regarded as a widely distributed and pan-tropical genus with a number of members in the Neotropics. Species of *Margaritopsis* can be distinguished from *Psychotria* by their characteristic stipules which become indurated and then fragmented, their often flattened internodes and their red fruits with ventrally smooth and flat pyrenes (TAYLOR 2005). According to TAYLOR (2005), the only *Margaritopsis* species occurring in the southern zone of Costa Rica, *M. microdon* (DC.) C.M. TAYLOR [Basionym: *Psychotria microdon* (DC.) URB.], is a member of the "Chazaliella" group and can be characterised by a low shrubby habit, a distinguishing corky bark, branched and paniculate inflorescences with well developed peduncles, truncate calyx limbs and rounded to obtuse corolla lobes.

Notopleura. *Notopleura* is a Neotropical genus of about 100 species, which was for a long time included in *Psychotria* (sect. *Notopleura* BENTH. & HOOK.), then treated as a separate genus by BREMEKAMP (1934), again included in *Psychotria* (subg. *Heteropsychotria*) by STEYERMARK (1972), and finally treated separately as a genus due to both morphological and molecular data (TAYLOR 2001b, TAYLOR 2003). Species of *Notopleura* are characterised by a typical low, unbranched, sub-shrubby and often succulent habit, with the stipules united around the stem and often with a single, usually glandular appendage, pseudoaxillary inflorescences and pyrenes with two germination slits on the ventral surface. The new combinations for the species in the Golfo Dulce area are: *Notopleura anomothyrsa* (K. SCHUM. & DONN. SM.) C.M. TAYLOR, Basionym: *Psychotria anomothyrsa*; *Notopleura capacifolia* (DWYER) C.M. TAYLOR, Basionym: *Psychotria capacifolia*; *Notopleura epiphytica* (K. KRAUSE) C.M. TAYLOR, Basionym: *Psychotria epiphytica*, Synonym: *Psychotria orchidearum* STANDL.; *Notopleura polyphlebia* (DONN. SM.) C.M. TAYLOR, Basionym: *Psychotria polyphlebia*; *Notopleura uliginosa* (SW.) BREMEK, Basionym: *Psychotria uliginosa*.

Psychotria. With approximately 2000 species (TAYLOR 2004b), the genus *Psychotria* L. s.l. is one of the world's largest genera. Consequently, many changes in the taxonomy of this group have been made during the last centuries and decades. The currently accepted sta-

Table 1: Rubiaceae species list of the Golfo Dulce area with one reference collection

