

CONSPECTUS OF THE GENUS *Palicourea* Charlotte M. Taylor²

PALICOUREA (RUBIACEAE: PSYCHOTRIEAE) WITH THE DESCRIPTION OF SOME NEW SPECIES FROM ECUADOR AND COLOMBIA¹

ABSTRACT

Palicourea Aublet comprises about 200 species of shrubs and small trees found throughout the moist and wet Neotropics. This genus is distinguished by characters of the corolla that apparently represent adaptations for pollination by hummingbirds and seems to be a member of a hummingbird-pollinated group closely related to *Psychotria* subg. *Heteropsychotria*, which is generally insect-pollinated. An infrageneric classification is proposed here for 188 species, based largely on characters of the stipules and fruits. This classification comprises two subgenera, one generally lowland, centered in Amazonia, and comprising 52 species in four sections, and the other generally middle to high elevation, centered in the northern Andes, and comprising 136 species in five sections. Several distinctive features shared by species that belong to different sections and in some cases different subgenera are noted. These patterns suggest that at least some features have been derived repeatedly in parallel within the genus. The relatively large number of species of *Palicourea* found at middle and high elevations may be due to the exploitation by this group of hummingbird pollination, together with habitat diversity, distyly, and variation among local populations leading to their reproductive isolation. The following new combinations are made: *Palicourea* sect. *Corymbiferae* (Müll. Arg.) C. M. Taylor, *Palicourea subtomentosa* (Ruiz. & Pav.) C. M. Taylor and *P.* subser. *Subcymosae* (Müll. Arg.) C. M. Taylor; the following new taxa are described: *P.* subg. *Montanae*, *P.* sect. *Cephaeloides*, *P.* sect. *Grandiflorae*, *P.* sect. *Montanae*, *P.* sect. *Obovoideae*, *P.* sect. *Pseudoamethystinae*, and *P.* sect. *Psychotrioides*; and the following new taxa are described, illustrated, and classified: *P. anderssoniana*, *P. aniangwana*, *P. asplundii*, *P. azurea*, *P. canarina*, *P. candida*, *P. chignul*, *P. condorica*, *P. corniculata*, *P. cornigera*, *P. deviae*, *P. gentryi*, *P. harlingii*, *P. jaramilloi*, *P. lugoana*, *P. luteonivea*, *P. prodiga*, *P. subalatoideae*, *P. subtomentosa* subsp. *lojana*, *P. ulloana*, and *P. vulcanalis*.

Palicourea Aublet comprises about 200 species of shrubs and small trees distributed from central Mexico and the Antilles to southern Peru, Bolivia, Paraguay, and northern Argentina (Fig. 1). This genus has not been surveyed as a whole since Schumann's (1891) review of the family and has never been studied in any detail in its entirety, although several recent regional treatments are available (Steyermark, 1972, 1974; Bacigalupo, 1952; Taylor, 1989, 1993), and monographic work is currently in progress. *Palicourea* is notable for the large number of apparently closely related species it includes overall, and also for the frequent sympatric occurrence of several (to numerous) different species at

a given site (e.g., Kappelle & Zamora, 1995; Sobrevilla et al., 1983; pers. obs.).

Species of *Palicourea* are typically members of the understory and subcanopy of moist to wet forest, and are found from low elevations to the upper limits of wet montane forest. A few species grow in savanna habitats and show pyrrhophytic adaptations. Both widespread weedy species and locally endemic, apparently more specialized species are found in this genus. *Palicourea* flowers have corollas with relatively well-developed tubes and typically are odorless, brightly colored, and pollinated by hummingbirds; the carnosae, usually blue to purple fruits are dispersed by birds. Nearly all *Pali-*

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courea species are distylous; this appears to be the ancestral condition for the genus (Taylor, 1993).

Palicourea is closely related to the neotropical subgenus *Heteropsychotria* Steyermark. of *Psychotria* L. (Taylor, 1996). These groups are separated only by characters of the corolla, as discussed below.

Schumann (1891) presented an infrageneric classification for *Palicourea* as a whole, based primarily on the regional treatments by Mueller (1881, who included it in *Psychotria*) and Grisebach (1861); no subsequent author has made reference to this classification, including Steyermark (1972, 1974), even though he treated 56 and 47 species, respectively, and presented a detailed infrageneric classification for the closely related genus *Psychotria*. No infrageneric classification has been proposed more recently for this genus.

In this article I outline the circumscription of *Palicourea*, present an infrageneric classification, discuss some of the character patterns now evident within the genus, and describe several new taxa.

CIRCUMSCRIPTION OF *PALICOUREA*

Schumann (1891) was one of the first authors to distinguish *Palicourea* explicitly from *Psychotria*. In his key to genera, he separated *Palicourea* by its bent corolla that is gibbous at the base. He nevertheless included in *Palicourea* species such as *Psychotria domingensis* Jacq. (Schumann, 1891: 115), with white corollas that are curved in the tube but never gibbous at the base (Taylor, 1987), and excluded from it species such as *Palicourea aurantiaca* Miq. (Schumann, 1891: 114), a name here considered synonymous with *Palicourea fastigiata* Kunth and based on a set of specimens with the corollas bright orange, gibbous, and straight to slightly bent at the base, but generally straight in the tube. Thus, his actual circumscription of the genus was not entirely consistent.

Standley (1936, 1938) distinguished *Palicourea* by its "corolla tube elongate, more or less curved, gibbous at the base; branches of the inflorescence usually pale or red or yellow," and this concept was followed closely by Dwyer (1980). Standley placed in *Palicourea* several species with these distinguishing features but with green inflorescence branches and white or nearly white corollas, e.g., *Palicourea andrei* Standl., *P. andaluciana* Standl., and *P. garciae* Standl.; simultaneously he placed in *Psychotria* several similar species that have white or yellow corollas that are swollen at the base and green to brightly colored inflorescence branches, e.g., *Psychotria bella* Standl. [= *Palicourea bella* (Standley) Dwyer], *Psychotria copeyana* Standl. &

L. O. Williams [= *Palicourea garciae*], and *Psychotria brenesii* Standl. [= *Palicourea standleyana* C. M. Taylor]. Standley's circumscription of *Palicourea* seems to have been based on the aggregate classification of individual species rather than characterization of the genus as a whole.

Steyermark's (1972, 1974) generic concept of *Palicourea* was more consistent and based more strongly on corolla features. He distinguished *Palicourea* from *Psychotria* in his key as follows (Steyermark, 1974, my translation from the Spanish): "[b]ase of the corolla tube with a slight swelling or a curvature on one side; interior of the corolla tube with a ring of trichomes usually near the base; corolla usually blue, purple, yellow, orange, red, or combinations of these colors; rachis and axes of the inflorescence with similar colors." In practice, species included by Steyermark in *Palicourea* usually also have a relatively well-developed corolla tube.

As a basis for distinguishing *Palicourea* species, I (Taylor, 1989, 1993, 1996) have used corollas with a swollen base closed internally by a ring of pubescence (as emphasized by Steyermark), and the general tendency to have brightly colored floral displays and relatively well-developed corolla tubes. These features appear to represent adaptation for pollination by hummingbirds: nectar accumulates in the enlarged basal part of the corolla and is protected by the ring of pubescence from weaker or smaller flower visitors, and the pollinators are often attracted by the colorful inflorescence displays.