1. <i>Alibertia edulis</i> (RICH.) A. RICH. ex DC.: Quesada 121 (INB, MO)	33. <i>Faramea suerrensii</i> (DONN. SM.) DONN. SM.: R. Aguilar 910 (INB, MO)
2. <i>Alibertia utleyorum</i> (DWYER) C.M. TAYLOR: B. Hammel, Chavarria & Maas 18063 (CR, MO)	34. <i>Faramea tamberlikiana</i> MUELL. ARG. subsp. <i>sessifolia</i> ¹¹ (P. H. ALLEN) C.M. TAYLOR: Zamora, Almeda, Anderson 1200 (CR, MO)
3. <i>Alseis costaricensis</i> ¹ C.M. TAYLOR: R. Aguilar 927 (CR, MO)	35. <i>Genipa americana</i> L.: D.H. Janzen 11047 (MO)
4. <i>Amphidasia longicalycina</i> ² (DWYER) C.M. TAYLOR: A. Azofeifa 212 (INB, MO)	36. <i>Geophila cordifolia</i> MIQ.: R. Aguilar 4595 (INB, MO)
5. <i>Bathysa veraguensis</i> DWYER: Morales, Zamora, Aguilar, Lépez, Ramírez 2092 (CR, MO)	37. <i>Geophila macropoda</i> (RUIZ & PAV.) DC.: S. Will 89 (MO, WU)
6. <i>Bertiera bracteosa</i> ³ (J.D. SMITH) B. STAHL & L. ANDERSSON: A. Aguilar 207 (INB, MO)	38. <i>Geophila repens</i> (L.) I.M. JOHNST.: R. Aguilar 3499 (INB, MO)
7. <i>Borojoa panamensis</i> DWYER: S. Will 74 (MO, WU)	39. <i>Gonzalagunia brenesii</i> STANDL.: S. Will 127 (MO, WU)
8. <i>Borojoa patinoi</i> CUATREC.: S. Will 102 (MO, WU)	40. <i>Gonzalagunia osaensis</i> ¹² C.M. TAYLOR: R. Aguilar 259 (CR, MO)
9. <i>Carapichea affinis</i> ⁴ (STANDL.) L. ANDERSSON: B. Hammel, L. Azofeifa, R. Vargas 17922 (CR, MO)	41. <i>Gonzalagunia ovatifolia</i> (DONN. SM.) B.L. ROB.: S. Will 58 (MO, WU)
10. <i>Chimarrhis latifolia</i> STANDL.: H. Schmidt 604 (CR, MO)	42. <i>Gonzalagunia panamensis</i> (CAV.) K. SCHUM.: D. Santamaria S-947 (MO)
11. <i>Chimarrhis parviflora</i> STANDL.: J. Marín 161 (CR, MO)	43. <i>Guettarda acreana</i> ¹³ K. KRAUSE: C. Kernan, P. Phillips, P. Kernan 852 (MO)
12. <i>Chiococca alba</i> (L.) HITCHC.: R. Aguilar 6236 (INB, MO)	44. <i>Guettarda crispiflora</i> subsp. <i>sabiceoides</i> ¹⁴ (STANDL.) C.M. TAYLOR: S. Will 23 (MO, WU)
13. <i>Chiococca belizensis</i> LUNDELL: R. Aguilar 2312 (INB, MO)	45. <i>Guettarda foliacea</i> STANDL.: Quesada 85 (INB, MO)
14. <i>Chione venosa</i> (SW.) URB. var. <i>venosa</i> ⁵ : B. Hammel, G. Herrera, M.M. Chavarria & A. Solís 16857 (CR, MO)	46. <i>Guettarda macrosperma</i> DONN. SM.: R. Liesner 2978 (MO)
15. <i>Chomelia microloba</i> DONN. SM.: J. Sánchez, E. Volio 633 (CR, MO)	47. <i>Guettarda sanblasensis</i> DWYER: R. Aguilar 2299 (INB, MO)
16. <i>Chomelia recordii</i> STANDL.: Delprete 5127 (INB, MO)	48. <i>Guettarda turrialbana</i> N. ZAMORA & POVEDA: R. Aguilar 6291 (INB, MO)
17. <i>Chomelia tenuiflora</i> ⁶ BENTH.: R. Liesner 2146 (MO)	49. <i>Hamelia axillaris</i> SW.: Socorro Avila 86 (INB, MO)
18. <i>Chomelia venulosa</i> W.C. BURGER & C.M. TAYLOR.: K. Thomsen 289 (CR, MO, USJ, K)	50. <i>Hamelia macrantha</i> LITTLE: A. Chacón 903 (CR, MO)
19. <i>Coccocypselum hirsutum</i> BARTL. ex DC.: S. Will 14 (MO, WU)	51. <i>Hamelia magnifolia</i> WERNHAM: J. Sánchez, E. Volio 636 (CR, MO)
20. <i>Condaminea corymbosa</i> (RUIZ & PAV.) DC.: A. Rodríguez, L.D. Vargas 3494 (INB, MO)	52. <i>Hamelia patens</i> JACQ.: A. Weissenhofer W149 (CR, MO, WU)
21. <i>Cosmibuena grandiflora</i> (RUIZ & PAV.) RUSBY: R. Aguilar 578 (CR, MO)	53. <i>Hamelia xerocarpa</i> KUNTZE: R. Aguilar 2013 (LSCR)
22. <i>Coussarea grandifructa</i> ⁷ C.M. TAYLOR: B. Hammel, G. Herrera, M.M. Chavarria, & A. Solís 16950 (MO)	54. <i>Hillia loranthoides</i> STANDL.: G. Herrera 4826 (CR, MO)
23. <i>Coussarea hondensis</i> (STANDL.) C.M. TAYLOR & W.C. BURGER: L. Acosta, V. Ramírez, G. Soto, E. Mora Castro 1641 (INB, MO)	55. <i>Hoffmannia</i> sp. aff. <i>H. arborescens</i> ¹⁵ J.D. SMITH : B. Hammel, G. Herrera, M.M. Chavarria, A. Solís 16971 (CR, MO)
24. <i>Coussarea loftonii</i> (DWYER & M.V. HAYDEN) DWYER subsp. <i>occidentalis</i> ⁸ C.M. TAYLOR: G. Induni 255 (INB, MO)	56. <i>Hoffmannia davidsoniae</i> STANDL.: J. Marín 196 (CR, MO)
25. <i>Coussarea nigrescens</i> C.M. TAYLOR & HAMMEL: K. Thomsen 689 (CR, MO, USJ, K)	57. <i>Hoffmannia hammelii</i> C.M. TAYLOR: C. Kernan 1249 (CR, MO)
26. <i>Coussarea paniculata</i> ⁹ (VAHL) STANDL.: R. Aguilar 1765 (INB, MO)	58. <i>Hoffmannia laxa</i> STANDL.: S. Will 106 (CR, MO, WU)
27. <i>Coussarea talamancana</i> STANDL.: Fletes 630 (INB, MO)	59. <i>Hoffmannia</i> cf. <i>leucocarpa</i> STANDL.: J. Marín & D. Marín 524 (INB, MO)
28. <i>Duroia costaricensis</i> STANDL.: W.J. Kress, T.P. Prinzie 4558 (US, MO)	60. <i>Hoffmannia nicotianifolia</i> ¹⁶ (M. MARTENS & GALEOTTI) L.O. WILLIAMS: Liesner 3164 (MO)
29. <i>Faramea eurycarpa</i> DONN. SM.: R. Aguilar 3339 (INB, BRIT)	61. <i>Hoffmannia pallidiflora</i> STANDL.: Grayum 10660 (INB, MO)
30. <i>Faramea glandulosa</i> ¹⁰ POEPP. & ENDL.: C. Kernan 698 (CR, MO)	62. <i>Hoffmannia pittieri</i> ¹⁷ STANDL.: R. Aguilar, M. Segua, F. Quesada 2052 (INB, MO)
31. <i>Faramea occidentalis</i> (L.) RICH.: C. Kernan 618 (CR, MO)	63. <i>Isertia haenkeana</i> DC.: R. Aguilar 679 (CR, MO, WU)
32. <i>Faramea permagnifolia</i> DWYER ex C.M. TAYLOR: R. Aguilar 1761 (INB, MO)	64. <i>Isertia laevis</i> (TRIANA) B.M. BOOM: S. Will 56 (MO, WU)
	65. <i>Ixora nicaraguensis</i> ¹⁸ WERNHAM: C. Kernan, G. Fonseca, L. Ramsey 1301 (CR, MO)
	66. <i>Ladenbergia brenesii</i> STANDL.: N. Zamora 1930 (CR, MO)
	67. <i>Ladenbergia heterophylla</i> ¹⁹ (WEDD.) STANDL.: B. Hammel, R. Aguilar, A. Gentry 18731 (INB, MO)