Palicourea appears in general to represent a lineage closely related to or perhaps even derived from *Psychotria* subg. *Heteropsychotria* through adaptation for hummingbird pollination (Taylor, 1989, 1996). This genus has so far been assumed to comprise a monophyletic group (Taylor, 1989, 1996) that can be recognized by the characteristic corolla morphology. Additionally, the pollen of the very few species of *Palicourea* that have been studied lacks or nearly lacks exine (Erdtman, 1952; Taylor, 1996). No evidence has been found to date to suggest that this genus is polyphyletic, although its unusual corolla morphology could conceivably have been derived more than once. A few species that show this characteristic corolla morphology and are similar to other *Palicourea* species, but do not appear to be solely hummingbird pollinated, may represent secondary pollinator shifts. For example, *Palicourea andrei* is very similar to *P. boyacana* Standl., which has tubular orange flowers, but *P. andrei* has sweetly fragrant, tubular white corollas that could also be adapted for insect pollination. As discussed below, hummingbird pollination ap-



Figure 1. Approximate number of species of *Palicourea* by country, for the entire range of the genus. Numbers followed by "+" represent conservative estimates for country floras not yet surveyed in detail.

pears to be an important factor in the diversification of this genus. Adaptations for hummingbird pollination are generally considered to include brightly colored flowers, but these birds frequently do visit, and even actively defend, *Palicourea* plants with green inflorescences and relatively short white corollas (e.g., *P. calophlebia* Standl., Colombia, pers. obs.).

PHYTOGEOGRAPHY AND ECOLOGY OF *PALICOUREA*

Species of *Palicourea* are concentrated in tropical South America; they are also well represented in Central America, particularly in montane Costa Rica and Panama (Fig. 1). Eight species are found in the Antilles, most of them in the Greater Antilles, and more than 32 species are now known from Central America (Taylor, 1989, 1990). In South America, *Palicourea* is widespread in low-elevation

wet tropical forests and also shows notable centers of species diversity in wet tropical montane areas.

Palicourea is more species-rich in montane than lowland habitats. When montane species are defined as those predominantly distributed at or above 1000 m elevation (Gentry, 1988), 22 of the 26 species known from Costa Rica can be considered montane (Burger & Taylor, 1993), as can ca. 50 of the ca. 80 species known from Ecuador (Taylor, in prep.). The two subgenera recognized below approximate this habitat distribution: of the 188 species of *Palicourea* classified below, 52 are placed in subgenus *Palicourea*, which is primarily distributed at low elevations, while 136 are placed in subgenus *Montanae*, which is primarily montane. *Palicourea* is usually well represented locally in montane forests in both number of individuals and number of species (e.g., Kappelle & Zamora, 1995; Silverstone-Sopkin & Ramos-Pérez, 1995). The dis-

tributions of most species of subgenus *Montanae* correspond to Takhtajan's (1986) regions, and in particular support his circumscription of the Central American region, which extends south along coastal Colombia into Ecuador, rather than Gentry's (1982) circumscription of this region, which ends in northwestern Colombia. Several groups of apparently closely related species of *Palicourea* are restricted to individual phytogeographic provinces (sensu Takhtajan, 1986).

The relatively greater species diversity of *Palicourea* in montane habitats is very likely due in part to the larger number of different habitats, or microhabitats, in montane regions. In general, low-elevation species of *Palicourea* usually have wider geographic distributions than do montane species, and fewer of the low-elevation species are local endemics. For example, none of the four lowland species known from Costa Rica is endemic and all extend at least as far south as Peru; in contrast, 6 of the 22 montane species from that country are endemic to it and the rest are otherwise found only in Panama or in a few cases in western Colombia. Montane areas have been considered by a number of authors to comprise a greater diversity of habitats than lowland areas, due to both physical and historical factors (Gentry, 1982, 1995; Young, 1995). Additionally, apparently related species of *Palicourea* frequently show distinct elevational zonation (see discussion of *P. ovalis* and related species, below), further partitioning montane habitats, as noted by Webster (1995).

The relative youth of these areas may also be a factor contributing to high species diversity. Although mountains have existed in the region of the Andes since at least the Eocene (Taylor, 1995), the great height and perhaps also the pluvial climate of the northern Andes are apparently more recent, with the principal uplift occurring during the last 5 million years (van der Hammen, 1974). Significant alteration in local conditions and therefore plant communities has been noted during at least the last 3.5 million years (Hooghiemstra & Cleef, 1995), which suggests that many populations of *Palicourea* have long occupied a changing environment. *Palicourea* has not been reported from fossil assemblages and probably will not be found because of its limited pollen exine, so its historical occurrence is unknown. Modern species of *Palicourea* show variation among populations in flower size (Sobrevila et al., 1983), inflorescence color, and local flowering time (pers. obs., Puerto Rico, Costa Rica), which may favor selection for reproductive isolation through differing phenology and perhaps pollinators. Fragmentation and isolation of

montane populations of *Palicourea* species would reinforce this reproductive isolation, while distyly would continue to promote outcrossing among individuals within small populations. Most species of *Palicourea*, including many of those known only from a few widely separated sites, are represented on herbarium specimens by both long-styled and short-styled plants. Only a very few cases of loss of this feature have been demonstrated, mostly in plants of the Antilles (Taylor, 1989), and in populations peripheral to the principal range of the generally distylous species (Sobrevila et al., 1983). Widespread maintenance of distyly in the genus suggests that this feature is adaptive and maintained through selection, and that pollen transfer among plants is effective in most species at least through the principal part of their range.

Many species of *Palicourea* are notoriously similar vegetatively and in fruit, sometimes to the degree that they can be separated only by their mature flowers. Sympatric assemblages of *Palicourea* are common, with the sympatric species usually separated reproductively by phenology and perhaps subtle to marked differences in morphology (e.g., Sobrevila et al., 1983). For example, *Palicourea crocea* (Sw.) Roem. & Schult. and *P. croceoides* Ham. frequently grow sympatrically in Puerto Rico, with plants of both species often found side by side in mixed populations. These species have been treated by a number of authors as conspecific (e.g., Liogier & Martorell, 1982). In one site in Puerto Rico where these species are sympatric, plants of *P. crocea* are usually less than 1 m tall, bear dark red corollas that are shorter than those of *P. croceoides* on yellow inflorescence branches, flower for a period of 1–2 weeks once or twice a year, and are diploid; plants of *P. croceoides* are taller, bear longer yellow corollas on red inflorescence branches, produce flowers during a period of a month or more approximately every 3–4 months, and are polyploid (Taylor, pers. obs.; Kiehn, 1986). Individual plants are difficult to identify to species when not in flower, but the two populations are reproductively isolated and clearly separable by reproductive features, and are considered separate species here. Such reproductive isolation among sympatric *Palicourea* species is probably common; little work has been done in this area.

The relatively greater diversification of *Palicourea* in montane habitats is likely due also in part to its exploitation of hummingbirds as pollinators. An increase in importance of species pollinated by hummingbirds at higher elevations has been noted in surveys covering various families (Webster, 1995), which suggests that this mode of pollination

is more effective than insect pollination at higher elevations. This is probably partly why with increasing elevation, *Palicourea* becomes relatively more important than, or even replaces, *Psychotria* subg. *Heteropsychotria*, the group most closely related to it, which is generally pollinated by small insects.

CHARACTER PATTERNS IN *PALICOUREA*

Diagnostic morphological characters used here to distinguish species of *Palicourea* include the following features. **Stipule form** may be sheathing, i.e., united around the stem in a continuous, usually truncate sheath, or laminar, i.e., with the interpetiolar portion well developed and the intra-petiolar portion reduced or absent; the stipule lobes may be broadly rounded or acute to obtusely angled, and straight at the base or rounded to lobed or subauriculate on one or both sides. **Leaf arrangement** may be paired or occasionally verticillate. **Inflorescence shape** ranges from pyramidal, in most species, to elongated and cylindrical or spiciform, or to rounded-corymbiform with the basal branches ascending and nearly as well as to better developed than the central axis. **Inflorescence and corolla colors** may be pale green to white, or dull to bright yellow, orange, red, purple, violet, or blue; corolla color may be similar to or contrast with the inflorescence branches. In general, most species with brightly colored inflorescences or corollas vary from yellow to red, or purple to blue; relatively few species combine colors from these two groups. **Calyx limb length** varies from relatively short, 0.2–1.2 mm long, as in most species of *Psychotria* subg. *Heteropsychotria*, to relatively well developed, to 20 mm long in *Palicourea bella* and related species. **Corolla shape** varies from somewhat swollen and a little gibbous at the base and generally straight there and in the tube, to strongly gibbous at the base, bent to 90° just above this swelling, and curved in the tube; the tube may be slender to relatively stout. **Corolla length** varies from relatively short in the tube, 4–5 mm long, to ca. 40 mm long in species of several different groups; the length of the lobes varies, but generally it is similar in proportion to the length of the tube. **Linear corolla lobe appendages and colored multicellular corolla trichomes** are found in a few species. **Fruit shapes** described here are evident mainly on dried specimens and are due to the aggregate shape of the pyrenes. Dried fruits range from subglobose to ellipsoid or obovoid and may sometimes be laterally flattened. **Pyrene number** is typically 2, but ranges to 4–5

in a few species; this number may be constant or variable within a species. The longitudinal **pyrene ridges** may be rounded to nearly flat or raised and sharp.

Characters that may vary within an individual species include general shape and apex (i.e., rounded vs. obtuse or acute) of the calyx lobes; density of the pubescence on vegetative and sometimes reproductive structures (e.g., see discussion of *Palicourea alpina* in Taylor, 1993); color of the inflorescences and corollas, within the general color groups noted above; length of the stipules and pedicels (at least to some extent); and external pubescence of the corolla, including presence or absence of the multicellular colored trichomes. Some morphological structures appear to vary in correlated fashion on individual plants, in particular the proportional widths of leaves, stipule lobes, inflorescence bracts, and calyx lobes are usually similar. Inflorescence and corolla color appear to vary among closely related species and perhaps are correlated with reproductive isolating mechanisms, as in the example of *P. crocea* and *P. croceoides*, above. Among closely related species, for example, three that are morphologically similar have very different inflorescence and corolla colors: *P. ovalis* Standl., found at 1200–2000 m in Colombia and Ecuador, has blue to purple inflorescences and corollas; *P. chimboracensis* Standl., found at 150–1400 m in a similar range, has orange to red inflorescence branches and yellow corollas; and *P. heilbornii* Standl., found at 1400–2200 m only in Pichincha Province, Ecuador, has yellow to orange inflorescence branches and deep red corollas. Species of subgenus *Palicourea* sect. *Grandiflorae* present a similar example: of four similar species, two (*P. grandiflora* (Kunth) Standl., *P. macarthurorum* C. M. Taylor) have red-orange to yellow inflorescences and flowers, while two others (*P. nigricans* K. Krause, *P. amapaensis* Steyererm.) have violet to purple inflorescences and flowers; one yellow-flowered species and one purple-flowered species are sympatric through most of Amazonian South America, in various combinations, while both of the similarly colored species are allopatric.

Several unusual or distinctive features found in one or several species of *Palicourea* are also found in other genera of Rubiaceae, often from other tribes or subfamilies, and thus appear to have been derived more than once in the family. One such feature is a spathaceous calyx, which is completely fused in bud and split irregularly by the elongating calyx; this feature is found in *P. spathacea* C. M. Taylor and is also known in other genera, e.g., *Pentagonia* Benth., *Hippotis* Karst. (both Hippotideae),

and *Phellocalyx* Bridson (Gardenieae, African). The calyx lobes of several species of *Palicourea* are somewhat to strongly unequal in length on an individual flower; this feature is notable in *Palicourea mexiae* Standl., *P. gomezii* C. M. Taylor, *P. gibbosa* Dwyer, *P. discolor* K. Krause (all subg. *Montanae*), *P. fastigiata*, *P. cymosa* (Ruiz & Pav.) DC. (both subg. *Palicourea*), and other species, and also in some species of *Rondeletia* L. (Rondeletieae), *Pentas* Benth. (Hedyotideae), and many other genera. Verticillate leaves are found in several species of subgenus *Palicourea*, including *P. triphylla* DC., *P. officinalis* Mart., and the species of section *Corymbiferae*, and also in species of *Duroia* L.f. (Gardenieae), *Remijia* DC. (Cinchoneae), *Declieuxia* Kunth (Psychotrieae), *Bathysa* C. Presl, *Rondeletia* (both Rondeletieae), and other genera. Parallel (or convergent) derivation of distinctive conditions can be outlined for additional characters including capitate inflorescences with well-developed bracts, well-developed slender white corollas, and relatively large pyrenes.

Within *Palicourea*, the diagnostic characteristics noted above as used to distinguish species are distributed among the individual species in various—for some features, nearly all possible—combinations. This distribution of character states suggests that at least some of these features have been derived more than once, in some cases apparently several times. Within the classification presented here, characters that have apparently originated more than once include the following:

- ◆ Multicellular, elongated, colored trichomes on the exterior of the corolla are found in a number of species with inflorescences and flowers of both color groups, including *Palicourea lachnantha* Standl. and *P. mansoana* (Müll. Arg.) Standl. of subgenus *Palicourea*, and *P. thermydri* J. H. Kirkbr., *P. rigidifolia* (Dwyer & M. V. Hayden) Dwyer, *P. eriantha* DC., *P. dorantha* Wernham, *P. justicioides* Standl., *P. calycina* Benth., and *P. cornigera* C. M. Taylor, of several different series in subgenus *Montanae* sect. *Montanae*.

- ◆ Distinctive obovoid, laterally somewhat flattened fruits are found in a number of species of subgenus *Montanae*, including the species of section *Obovoideae* series 5, which have stipules with truncate continuous sheaths separating the lobes, and the species of section *Obovoideae* series 6, which have laminar stipules with the lobes closely set on each side of a narrow, acute to concave sinus. Thus, either fruit shape is a shared character and stipule form variable among these species, or the distinctive fruit shape has arisen at least twice in

these groups while the stipule form has been derived only once.

- ◆ The form of the longitudinal pyrene ridges is distinctive for several species and useful in separating some species groups. The pyrenes of most species have rounded, usually rather low ridges, but relatively sharp, pronounced ridges seem to have arisen independently in such species as *Palicourea lachnantha* and *P. calophylla* DC., which belong to two different sections of subgenus *Palicourea*, and in the species of subgenus *Montanae* sect. *Cephaeloides* series 10 and section *Montanae* series 4 subseries g.

- ◆ Calyx length shows marked variation throughout the genus, and to some degree within each species group. It is most variable among species of subgenus *Montanae*. Relatively long calyx limbs seem to have arisen several times in the genus, in *P. cymosa* of subgenus *Palicourea*, and in subgenus *Montanae* in species such as *P. orosiana* C. M. Taylor, *P. chignul* C. M. Taylor (both section *Obovoideae*), and the species of section *Cephaeloides*.

- ◆ Perhaps the most striking example of a feature that has arisen more than once is the linear corolla lobe appendages found in *P. rigidifolia*, *P. denslowiae* J. H. Kirkbr., *P. lehmannii* (Rusby) Standl., *P. corniculata* C. M. Taylor, and *P. cornigera* C. M. Taylor, which are all purple- to blue-flowered species of the western Andean cordillera of Colombia and Ecuador. These appendages differ morphologically: the first four species bear a single appendage originating from the middle of the abaxial surface of the corolla lobe (Fig. 9D, E), which is developed to various degrees in the different species and which is found in other species of Psychotrieae and other tribes; whereas *P. cornigera* bears two appendages per lobe, one originating from each side of the base of the lobe (Fig. 9B), an apparently unique feature in the family.

These combinations of morphological characters indicate that at least some of them have been derived more than once. They may suggest also the possibility that the classification proposed here should be reordered; however, any reordering will indicate the repeated derivation of other features, which suggests that the repeated origin of at least some of them is a real occurrence. This in turn suggests that different species may be responding in similar ways to similar patterns of selection in the environment. Particularly suggestive of this last possibility is the repeated similar variation in inflorescence and corolla colors (green and white, yellow-orange-red group, and purple-blue group) with-

in many species groups; the repeated derivation of relatively long, colored calyx limbs; and the unusual, prominent linear corolla lobe appendages described above. In this last case, convergent occurrence of unusual structures that are morphologically distinct suggests that some aspect of the environment of this particular region favors these structures.