¹ Sp. nov., see text² Comb. nov, see text; regarding records for *A. ambigua* for the region (mentioned in the Osa Peninsula Rubiaceae checklist of the NYBG) see text.³ Listed as *Gonzalagunia bracteosa* (J. D. Smith) B. L. Rob. in WEBER & al. (2001)⁴ Comb. nov., listed as *Psychotria borucana* (A.R. Molina) C. M. Taylor & W. C. Burger in WEBER & al. (2001)⁵ Var. nov., see text; listed as *Chione sylvicola* (Standl.) W. C. Burger in WEBER & al. (2001)⁶ Listed as *Chomelia atlantica* Dwyer in WEBER & al. (2001)⁷ Sp. nov., see text; listed as *C. psychotrioides* C. M. Taylor & Hammel in WEBER & al. (2001)⁸ Ssp. nov., see text⁹ Additional record, not listed in WEBER & al. (2001)¹⁰ Listed as *Faramea stenura* Standl. in WEBER & al. (2001)¹¹ Ssp. nov., see text. Listed as *F. sessifolia* P.H. Allen in WEBER & al. (2001)¹² Ssp. nov., see text. Collections referred to as *G. rudis* have been re-identified as *G. osaensis* in TAYLOR (2002b).¹³ Additional record, not listed in WEBER & al. (2001)¹⁴ Ssp. nov., see text. According to TAYLOR (2001c), *G. conferta*, recorded in the Osa Peninsula Rubiaceae checklist of the NYBG, is part of this subspecies.¹⁵ Additional record, not listed in WEBER & al. (2001), see text¹⁶ Additional record, not listed in WEBER & al. (2001)¹⁷ Additional record, not listed in WEBER & al. (2001), see text¹⁸ *I. finlaysoniana*, recorded in the Osa Peninsula Rubiaceae checklist of the NYBG, is only known from cultivation, as well as *I. coccinea*.

Table 1: continued

68. <i>Macrocnemum roseum</i> (RUIZ & PAV.) WEDD.: J. Sánchez, E. Volio 637 (CR, MO)	96. <i>Psychotria buchtienii</i> ²⁹ (H.J.P. WINKL.) STANDL.: E. Fletes 541 (INB, MO)
69. <i>Manettia barbata</i> OERST.: M. Grayum, B. Hammel 10601 (INB, MO)	97. <i>Psychotria calidicola</i> ³⁰ C.M. TAYLOR: B. Hammel, Croat, D. Hannon 20490 (INB, MO)
70. <i>Manettia reclinata</i> L.: R. Aguilar 4805 (INB, MO)	98. <i>Psychotria capitata</i> RUIZ & PAV.: S. Will 2 (MO, WU)
71. <i>Margaritopsis microdon</i> ²⁰ (DC.) C.M. TAYLOR: C. Kernan 1254 (CR, MO)	99. <i>Psychotria carthagenensis</i> ³¹ JACQ.: R. Aguilar 5423 (INB, MO)
72. <i>Mitracarpus hirtus</i> (L.) DC.: V. Ramírez 256 (MO)	100. <i>Psychotria chagensis</i> STANDL.: E. Castro 292 (CR, MO)
73. <i>Notopleura anomothyrsa</i> ²¹ (K. SCHUM. & DONN. SM.) C.M. TAYLOR: A. Azofeifa 440 (INB, MO)	101. <i>Psychotria chiapensis</i> STANDL.: P. Delprete 5116 (CR, MO)
74. <i>Notopleura capacifolia</i> ²² (DWYER) C.M. TAYLOR: B. Gamboa R., A. Rojas, A. Azofeifa, E. Fletes 2095 (INB, MO)	102. <i>Psychotria chitariana</i> DWYER & C.W. HAM.: S. Will 96 (MO, WU)
75. <i>Notopleura epiphytica</i> ²³ (K. KRAUSE) C.M. TAYLOR: E. Fletes 598 (INB, MO)	103. <i>Psychotria cooperi</i> ³² STANDL.: S. Will 73 (MO, WU)
76. <i>Notopleura polyphlebia</i> ²⁴ (DONN. SM.) C.M. TAYLOR: T.B. Croat, M.H. Grayum 59716 (MO)	104. <i>Psychotria correae</i> ³³ (DWYER & M.V. HAYDEN) C.M. TAYLOR: A. Fernandez 1864 (INB, MO)
77. <i>Notopleura uliginosa</i> ²⁵ (SW.) BREMEK.: M. Grayum, G. Herrera, G. Schatz, F. Chavarria 3978 (MO)	105. <i>Psychotria cyanococca</i> ³⁴ SEEM. ex DOMBRAIN: E. Fletes 403 (MO)
78. <i>Oldenlandia corymbosa</i> ²⁶ L.: S. Will 121 (MO, WU)	106. <i>Psychotria deflexa</i> DC.: R. Liesner 2842 (MO)
79. <i>Osa pulchra</i> (D.R. SIMPSON) AIELLO: B. Hammel, L. Gilbert, B. Marquis, R. Soto 18371 (INB, MO)	107. <i>Psychotria elata</i> (Sw.) HAMMEL: R. Aguilar 2147 (INB, MO)
80. <i>Palicourea crocea</i> (Sw.) ROEM. & SCHULT.: R. Aguilar 3468 (INB, MO)	108. <i>Psychotria glomerulata</i> ³⁵ (DONN. SM.) STEYER.: G. Induni 204 (MO)
81. <i>Palicourea guianensis</i> AUBL.: S. Will 83 (MO, WU)	109. <i>Psychotria gracilentia</i> ³⁶ MUELL. ARG.: E. Castro 47 (CR, MO)
82. <i>Palicourea triphylla</i> DC.: R. Aguilar, A. Fernandez 1959 (INB, MO)	110. <i>Psychotria grandis</i> Sw.: R. Aguilar, J.C. Castro, B. Hammel 114 (CR, MO)
83. <i>Pentagonia costaricensis</i> ²⁷ (STANDL.) W.C. BURGER & C.M. TAYLOR: L. Gonzalez, H. Acevedo, P. Cordero 954 (INB, MO)	111. <i>Psychotria hoffmannseggiana</i> ³⁷ (WILLD. ex ROEM. & SCHULT.) MUELL. ARG.: R. Aguilar, J. Gonzalez 3634 (MO)
84. <i>Pentagonia lobata</i> C.M. TAYLOR: B. Hammel 18619 (INB, MO)	112. <i>Psychotria horizontalis</i> Sw.: E. Castro 174 (MO)
85. <i>Pentagonia macrophylla</i> BENTH.: J. Marin 213 (CR, MO)	113. <i>Psychotria limonensis</i> ³⁸ K. KRAUSE: V. Ramírez 148 (MO)
86. <i>Pentagonia tinajita</i> SEEM.: S. Will 12 (MO, WU)	114. <i>Psychotria marginata</i> Sw.: R. Liesner 1718 (MO)
87. <i>Pentagonia wendlandii</i> HOOK. f.: B. Hammel, E. Bello, U. Chavarria, J. Marín 18395 (INB, MO)	115. <i>Psychotria micrantha</i> KUNTH: R. Aguilar 5290 (INB, MO)
88. <i>Pogonopus speciosus</i> ²⁸ (JACQ.) K. SCHUM.: M. Kiehn, M. Kiehn & N. Lux 920207-2/1 (WU)	116. <i>Psychotria microbotrys</i> RUIZ ex STANDL.: G. Davidse 24157 (MO)
89. <i>Posoqueria coriacea</i> M. MARTENS & GALEOTTI: T.B. Croat 44385 (MO)	117. <i>Psychotria mertoniana</i> STANDL.: S. Will 57 (MO, WU)
90. <i>Posoqueria latifolia</i> (RUDGE) ROEM. & SCHULT.: R. Aguilar 341 (CR)	118. <i>Psychotria osaensis</i> ³⁹ C.M. TAYLOR: C. Kernan 1211 (CR, INB, MO)
91. <i>Posoqueria panamensis</i> (WALP. & DUCHASS) WALP.: F. Quesada 311 (INB, MO)	119. <i>Psychotria panamensis</i> STANDL.: S. Will 75 (MO, WU)
92. <i>Psychotria acicularis</i> C.M. TAYLOR: M. Lobo 199 (INB, MO)	120. <i>Psychotria pilosa</i> RUIZ & PAV.: S. Will 44 (MO, WU)
93. <i>Psychotria acuminata</i> BENTH.: C.M. TAYLOR: R. Aguilar 2292 (CR, MO)	121. <i>Psychotria platypoda</i> DC.: G. Herrera 4517 (CR, MO)
94. <i>Psychotria aurantibractea</i> C.M. TAYLOR: B. Hammel, R. Robles, J. Marín 16803 (CR, MO)	122. <i>Psychotria poeppigiana</i> MUELL. ARG.: S. Will 20 (MO, WU)
95. <i>Psychotria brachiata</i> Sw.: W. Huber, A. Weissenhofer 9 (MO, WU)	123. <i>Psychotria psychotriifolia</i> ⁴⁰ (SEEM.) STANDL.: R. Aguilar 5295 (MO)
	124. <i>Psychotria pubescens</i> ⁴¹ Sw.: Aguilar 6194 (LSCR)
	125. <i>Psychotria racemosa</i> RICH.: D.H. Janzen 10407 (MO)
	126. <i>Psychotria remota</i> BENTH.: R. Aguilar 4702 (INB, MO)
	127. <i>Psychotria solitudinum</i> STANDL.: S. Will 4 (CR, MO)
	128. <i>Psychotria stenostachya</i> ⁴² STANDL.: F. Quesada 161 (INB, MO)
	129. <i>Psychotria valeriana</i> ⁴³ STANDL.: Lobo 142 (INB, MO)
	130. <i>Randia aculeata</i> L.: R. Aguilar 2279 (INB, MO)
	131. <i>Randia altiscandens</i> (DUCKE) C.M. TAYLOR: C. Kernan 809 (CR, MO)
	132. <i>Randia armata</i> (Sw.) DC.: G. Herrera 4346 (CR, MO)