AN INFRAGENERIC CLASSIFICATION OF *PALICOUREA*

The scheme presented below is based on a survey of the entire genus and monographic work on part of it. It classifies 188 species. This scheme does not include all species in this genus: those not included either have not been studied in adequate detail or are as yet too poorly known for classification. Synonyms at the species level are not included here, but can be found on the World Wide Web at <http://www.mobot.org/MOBOT/Staff/Research/taylor/palihome.html>. Species included in this classification that are described in this article are indicated with an asterisk. Geographic distributions presented for the species are approximate. "Amazonia" is used here in the sense of Takhtajan's (1986) "Amazonian Region" (i.e., including the Orinoco and other non-Amazonian drainages of lowland, moist to wet, eastern to central South America). Previously published infrageneric taxa of *Palicourea* are included here. Most of the infrageneric taxa subordinate to section that are proposed here are informal; formal description of these and phylogenetic analyses will depend on the completion of monographic work.

This scheme suffers the limitations inherent in translating what is clearly a branched pattern to a linear list. Species are listed in an order that attempts to place similar and apparently closely related species together.

Palicourea Aubl., Hist. pl. Guiane 172, t. 66. 1775. TYPE: *Palicourea guianensis* Aubl.

Subgenus I. *Palicourea*. Leaves paired to verticillate, usually membranaceous to papyraceous, or subcoriaceous in species of savanna habitats, usually minutely pustulose abaxially; stipules united around the stem into a continuous sheath, this often reduced, the lobes reduced to well developed or obsolete; inflorescences and flowers variously colored; corollas tubular to somewhat funnelform, somewhat to strongly swollen and gibbous at base, generally straight to somewhat bent here and in tube, externally glabrous or pubescent, sometimes with colored multicellular trichomes; pyrenes 2–5 per fruit. Generally found at lower elevations, 0–1200(1500) m, throughout the range of the genus.

Section A. *Palicourea*.

- Psychotria* sect. *Oribasia* Müll. Arg., in Mart., Fl. bras. 6(5): 223. 1881. *Palicourea* sect. *Oribasia* (Müll. Arg.) K. Schum., in Engl. & Prantl, Nat. Pflanzenfam. 4(4): 115. 1891. TYPE: *Palicourea grandifolia* (Willd. ex Roem. & Schult.) Standl., lectotype, here designated. Note: Authorship of section *Oribasia* is here ascribed solely to Müller, although he intended to base his name on *Oribasia* Schreb., Gen. pl. 124. 1789, nom. illeg., nom. superfl. for *Palicourea* Aubl.
- Palicourea* sect. *Stephanium* Griseb., Fl. Brit. W. I. 346. 1861. TYPE: *Palicourea guianensis*. Note: Authorship of section *Stephanium* is here ascribed solely to Grisebach; in the publication of the section, Grisebach referenced *Stephanium* Schreb., Gen. pl. 124. 1789, nom. illeg., which is a nom. superfl. for *Nonatelia* Aubl. and therefore nomenclaturally not synonymous with *Palicourea*, although as originally circumscribed it included *P. guianensis* as well.
- Palicourea* ser. *Suberosae* (Müll. Arg.) K. Schum., in Engl. & Prantl, Nat. Pflanzenfam. 4(4): 115. 1891. *Psychotria* ser. *Suberosae* Müll. Arg., in Mart., Fl. bras. 6(5): 227. 1881. TYPE: *Palicourea rigida* Kunth.
- Psychotria* ser. *Paniculatae* Müll. Arg., in Mart., Fl. bras. 6(5): 228. 1881. TYPE: *Psychotria sellowiana* DC., lectotype, here designated, = *Palicourea guianensis*.

Leaves paired; stipule lobes ligulate, usually obtuse to rounded, relatively well-developed; inflorescences pyramidal to broadly so; pyrenes 2–5. One widespread species, Mexico and Antilles to Bolivia and southern Brazil, the remaining species Amazonian.

P. guianensis Aubl. Lowlands of Mexico and Antilles to southern Brazil and Bolivia; pyrenes 2–5 per fruit.

P. grandifolia Kunth. Amazonia; similar to *P. guianensis* and perhaps not actually distinct; pyrenes 4–5 per fruit.

P. buntingii Steyerl. Venezuela; perhaps not distinct from *P. guianensis*.

P. tepuicola Steyerl. Venezuela; perhaps not distinct from *P. guianensis*.

P. rigida Kunth. Pyrrhophytic; savannas throughout South America.

P. semirasa Standl. Middle elevations, Venezuela and Colombia.

P. flavifolia (Rusby) Standl. Middle elevations, Bolivia.

P. attenuata Rusby. Middle elevations, Bolivia.

P. mansoana (Müll. Arg.) Standl. Western Amazonia.

P. lasiantha K. Krause. Western Amazonia.

P. pachycalyx Standl. Western Amazonia; similar to *P. lasiantha*, perhaps not distinct from it.

P. lachnantha Standl. Western Amazonia; characteristically drying turquoise-black, perhaps an aluminum accumulator.

P. aniangwana C. M. Taylor*. Local in eastern

Ecuador; combines characters of *P. lachnantha* and *P. lasiantha*.

Section B. Grandiflorae, sect. nov. TYPE: *Palicourea grandiflora* Kunth.

Folia lobis stipularum reductis. Fructus magnitudinem mediam generis aliquantum ad valde excedens.

Leaves paired; stipule lobes relatively reduced, triangular to deltoid or shortly ligulate; inflorescences broadly pyramidal to corymbiform-rounded; fruit somewhat to markedly larger than average, 4–15 mm long; pyrenes 2. Amazonia.

P. grandiflora Kunth. Amazonia.

P. amapaensis Steyer. Northeastern Amazonia.

P. nigricans K. Krause. Western Amazonia; similar to and perhaps a western sister species to *P. amapaensis*.

P. macarthurorum C. M. Taylor. Western Amazonia, low to middle elevations.

Section C. Crocothyrsae Griseb., Fl. Brit. W. I. 345. 1861. TYPE: *Palicourea crocea* (Sw.) Roem. & Schult., lectotype, here designated.

Leaves paired or verticillate; stipule lobes deltoid to narrowly triangular or lanceolate, acute, rather short to well developed; inflorescences pyramidal to broadly so, corymbiform-rounded to fastigiate or spiciform (series 1) or to narrowly pyramidal (series 2); pyrenes 2. Mexico and Antilles to Paraguay and Bolivia.

Series 1. Croceae (Müll. Arg.) K. Schum., in Engl. & Prantl, Nat. Pflanzenfam. 4(4): 115. 1891. *Psychotria* ser. *Croceae* Müll. Arg., in Mart., Fl. bras. 6(5): 228. 1881. TYPE: *Palicourea crocea*, lectotype, here designated.

Inflorescences pyramidal to broadly so, corymbiform-rounded, fastigiate, or spiciform.

Subseries a. Subcymosae (Müll. Arg.) C. M. Taylor, stat. et comb. nov. Basionym: *Psychotria* ser. *Subcymosae* Müll. Arg., in Mart., Fl. bras. 6(5): 229. 1881. TYPE: *Palicourea barraensis* Müll. Arg., lectotype, here designated, = *P. longiflora* (Aubl.) Rich.

Stipule lobes triangular to narrowly so. Mexico and Antilles to Paraguay and Bolivia.

P. croceoides Ham. Antilles, and perhaps throughout lowland moist South America; this and the next two species comprise a poorly understood, variable, widespread complex of forms that are most diverse in Amazonia.

P. crocea (Sw.) Roem. & Schult. Mexico to Paraguay and Bolivia.

P. fastigiata Kunth. Swamps and edges of black-water rivers, lowland South America.

P. charianthema Standl. Northern Amazonia.

P. subspicata Huber. Western Amazonia.

P. herzogii Standl. Middle elevations, Bolivia, perhaps to Peru or Ecuador.

P. huberi Steyer. Guayana Highlands.

P. lancigera Steyer. Guayana Highlands.

P. longiflora (Aubl.) Rich. Northern and eastern Amazonia.

P. marcegravi A. St.-Hil. Eastern Amazonia.

P. coriacea Mart. Savannas of eastern South America, pyrrophytic.

P. mello-barreto Standl. Savannas, Brazil; perhaps not distinct from *P. coriacea*.

P. officinalis Mart. Savannas; Brazil.

P. longistipulata (Müll. Arg.) Standl. Amazonia, with marked clinal variation from east to west.

P. bracteosa Standl. Western Amazonia.

P. lasiophylla Standl. Western Amazonia, to middle elevations.

P. nitidella (Müll. Arg.) Standl. Eastern Amazonia.

Subseries b. Stipule lobes lanceolate. Western Amazonia.

P. conferta (Benth.) Sandw. Western Amazonia.

P. cymosa (Ruiz & Pav.) DC. Western Amazonia.

P. punicea (Ruiz & Pav.) DC. Southwestern Amazonia.

P. iquitoensis K. Krause. Local in northeastern Peru.

P. plowmanii C. M. Taylor. Local in southeastern Peru.

P. jatun-sachensis C. M. Taylor. Northwestern Amazonia.

Series 2. Verticillatae (Müll. Arg.) K. Schum., in Engl. & Prantl, Nat. Pflanzenfam. 4(4): 115. 1891. *Psychotria* ser. *Verticillatae* Müll. Arg., in Mart., Fl. bras. 6(5): 227. 1881. TYPE: *Palicourea triphylla* DC., lectotype, here designated.

Psychotria ser. *Cylindricae* Müll. Arg., in Mart., Fl. bras. 6(5): 228. 1881. TYPE: *Psychotria tabacifolia* Müll. Arg., lectotype, here designated, = *Palicourea macrobotrys* (Ruiz & Pav.) DC.

Inflorescences pyramidal to elongated and narrowly so. One widespread species, Mexico to Bolivia and southern Brazil, the remainder in Amazonia.

P. macrobotrys (Ruiz & Pav.) DC. Southern Amazonia.

P. tetraphylla Cham. & Schltdl. Southeastern Brazil.

P. longepedunculata Gardner. Southern Brazil.

P. calophylla DC. Northern Amazonia.

P. affinis Standl. Southern Amazonia.

P. anisoloba (Müll. Arg.) Boom & M. T. Campos. Central Amazonia.

P. triphylla DC. Mexico and Cuba to Bolivia and southern Brazil; leaves usually verticillate, though consistently paired in Cuba.

P. melheana Jung-Mend. Brazil; very similar to *P. triphylla*.

Section D. Corymbiferae (Müll. Arg.) C. M. Taylor, stat. et comb. nov. Basionym: *Psychotria* ser. *Corymbiferae* Müll. Arg., in Mart., Fl. bras. 6(5): 229. 1881. TYPE: *Palicourea corymbifera* (Müll. Arg.) Standl., lectotype, here designated.

Psychotria ser. *Bracteosae* Müll. Arg., in Mart., Fl. bras. 6(5): 229. 1881. TYPE: *Palicourea virens* (Müll. Arg.) Standl., lectotype, here designated.

Leaves verticillate or occasionally paired; stipule sheaths subtruncate, lobes reduced or obsolete; inflorescences pyramidal to corymbiform-rounded, with floral bracts often well developed; pyrenes 2–5 per fruit. Amazonia.

P. corymbifera (Müll. Arg.) Standl. Amazonia; pyrenes 2–5 per fruit.

P. virens (Müll. Arg.) Standl. Eastern Amazonia; pyrenes 4–5 per fruit.

P. irwinii Steyererm. Northeastern Amazonia; pyrenes 2 per fruit.

P. quadrifolia (Rudge) DC. Amazonia, with marked clinal variation from east to west; pyrenes 2 per fruit.

Subgenus II. Montanae, subg. nov. TYPE: *Palicourea thyrsoiflora* (Ruiz & Pav.) DC.

Folia binatim jugata, papyracea chartacea subcoriaceae, abaxialiter plerumque epustulata; stipulis laminaribus vel circum caulem connatis vaginam continuum formantibus.

Leaves paired, usually papyraceous to chartaceous or subcoriaceous, usually not pustulose abaxially; stipules united around the stem in a usually well-developed, continuous sheath with two short to well-developed lobes, or laminar (i.e., interpetiolar) and bilobed to varying degrees; inflorescences and flowers variously colored; corollas tubular to funnelform, somewhat swollen and gibbous at base and generally straight there and in tube, to very strongly

gibbous and swollen at base, constricted and strongly bent, to as much as 90°, just above this, and straight to curved in tube, externally glabrous or pubescent with trichomes of various types, including short to long, multicellular, colored trichomes; pyrenes 2(4) per fruit. Generally found at higher elevations, (150)1000–3500 m (to limit of woody vegetation). Greater Antilles, Mexico and Central America to Venezuela and Bolivia.

Section E. Montanae, sect. nov. TYPE: *Palicourea thyrsoiflora* (Ruiz & Pav.) DC.

Folia stipulis circum caulem connatis vaginam continuum formantibus. Fructus pyrenis ellipsoideis ovoideis subglobosisve.

Stipules united around the stem in a continuous, usually well-developed and truncate sheath, with lobes triangular to narrowly so or rarely lanceolate; inflorescences pyramidal to narrowly so or sometimes relatively short and few-flowered in species of higher elevations; infructescences typically becoming purple in all species; fruits ellipsoid, ovoid, or subglobose, sometimes laterally flattened. Greater Antilles, Mexico and Central America to Venezuela and Bolivia.

Series 3. Fruits generally ellipsoid to ovoid and laterally flattened. Mexico and Antilles to Venezuela and Bolivia.

Subseries c. Stipules with sheath moderately to well developed or sometimes reduced in species of higher elevations, with lobes triangular to narrowly so, generally persisting with the stipules. Greater Antilles, Mexico and Central America to Venezuela and Bolivia.

P. thyrsoiflora (Ruiz & Pav.) DC. Andes of Colombia and Venezuela to Bolivia.

P. padifolia (Willd. ex Roem. & Schult.) C. M. Taylor & Lorence. Mexico to Panama; similar to *P. thyrsoiflora*.

P. alpina (Sw.) DC. Greater Antilles; similar to *P. thyrsoiflora*, flowers monomorphic (i.e., not distylous).

P. eriantha DC. Hispaniola; similar to *P. alpina*, flowers monomorphic.

P. angustifolia Kunth. Costa Rica to Venezuela and Peru.

P. rigidifolia (Dwyer & M. V. Hayden) Dwyer. Panama to western Colombia; provisionally placed in *Palicourea*, similar in several features to *P. angustifolia* and perhaps *P. densa* Standl. (Series 4, Subseries f)

P. weberbaueri K. Krause. Colombia to Peru; perhaps a color variant of *P. thyrsoiflora*.

- P. leucantha** Donn. Sm. Guatemala.
P. acetosoides Wernham. Western Colombia.
P. lutulenta Standl. Colombia.
P. heterantha Standl. Colombia; perhaps not distinct from *P. lutulenta*.
P. canarina C. M. Taylor.* Ecuador; similar to *P. thyrsiflora*.
P. subalata Standl. ex Steyerl. Colombia to Peru.
P. gentryi C. M. Taylor.* Local in east-central Ecuador; similar to *P. subalata*.
P. subalatooides C. M. Taylor.* Ecuador; similar to *P. subalata*.
P. danielis Standl. Local in northwestern Colombia.
P. luteonivea C. M. Taylor.* Southern Colombia to Ecuador; similar to *P. thyrsiflora*.
P. holmgrenii Standl. Southern Colombia to Ecuador.
P. vulcanalis Standl. ex C. M. Taylor.* East-central Ecuador.
P. ulloana C. M. Taylor.* Ecuador to northern Peru; pyrenes 4.
P. calothyrsus K. Schum. Ecuador; perhaps a high-elevation form of *P. thyrsiflora*.
P. pennellii Standl. Colombia; perhaps not distinct from *P. calothyrsus*.
P. calantha Standl. Ecuador.
P. ponasae K. Krause. Peru.
P. psittacorum Standl. Colombia to Ecuador.
P. ionantha Standl. Colombia.
P. herrerae Standl. Peru to Bolivia.
P. lobbii Standl. Ecuador.
P. subtomentosa (Ruiz & Pav.) C. M. Taylor.* Ecuador to Bolivia, with marked variation from north to south.
P. buchtienii Standl. Bolivia; provisionally placed here.
P. corniculata C. M. Taylor.* Northern Ecuador.
P. anderssoniana C. M. Taylor.* Ecuador.