¹⁹ Listed as *Ladenbergia sericophylla* Standl. in WEBER & al. (2001).²⁰ Comb. nov., see text²¹ Comb. nov., see text. Listed as *Psychotria macrophylla* Ruiz & Pav. in WEBER & al. (2001).²² Comb. nov., see text²³ Comb. nov., see text²⁴ Comb. nov., see text²⁵ Comb. nov., see text²⁶ The record of *O. aspera* in the Osa Peninsula Rubiaceae checklist of the NYBG, based on R. Aguilar 10442 (collected August, 2007), could not be verified as the voucher could not be checked up to now.²⁷ Additional record, not listed in WEBER & al. (2001)²⁸ Additional record, not listed in WEBER & al. (2001)²⁹ Listed as *Psychotria officinalis* (Aublet) Sandwith. in WEBER & al. (2001), see text³⁰ Sp. nov., listed as *Psychotria eurycarpa* Standl. in WEBER & al. (2001), see text³¹ Additional record, not listed in WEBER & al. (2001)³² Additional record, not listed in WEBER & al. (2001)³³ Additional record, not listed in WEBER & al. (2001)³⁴ Listed as *Psychotria pittieri* Standl. in WEBER & al. (2001)³⁵ Additional record, not listed in WEBER & al. (2001)³⁶ Listed as *Psychotria brachybotrya* Muell. Arg. in WEBER & al. (2001)³⁷ Listed as *Psychotria furcata* DC. in WEBER & al. (2001)³⁸ Additional record, not listed in WEBER & al. (2001)³⁹ Sp. nov., see text⁴⁰ Additional record, not listed in WEBER & al. (2001)⁴¹ Collection site inside the Golfo Dulce region, cf. Osa Peninsula Rubiaceae checklist of the NYBG⁴² Additional record, not listed in WEBER & al. (2001)⁴³ The collection R. Aguilar 6324 originates from the region. It is listed as *Psychotria haematocarpa* Standl. in the Osa Peninsula Rubiaceae checklist of the NYBG. The identification could not be verified as the voucher could not be checked up to now.

Table 1: continued

133. <i>Randia brenesii</i> STANDL.: B. Hammel, G. Herrera, M.M. Chavarria, A. Solís 16913 (CR, MO)	148. <i>Rustia occidentalis</i> (BENTH.) HEMSL.: R. Aguilar 742 (CR, MO)
134. <i>Randia genipoides</i> DWYER: G. Herrera 4334 (CR, MO)	149. <i>Sabicea panamensis</i> WERNHAM: L. Acosta, V. Ramírez, G. Soto, G. Soto 1353 (INB, MO)
135. <i>Randia gentryi</i> DWYER: R. Aguilar, N. Martín, N. Zamora, G. Bills 1475 (INB, MO)	150. <i>Sabicea villosa</i> WILLD. ex. ROEM. & SCHULT.: L. Acosta, V. Ramírez, G. Soto, G. Sancho 1486 (INB, MO)
136. <i>Randia grandifolia</i> (DONN. SM.) STANDL.: L. Angulo 491 (INB, MO)	151. <i>Simira maxonii</i> (STANDL.) STEYERM.: B. Hammel, N. Zamora, N. Marín 18503 (INB, MO)
137. <i>Raritebe palicouroides</i> ⁴⁴ WERNHAM: G. Cordero 174 (INB, MO)	152. <i>Sommeria donnell-smithii</i> STANDL.: P. Allen 5431 (MO)
138. <i>Richardia scabra</i> L.: V. Ramírez 169 (CR, MO)	153. <i>Spermacoce densiflora</i> (DC.) ALAIN: B. Hammel, R. Dressler, C. Morales 19142 (INB, MO)
139. <i>Ronabea emetica</i> ⁴⁵ (L. f.) A. RICH.: R. Aguilar 6294 (INB, MO)	154. <i>Spermacoce remota</i> ⁴⁹ LAM.: L. Gonzalez 1048 (INB, MO)
140. <i>Ronabea latifolia</i> ⁴⁶ AUBL.: S. Will 1 (MO, WU)	155. <i>Tocoyena pittieri</i> (STANDL.) STANDL.: F. Quesada 881 (INB, MO)
141. <i>Rondeletia bertieroides</i> STANDL.: B. Hammel, J. Marín, F. Quesada 18305 (CR, MO)	156. <i>Warszewiczia coccinea</i> (VAHL) KLOTZSCH: S. Will 88 (MO, WU)
142. <i>Rudgea amplexicaulis</i> DWYER: R. Aguilar 696 (CR, MO)	
143. <i>Rudgea cornifolia</i> (KUNTH.) STANDL.: S. Will 94 (MO, WU)	
144. <i>Rudgea raveniana</i> W.C. BURGER: J.F. Morales, R.J. Abarca 4829 (INB, MO)	
145. <i>Rudgea reducticalyx</i> ⁴⁷ DWYER: Liesner 3225 (MO)	
146. <i>Rudgea skutchii</i> ⁴⁸ STANDL.: S. Will 65 (MO, WU)	
147. <i>Rustia costaricensis</i> (STANDL.) LORENCE: G. Herrera 4857 (INB, MO)	

⁴⁴ The collection R. Aguilar 6721 originates from the region. It is listed as *Raritebe trifoliata* (Dwyer & Hayden) Dwyer in the Osa Peninsula Rubiaceae checklist of the NYBG. The identification could not be verified as the voucher could not be checked up to now.

⁴⁵ Comb. nov., see text

⁴⁶ Comb. nov., listed as *Psychotria erecta* (Aubl.) Standl. & Steyerem. in WEBER & al. (2001)

⁴⁷ Additional record, not listed in WEBER & al. (2001)

⁴⁸ Additional record, not listed in WEBER & al. (2001)

⁴⁹ Synonym for and listed under *Spermacoce assurgens* Ruiz & Pav. in WEBER & al. (2001); reports of the presence of other *Spermacoce* species [*S. exilis* (L.O. Williams) C.D. Adams, *S. latifolia* Aubl., *S. prostrata* Aubl.] in the Osa Peninsula Rubiaceae checklist of the NYBG need confirmation.

tus divides *Psychotria* s.l. into *Psychotria* subg. *Psychotria* and *Psychotria* subg. *Heteropsychotria*, mainly distinguished by the colour of dried specimens, the form and persistence of the stipules, the colour of flowers and fruits and the number and form of pyrenes. The only new description for the Golfo Dulce area within *Psychotria* subg. *Psychotria* is *P. jefensis* DWYER ex. C.M. TAYLOR (TAYLOR 2002a). One collection for this species was recorded from the Fila Costeña and is therefore listed in Appendix I. New recently described species belonging to *Psychotria* subg. *Heteropsychotria* in the area of Osa Peninsula include *Psychotria calidicola* C.M. TAYLOR, which was confused with *P. eurycarpa* and listed under that name in WEBER et al. 2001), and *Psychotria osaensis* C.M. TAYLOR (TAYLOR 2004b).

Specimens previously identified as *Psychotria officinalis* (AUBLET) SANDWITH., turned out to be different from the type of this species and have now been identified as *P. buchtienii* (H. WINKLER) STANDL. (TAYLOR 2004b).