Subseries d. Stipules with sheaths well developed, with lobes narrowly triangular to setaceous and usually deciduous to caducous, or obsolete. Ecuador and perhaps Peru.

- P. flavescens** Kunth. Ecuador and perhaps Peru.
P. tectoneura K. Schum. & K. Krause. Ecuador.
P. prodiga Standl. ex C. M. Taylor.* Central Ecuador.

Series 4. Fruits generally subglobose to ovoid, not

laterally flattened. Costa Rica to Venezuela and Bolivia.

Subseries e. Corollas tubular to somewhat funnel-form, externally glabrous or pubescent with relatively short, usually colorless trichomes. Costa Rica and Venezuela to Peru.

- P. amethystina** (Ruiz & Pav.) DC. Colombia to Peru.
P. brenesii Standl. Costa Rica; similar to *P. amethystina*.
P. purpurea C. M. Taylor. Costa Rica and Panama.
P. demissa Standl. Venezuela and Colombia to Ecuador.
P. ovalis Standl. Western Colombia to Ecuador; similar to *P. chimboracensis* and *P. heilbornii*.
P. chimboracensis Standl. Western Colombia to Ecuador; similar to *P. ovalis* and *P. heilbornii*.
P. heilbornii Standl. Local in Ecuador; similar to *P. ovalis* and *P. chimboracensis*.
P. latifolia K. Krause. Colombia to Peru; similar to *P. amethystina*.
P. discolor K. Krause. Costa Rica and Panama; similar to *P. latifolia*.
P. deviae C. M. Taylor.* Ecuador to western Colombia.
P. perquadrangularis Wernham. Venezuela to Colombia.
P. stipularis Benth. Western Colombia to Peru.
P. albert-smithii Standl. Eastern Colombia to Venezuela; similar to *P. stipularis*.
P. lehmannii (Rusby) Standl. Local in western Colombia; provisionally placed here.

Subseries f. Calyx relatively well developed; corollas tubular, often relatively well developed, externally glabrous to pubescent with short colorless trichomes or sometimes with multicellular, colored, showy trichomes. Central America to northern Ecuador.

- P. heterochroma** K. Schum. & K. Krause. Western Colombia to Ecuador.
P. albocerulea C. M. Taylor. Local in Costa Rica.
P. lancifera Standl. & L. O. Williams. Honduras to Costa Rica.
P. macrocalyx Standl. Costa Rica to Panama.
P. standleyana C. M. Taylor. Costa Rica to Colombia.
P. antioquiensis Standl. Northwestern Colombia.
P. tunjaensis C. M. Taylor. Colombia.

P. calophlebia Standl. Western Colombia to Ecuador.

P. toroi Standl. Western Colombia.

P. dorantha Wernham. Western Colombia.

P. densa Standl. Western Colombia.

P. justicioides Standl. Western Colombia.

P. calycina Benth. Local in Ecuador.

P. azurea C. M. Taylor.* Local in Ecuador.

P. jaramilloi C. M. Taylor.* Southern Ecuador.

P. cornigera C. M. Taylor.* Southern Ecuador.

Subseries g. Inflorescences pyramidal to broadly so or corymbiform-rounded, usually with floral bracts relatively well developed and broad; corollas tubular, with tubes relatively stout; pyrenes generally triangular in cross section. Western Colombia to Peru.

P. quadrilateralis C. M. Taylor. Northwestern Colombia (in press, *Novon*).

P. thermydri J. H. Kirkbr. Northwestern Colombia.

P. denslowiae J. H. Kirkbr. Local in northwestern Colombia.

Section F. Obovoideae, sect. nov. TYPE: *Palicourea hospitalis* Standl.

Folia stipulis laminaribus vel circum caulem connatis vaginam continuam formantibus. Fructus plerumque obovoideus etiam lateraliter subcomplanatus.

Stipules united around the stem in a continuous sheath or laminar; corollas generally funnelform, somewhat to strongly gibbous at base, slightly to strongly constricted and bent there, externally glabrous or pubescent with usually colorless trichomes; fruit generally obovoid and somewhat flattened laterally. Costa Rica to Venezuela and Ecuador.

Series 5. Stipules united around the stem in a continuous truncate sheath; inflorescences generally yellow, or sometimes flushed with purple or blue, generally remaining or becoming yellow in fruit. Costa Rica to northwestern Colombia or perhaps Ecuador.

P. lasiorrhachis Oerst. Costa Rica to northwestern Colombia.

P. pendula C. M. Taylor. Local in Panama.

P. vestita Standl. Local in Costa Rica.

P. obtusata K. Krause. Venezuela.

P. orosiana C. M. Taylor. Local in Costa Rica and western Panama.

P. chiriquina Standl. Local in western Panama.

P. montivaga Standl. Costa Rica, perhaps to western Panama.

P. adusta Standl. Costa Rica, perhaps to western Panama.

Series 6. Stipules laminar; inflorescences yellow to orange or red, often becoming purple in fruit. Panama to Ecuador.

P. hospitalis Standl. Western Colombia to Ecuador.

P. sodiroi Standl. Local in Ecuador; perhaps not distinct from *P. hospitalis*.

P. chignul C. M. Taylor.* Northwestern Ecuador.

P. kalbreyeri Standl. Western Colombia to Ecuador.

P. lugoana C. M. Taylor.* Western Colombia to Ecuador.

P. asplundii C. M. Taylor.* Ecuador.

P. gibbosa Dwyer. Panama to Ecuador.

P. lyristipula Wernham. Colombia to Ecuador.

P. myrtifolia K. Schum. & K. Krause. Ecuador.

Series 7. Stipules laminar; inflorescences pyramidal to corymbiform-rounded, variously colored in flower and fruit; pyrenes with ridges rounded and often becoming planar to nearly smooth at maturity. Panama to Venezuela and Ecuador.

P. apicata Kunth. Venezuela and Colombia to Ecuador.

P. andaluciana Standl. Western Colombia to Ecuador.

P. sulphurea (Ruiz & Pav.) DC. Peru, perhaps north to Colombia.

P. vaginata Benth. Colombia and Venezuela; identity not clear, provisionally recognized here.

P. tubuliflora Dwyer. Panama.

P. tumidonodosa Dwyer. Panama, perhaps to northwestern Colombia.

P. salicifolia Standl. Costa Rica to western Panama.

P. pauciflora Standl. Local in Costa Rica and western Panama; provisionally placed here, fruit unknown.

P. nubigena Standl. Western Colombia, perhaps to Peru.

P. mexiae Standl. Costa Rica to Peru.

P. gomezii C. M. Taylor. Costa Rica to Ecuador.

P. amplissima (Standl. ex Steyererm.) C. M. Taylor. Western Colombia.

Section G. Pseudoamethystinae, sect. nov. TYPE: *Palicourea obovata* (Ruiz & Pav.) DC.

Folia stipulis laminaribus. Fructus ex subgloboso ovoideus, lateraliter nec complanatus.