Ronabea. Like some species of the genera *Margaritopsis* and *Notopleura*, species of *Ronabea* have also been included in *Psychotria* in the past. But *Ronabea* is now recognised as a separate genus again (TAYLOR 2004a). Two species occur in southern Costa Rica: *R. emetica* (L.f.) A. RICH. (Basionym: *Psychotria emetica* L.f.) and *R. latifolia* AUBL. (Synonym: *P. erecta* (AUBL.) STANDL. &

STEYERM.). Both taxa can be distinguished from *Psychotria* s.str. by their simple, triangular to linear, mostly persistent stipules, axillary and subcapitate to congested-cymose inflorescences and purple-black fruits (TAYLOR 2004a). Molecular data show that the genus is not closely related to *Psychotria* but belongs to the tribe Lasiantheae (BREMER & MANEN 2000).

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Appendix I: The following additional species have been recorded in the Southern Pacific region of Costa Rica mainly on the slopes of the Fila Costeña or the Talamanca area between 400 and 1600 m (which is close to the Cordillera de Talamanca and therefore outside of the Golfo Dulce area in the strict sense). For reasons of completeness, they are mentioned here:

Cinchona pubescens VAHL: G. Davidse, G. Herrera Ch., M. Grayum 28466 (MO)
Elaeagia myriantha (STANDL.) C.M. TAYLOR & HAMMEL: B. HAMMEL, R. AGUILAR, M. GRAYUM 19191 (INB, MO)
*Hoffmannia discolor*⁵⁰ (LEMAIRE) HEMSL.: M.H. Grayum 3357 (MO)
*Joosia umbellifera*⁵¹ H. KARST: B. Hammel, R. Aguilar, M. Grayum 19211 (INB, MO)
Manettia microphylla LORENCE & DWYER: B. Hammel, R. Aguilar, M. Grayum 19218 (INB, MO)
Notopleura aggregata (STANDL.) C.M. TAYLOR: J. Quesada, A. Rojas, E. Alfaro, E. Navarro 1767 (INB, MO)
Notopleura panamensis (DWYER) C.M. TAYLOR: Hammel 19271 (INB, MO)
Notopleura tolimensis (WERNHAM) C.M. TAYLOR: Hammel 19278 (CR, MO)
Palicourea triphylla DC.: M. Moraga, A. Rojas 560 (MO)
Psychotria angustiflora K. KRAUSE: B. Hammel, R. Aguilar, M. Grayum 19212 (INB, MO)
Psychotria berteriana DC.: J. & K. Utley 4824 (MO)
Psychotria jefensis DWYER ex C.M. TAYLOR: B. Hammel, R. Aguilar, M. Grayum 19214 (INB, MO)

⁵⁰ Synonym for and listed under *Hoffmannia bullata* L.O. Williams in WEBER et al. (2001)

⁵¹ *Joosia umbellifera* is also recorded in the Osa Peninsula Rubiaceae checklist of the NYBG, but the collection site of Aguilar 2053 is outside the Golfo Dulce area in the strict sense.

References

- ACHILLE F., MOTLEY T.J., LOWRY P.P. & J. JÉRÉMIE (2006): Polyphyly in *Guettarda* L. (Rubiaceae, Guettardeae) based on nrDNA ITS sequence data. — *Ann. Miss. Bot. Gard.* **93**: 103-121.
- ALEJANDRO D.G., RAZAFIMANDIMBISON S.G. & S. LIEDE-SCHUMANN (2005): Polyphyly of *Mussaenda* inferred from ITS and trnT-F data and its implication for generic limits in Mussaendeae (Rubiaceae). — *Am. J. Bot.* **92** (3): 544-557.
- ANDERSSON L. (2001): *Margaritopsis* (Rubiaceae, Psychotrieae) is a pantropical genus. — *Syst. Geogr. Pl.* **71**: 73-85.
- ANDERSSON L. (2002): Re-establishment of *Carapichea* (Rubiaceae, Psychotrieae). — *Kew Bulletin* **57** (2): 363-374.
- ANDERSSON L. & B. STAHL (1999): *Bertiera* AUBL. — In: HARLING G. & L. ANDERSSON (eds): *Flora of Ecuador*. 162. Rubiaceae (part 3). Council for Nordic Publications in Botany, Copenhagen.
- BREMER B. & J.-F. MANEN (2000): Phylogeny and classification of the subfamily Rubioideae (Rubiaceae). — *Plant Syst. Evol.* **225**: 43-72.
- BURGER W.C. (ed.) & C.M. TAYLOR (1993): *Flora Costaricensis*. Family # 202 Rubiaceae. — *Fieldiana, Botany* **33**, Field Museum of Natural History.
- BURGER W.C. (1999): Two new species of *Hoffmannia* (Rubiaceae) from Panama, with Remarks on Circumscription of Mesoamerican Species of the Genus. — *Novon* **9** (1): 13-17.
- CHURCH S.A. (2003): Molecular phylogenetics of *Houstonia* (Rubiaceae): descending aneuploidy and breeding system evolution in the radiation of the lineage across North America. — *Mol. Phylogenet. Evol.* **27**: 223-238.
- DAVIS P.A., CHESTER M., MAURIN O. & M.F. FAY (2007): Searching for the relatives of *Coffea* (Rubiaceae, Ixoroideae): The circumscription and phylogeny of Coffeae based on plastid sequence data and morphology. — *Am. J. Bot.* **94** (3): 313-329.
- DELPRETE P.G. (2004): Rubiaceae. — In: SMITH N., MORI S.A., HENDERSON A., STEVENSON D.W. & S.V. HEALD (eds), *Flowering Plants of the Neotropics*. Princeton University Press.
- GUSTAFSSON C. & C. PERSSON (2002): Phylogenetic relationships among species of the neotropical genus *Randia* (Rubiaceae, Gardenieae) inferred from molecular and morphological data. — *Taxon* **51**: 661-647.
- HUBER W. (2005): Tree diversity and Biogeography of four one-hectare plots in the lowland rain forest of the Piedras Blancas National Park ("Regenwald der Österreicher"), Costa Rica. — Dissertation, Fakultät für Lebenswissenschaften, Universität Wien.
- KÄREHED J. & B. BREMER (2007): The systematics of Knoxieae (Rubiaceae) – molecular data and their taxonomic consequences. — *Taxon* **56** (4): 1051-1076.
- KAPPELLE M., CASTRO M., ACEVEDO H., GONZÁLEZ L. & H. MONGE (2003): *Ecosistemas del Área de Conservación Osa (ACOSA)*. — Instituto Nacional de Biodiversidad. Santo Domingo de Heredia, Costa Rica.
- KHAN, S.A., RAZAFIMANDIMBISON S.G., BREMER B. & S. LIEDE-SCHUMANN (2008): Sabiceae and Virentarieae (Rubiaceae, Ixoroideae): one or two tribes? New tribal and generic circumscriptions of Sabiceae and biogeography of *Sabicea* s.l. — *Taxon* **57** (1): 7-23.
- MOTLEY T.J., WURDACK K.J. & P.G. DELPRETE (2005): Molecular systematics of Catesbaeeae-Chiococceae complex (Rubiaceae): Flower and fruit evolution and biogeographic implications. — *Am. J. Bot.* **92** (2): 316-329.
- OBANDO V. (2002): *Biodiversidad en Costa Rica: Estado del conocimiento y gestión*. — Instituto Nacional de Biodiversidad. Santo Domingo de Heredia, Costa Rica, 1 ed.
- RAZAFIMANDIMBISON S.G. & B. BREMER (2002): Phylogeny and classification of Naucleaeae s.l. (Rubiaceae) inferred from molecular (ITS, RBCL, and TRNT-F) and morphological data. — *Am. J. Bot.* **89** (7): 1027-1041.
- ROVA J.H.E., DELPRETE P.G., ANDERSSON L. & V.A. ALBERT (2002): A *trnL-F* cpDNA sequence study of the Condamineae-Rondeletieae-Sipaneae complex with implications on the phylogeny of the Rubiaceae. — *Am. J. Bot.* **89** (1): 145-159.
- SMEDMARK J.E.E., RYDIN C., RAZAFIMANDIMBISON S.G., KHAN S.A., LIEDE-SCHUMANN S. & B. BREMER (2008): A phylogeny of Urophylleae (Rubiaceae) based on rps16 intron data. — *Taxon* **57** (1): 24-32.

- TAYLOR C.M. (2001a): Rubiaceae. Flora de Nicaragua. — Monographs in Systematic Botany, Vol. **85**, Tomo III, Missouri Botanical Garden Press.
- TAYLOR C.M. (2001b): Overview of the neotropical genus *Noto-pleura* (Rubiaceae: Psychotrieae), with the description of some new species. — Ann. Missouri Bot. Gard. **88**: 478-515.
- TAYLOR C.M. (2001c): Rubiacearum Americanarum Magna Hama Pars II. New and Newly Circumscribed Taxa of *Guettarda* (Guettardeae). — Novon **11**: 127-134.
- TAYLOR C.M. (2001d): Rubiacearum Americanarum Magna Hama Pars III. Five New Species and a New Subspecies of *Coussarea* (Coussareae) from Central America and Colombia. — Novon **11**: 135-142.
- TAYLOR C.M. & J.L. CLARK (2001): Rubiacearum Americanarum Magna Hama V. *Amphidasya* in Mesoamerica and Western South America. — Novon **11**: 489-497.
- TAYLOR C.M. (2002a): Rubiacearum Americanarum Magna Hama Pars VI. New Species of and morphological Notes on *Psychotria* subg. *Psychotria* (Psychotrieae) from Mesoamerica and Western South America. — Novon **12**: 120-132.
- TAYLOR C.M. (2002b): Rubiacearum Americanarum Magna Hama Pars VIII. New Species of *Gonzalagunia* and *Sabicea* from Mesoamerica and Colombia. — Novon **12**: 281-285.
- TAYLOR C.M. (2002c): Rubiacearum Americanarum Magna Hama Pars X. New Species and a New Subspecies of *Fareamea* (Coussareae) from Central and South America. — Novon **12**: 563-570.
- TAYLOR C.M. (2002d): Rubiacearum Americanarum Magna Hama Pars XI. A New Species of *Alseis* (Calycophylleae) from Central America and Notes on the Morphology of this Neotropical Genus. — Novon **12**: 571-574.
- TAYLOR C.M. (2003): Rubiacearum Americanarum Magna Hama Pars XV. New Species and Two New Combinations in *Noto-pleura* (Psychotrieae) from Central and South America. — Novon **13**: 228-260.
- TAYLOR C.M. (2004a): The neotropical genus *Ronabea* (Rubiaceae, Lasiantheae). — Syst. Geogr. Pl. **74**: 35-42.
- TAYLOR C.M. (2004b): Rubiacearum Americanarum Magna Hama Pars XVI. New Species, a New Subspecies, and an Overlooked Species of *Psychotria* subg. *Heteropsychotria* from Mexico, Central America, and Western South America. — Novon **14** (4): 493-508.
- TAYLOR C.M. (2005): *Margaritopsis* (Rubiaceae, Psychotrieae) in the Neotropics. — Syst. Geogr. Pl. **75**: 161-177.
- TAYLOR C.M. (2006): *Carapichea* AUBL. — In: HARLING G. & C. PERS-SON (eds), Flora of Ecuador, 162. Rubiaceae (part 5), Tribe 18. Psychotrieae (2), Elanders Berlings, Malmö, Sweden, 5-8.
- TAYLOR D.W. (2003): A taxonomic revision of the genus *Chione* (Rubiaceae). — Syst. Geogr. Pl. **73**: 171-198.
- WEBER A., HUBER W., WEISSENHOFER A., ZAMORA N. & G. ZIMMERMANN (2001): An introductory field guide to the flowering plants of the Golfo Dulce rainforests, Costa Rica. — Stapfia **78**: 1-462.
- WEISSENHOFER A. (2005): Structure and vegetation dynamics of four selected one hectare plots in the lowland rainforests of the Piedras Blancas National Park ("Regenwald der Österreicher"), Costa Rica, with notes on the vegetation diversity of the Golfo Dulce region. — Unpubl. doctoral thesis, University of Vienna, Vienna..