Stipules laminar; inflorescences pyramidal; inflo-

rescences and flowers blue to purple; corollas with relatively well developed tubes; fruits subglobose to ovoid, not laterally flattened. Western Colombia to Peru.

P. lineata Benth. Colombia to Peru; similar to *P. stipularis* but with stipules laminar.

P. obovata (Ruiz & Pav.) DC. Colombia to Peru; similar to *P. latifolia* but with stipules laminar.

P. subscandens Standl. ex Steyer. Western Colombia to Peru; similar to *P. perquadrangularis* but with stipules laminar.

Section H. Psychotrioides, sect. nov. TYPE: *Palicourea petiolaris* Kunth.

Folia stipulis laminaribus. Fructus plerumque ellipsoideus etiam lateraliter complanatus.

Stipules laminar; inflorescences pyramidal to broadly so or rounded-corymbiform, frequently yellow or sometimes pink; corollas yellow to white or pink; fruit generally ellipsoid and distinctly flattened laterally. Mexico and Costa Rica to Venezuela and Ecuador.

Series 8. Corollas with tubes relatively short. Costa Rica and Venezuela to Ecuador and in Jamaica.

P. petiolaris Kunth. Venezuela to eastern Colombia.

P. leuconeura Standl. Venezuela to eastern Colombia.

P. steyermarkii C. M. Taylor. Venezuela.

P. tilaranensis C. M. Taylor. Costa Rica.

P. garciae Standl. Costa Rica to Ecuador.

P. jahnii Standl. Venezuela, perhaps to Colombia.

P. caloneura Rusby. Local in northeastern Colombia.

P. abbreviata Rusby. Local in northeastern Colombia.

P. zarucchii C. M. Taylor. Northwestern Colombia (in press, *Novon*).

P. pittieri Standl. Venezuela and eastern Colombia.

P. pulchra Griseb. Jamaica; provisionally placed here.

P. wilesii C. D. Adams. Jamaica; similar to *P. pulchra*.

P. aschersonianoides (Wernham) Steyer. Venezuela to eastern Colombia.

Series 9. Inflorescences corymbiform-rounded; corollas with relatively long tubes, these often elongating shortly before anthesis from relatively short buds. Southern Mexico and Venezuela to Ecuador.

P. lineariflora Wernham. Venezuela to eastern Colombia.

P. macrantha Loes. Southern Mexico; provisionally placed here.

P. boyacana Standl. Eastern Colombia.

P. andrei Standl. Colombia to northern Ecuador.

P. candida C. M. Taylor.* Northern Ecuador.

Section I. Cephaeloides, sect. nov. TYPE: *Palicourea bella* (Standl.) Dwyer.

Folia stipulis laminaribus. Inflorescentia bracteis et limbo calycino modice vel bene evolutis.

Stipules laminar; inflorescences pyramidal to broadly so or corymbiform-rounded, or congested to subcapitate, usually pink to red-purple; usually with relatively well-developed and showy bracts; calyx limb moderately to very well developed; corollas tubular to somewhat funnelform, usually white to purple, often with tubes relatively well developed. Costa Rica to Ecuador.

Series 10. Inflorescences pyramidal to corymbiform-rounded; calyx moderately to well developed, usually colored and showy; pyrenes generally relatively large, with ridges relatively sharp and well developed. Costa Rica to western Colombia.

P. bellula C. M. Taylor. Costa Rica.

P. stenosepala Standl. Western Colombia to Ecuador.

P. bella (Standl.) Dwyer. Costa Rica to Panama.

P. spathacea C. M. Taylor. Local in Costa Rica.

P. hammelii C. M. Taylor. Costa Rica to Panama.

P. killipii Standl. Local in western Colombia.

P. ochnoides Dwyer. Western Panama.

Series 11. Stipules often relatively large; inflorescences congested to subcapitate, with bracts usually well developed and showy; pyrenes generally not unusually large, with ridges rounded and frequently low. Panama and Venezuela to Peru.

P. grandistipula (Standl. ex Steyer.) C. M. Taylor. Western Colombia.

P. macbridei Standl. Peru.

P. condorica C. M. Taylor.* Southern Ecuador.

P. harlingii C. M. Taylor.* Northeastern Ecuador.

P. tamaensis (Standl. & Steyer.) Steyer. Venezuela and Colombia.

P. skotakii C. M. Taylor. Local in Costa Rica.

P. sopkinii C. M. Taylor. Western Colombia (in press, *Novon*).

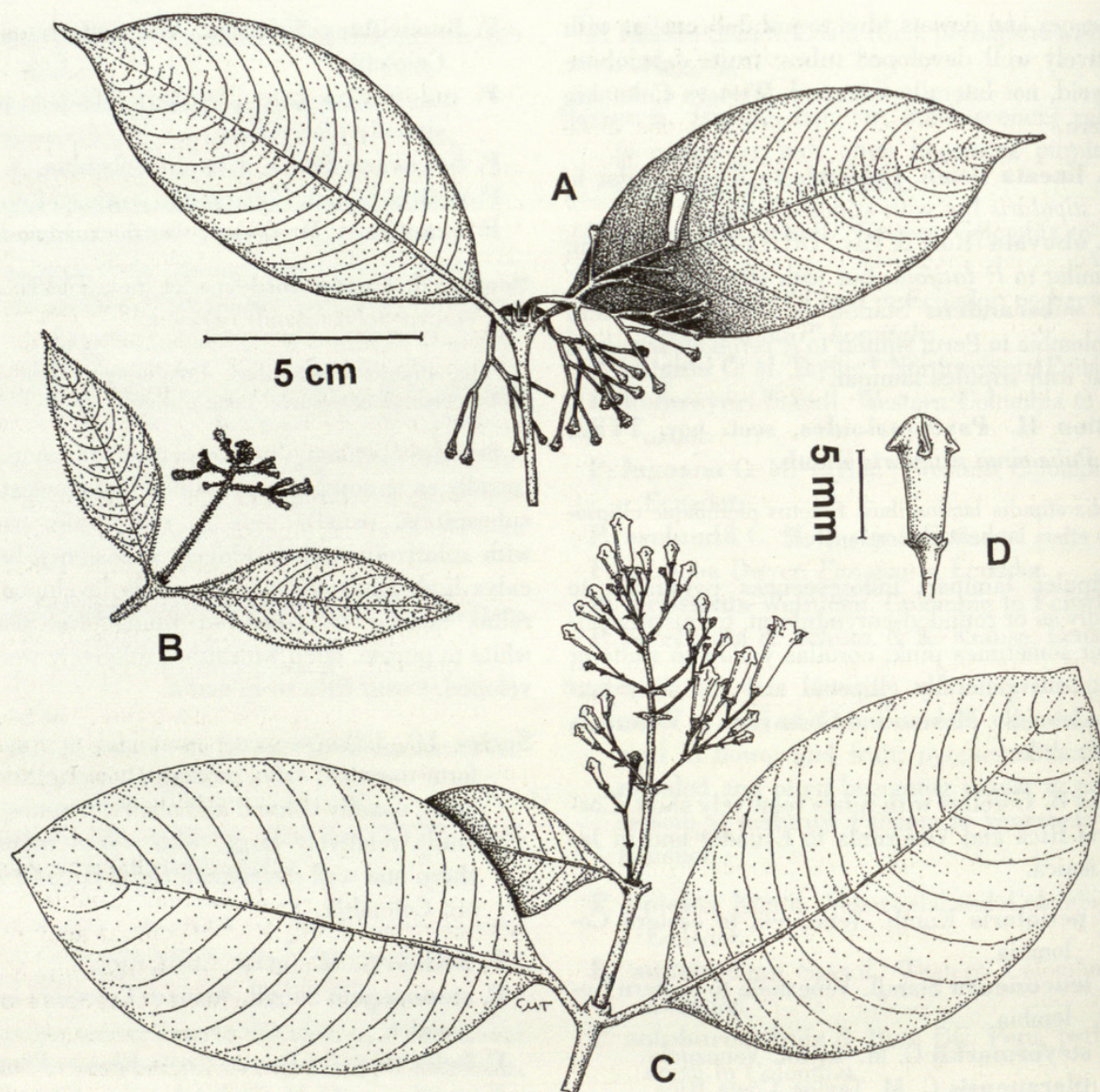


Figure 2. —A. *Palicourea anderssoniana*, flowering branch, based on Asplund 17430.—B. *Palicourea subtomentosa* subsp. *lojana*, flowering branch, based on Harling & Andersson 21367. C, D, *Palicourea canarina*, based on Harling & Andersson 21825.—C. Flowering branch.—D. Flower in bud. A–C to 5-cm scale.