WILL S., ZIMMERMANN G. & J. SÁNCHEZ (2001a): Rubiaceae. — Stapfia **78**: 378-396.

WILL S. (2001b): Diversity of Rubiaceae Juss. (Coffee or Madder Family) in the Esquinas rainforest, Costa Rica. — Diploma thesis, University of Vienna, Vienna.

Web

AGUILAR R., CORNEJO X., BAINBRIDGE C., TULIG M. & S.A.MORI: The Flowering Plants of the Osa Peninsula, Costa Rica (<http://sweetgum.nybg.org/osa/index.html>).

InBio database "Manual de Plantas de Costa Rica": http://www.inbio.ac.cr/papers/manual_plantas/index.html

Species Search, Instituto Nacional de Biodiversidad Costa Rica (Rubiaceae): <http://www.inbio.eas.ualberta.ca/bims/k03/p13/c045/o0142/f01359.htm>

Tropicos W³ database: <http://www.tropicos.org>

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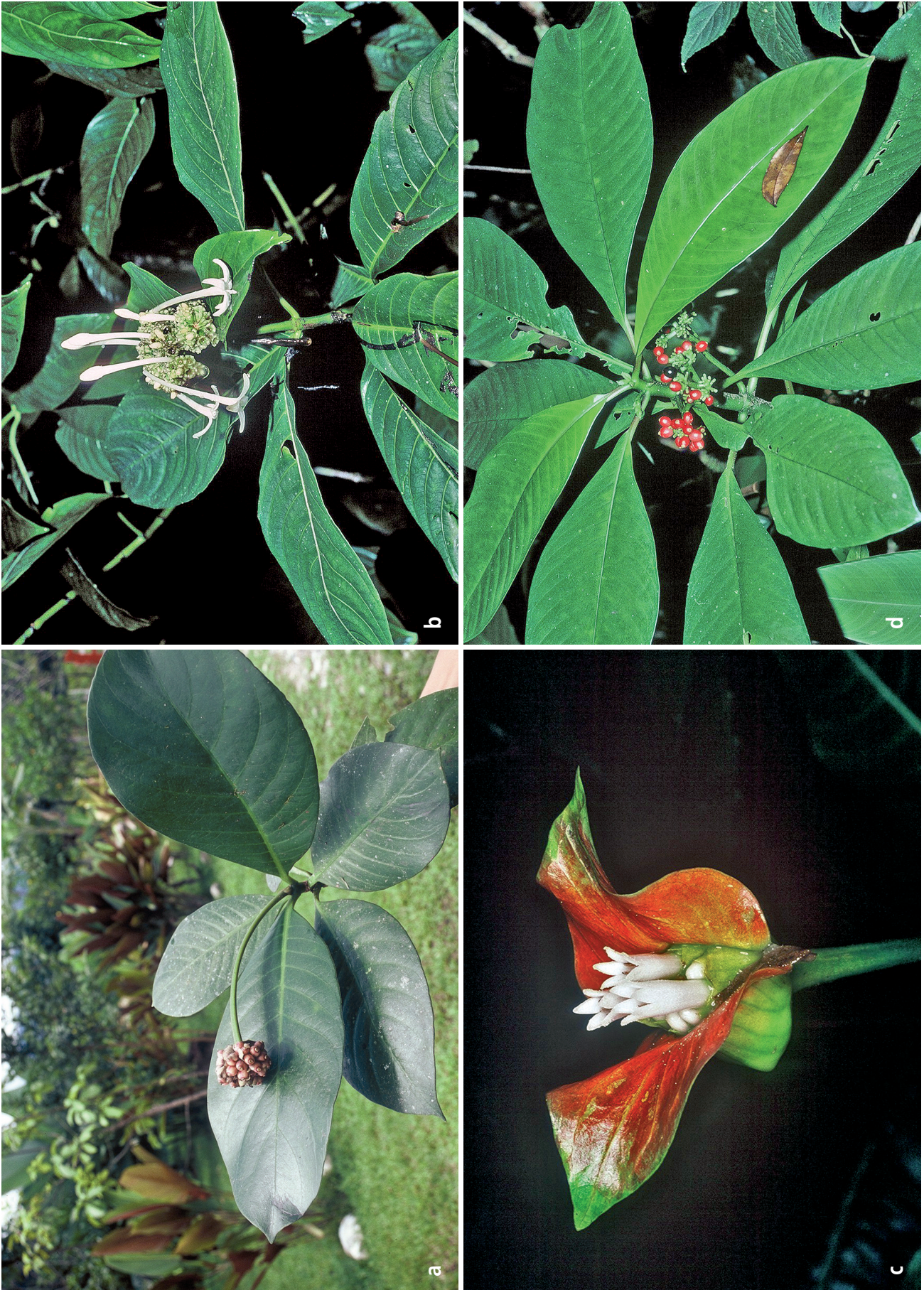


Plate 1: (a) *Carapichea affinis* (syn. *Psychotria borucana*), (b) *Psychotria chiapensis*, (c) *Psychotria elata*, (d) *Notopleura uliginosa* (syn. *Psychotria uliginosa*)



Plate 2: (a) *Faramea suerrensis*, (b) *Notopleura polyphebia* (syn. *Psychotria polyphebia*), (c) *Ronabea latifolia* (syn. *Psychotria erecta*), (d) *Sabicea panamensis*

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