- P. dimorphandrioides*** (Dwyer) C. M. Taylor.
Eastern Panama to western Colombia.
- P. acanthacea*** C. M. Taylor. Western Panama to
northwestern Ecuador.
- P. frontinensis*** Cogollo & C. M. Taylor. Western
Colombia (in press, *Caldasia*).
- P. orquidea*** C. M. Taylor. Western Colombia (in
press, *Novon*).

DESCRIPTIONS OF NEW TAXA

The following newly described taxa are included in the infrageneric classification presented above, which indicates their relationships within *Palicourea*. They are treated here in alphabetical order; the position of each species in the infrageneric classification is indicated at the end of the morphological description. Descriptions and diagnostic characters

of the genus *Palicourea* have been presented by Taylor (1989) and Burger and Taylor (1993).

Palicourea anderssoniana C. M. Taylor, sp. nov.
TYPE: Ecuador. Pichincha: Reserva Florística-Ecológica "Río Guajalito," Km 59 de la carretera antigua Quito-Santo Domingo de los Colorados, a 3.5 km al NE de la carretera, estribaciones occidentales del Volcán Pichincha, 00°13'53"S, 78°48'10"W, 11 Aug. 1985, J. Jaramillo & V. Zak 7992 (holotype, MO-4990804; isotype, AAU). Figure 2A.

Haec species a congeneris inflorescentiis sessilibus ramis imis reflexis, pedicellis sat longis atque corolla lutea gibbosa glabra distinguitur.

Flowering at 1.5 m tall, to 5 m tall; stems glabrous. Leaves paired; blades elliptic to rather broad-

ly so or oblanceolate, $7-15 \times 2.5-8$ cm, at apex rather abruptly acuminate with tips 5–15 mm long and usually falcate, at base cuneate to acute, papyraceous to chartaceous, adaxially glabrous, abaxially sparsely to moderately pilosulous, usually markedly more densely so on costa and secondary veins; secondary veins 8–15 pairs, generally extending to margins, with 1–3 weak intersecondary veins usually present between pairs of secondary veins, adaxially venation plane or costa sometimes thickened, abaxially costa and secondary veins prominulous and lesser venation thickened; margins thinly cartilaginous, entire; *petioles* glabrous, 6–25 mm long; *stipules* glabrous, united around the stem in a continuous truncate sheath 2.5–3 mm long, lobes narrowly triangular, 4–5 mm long, acute, ciliolate. *Inflorescences* deflexed, sessile; panicles broadly pyramidal to corymbiform, $6-15 \times 6-15$ cm excluding corollas, with secondary axes 2–4 pairs, the basalmost pair reflexed, with flowers pedicellate in cymules of 3–7; bracts narrowly triangular, 3–9 mm long, acute, ciliolate, those subtending secondary axes 5–9 mm long, those subtending pedicels 3–5 mm long; pedicels 5–17 mm long; axes, bracts, and pedicels glabrous, yellow to red; *flowers* with hypanthium glabrous, cylindrical, 1–1.3 mm long, *calyx* limb glabrous, 1.5–2 mm long, divided for $\frac{3}{4}$ to nearly completely to base, lobes triangular to ovate, rounded to acute or slightly acuminate, equal or somewhat unequal on an individual flower, entire; *corolla* tubular to somewhat funnelform, yellow, at base swollen and generally strongly gibbous, generally straight there, straight or slightly curved in tube, externally glabrous or sometimes pilosulous on lobes in bud, internally glabrous except for a densely villous ring ca. 4 mm above the base, tubes 17–19 mm long, 4–5 mm diam. near middle, lobes 3–6 mm long, slightly thickened adaxially at apex; *anthers* in apparent short-styled form partially exerted, ca. 4 mm long; *stigmas* not seen; *disk* ca. 1 mm high. *Infructescences* similar to inflorescences; *fruit* ellipsoid to subglobose, ca. 7 mm diam.; *pyrenes* with 3–5 low, rather sharp longitudinal ridges. Cloud and wet montane forest at 1325–1930 m, north-central Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its sessile inflorescences with the basalmost pair of secondary axes reflexed, relatively long pedicels, and glabrous, gibbous, yellow corollas. This inflorescence arrangement is unique in *Palicourea*. Vegetatively *P. anderssoniana* resembles *P. thyrsiflora*. This handsome plant is named in honor of Swedish botanist Len-

nart Andersson, whose work has contributed significantly to our understanding of the Ecuadorian flora and its biogeography.

Paratypes. ECUADOR. **Pichincha**: El Volante on road from Chiriboga to Santo Domingo de los Colorados, *Asplund* 17430 (S); along road between Tandayapa and Mindo, 19 km from Tandayapa, about 5.5 km from Mindo, *Croat* 49391 (MO); cantón Quito, parroquia Mindo, "Bosque Protector Mindo," cumbre de la montaña entre río Mindo y río Bagasal, $00^{\circ}02'N$, $78^{\circ}48'W$, *Delprete et al.* 6098 (MO, TEX); Guajalito, carretera antigua Quito-Santo Domingo, $00^{\circ}10'S$, $78^{\circ}55'W$, *Palacios* 525 (MO); along new road Nanegal-Mindo, *van der Werff* 13397 (MO); Río Guajalito, near Chiriboga, along old Quito-Santo Domingo road, *van der Werff et al.* 12214 (MO).

Palicourea ananguana C. M. Taylor, sp. nov.

TYPE: Ecuador. Napo: Añangu, Río Napo, $00^{\circ}31'-32'S$, $76^{\circ}23'W$, 16–27 Apr. 1983, *J. E. Lawesson, T. Læssøe & P. M. Jørgensen* 39442 (holotype, MO-4279338; isotypes, AAU, QCA not seen). Figure 3.

Haec species a congeneris lobis stipularibus bene evolutis ex obtusis rotundatis, inflorescentia purpurea dense pubescente, corolla trichomatibus purpureis longis vestita atque pyrenis acute porcatis distinguitur.

Flowering at 5 m tall, to 8 m tall; stems glabrous to densely puberulous. *Leaves* paired; *blades* elliptic to broadly so, $15-32 \times 7-19$ cm, at apex shortly acuminate with deltoid tips 5–10 mm long, at base obtuse to truncate or somewhat rounded, membranaceous to papyraceous, adaxially minutely puberulous to glabrous, abaxially moderately to densely short-pilosulous throughout; secondary veins 12–18 pairs, occasionally looping to interconnect in distal part of leaf, without or with 1(2) weak intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous to prominent, secondary veins thickened to prominulous, and minor venation plane, abaxially costa prominent, secondary veins prominulous, and minor venation plane and not particularly evident; margins thinly cartilaginous, entire; *petioles* puberulous to glabrous, 13–38 mm long; *stipules* glabrous to puberulous, united around the stem in a continuous truncate to concave sheath 1–1.5 mm long, lobes ligulate, 9–13 mm long, obtuse to rounded, ciliolate. *Inflorescences* erect; peduncles 4.5–9 cm long; panicles pyramidal, $4-10 \times 4-10$ cm excluding corollas, with secondary axes 4–9 pairs, with flowers pedicellate in cymules of 3–7; bracts narrowly triangular to lanceolate or linear, acute, those subtending secondary axes displaced distally for $\frac{1}{3}$ to $\frac{1}{2}$ of length of first axis internode, 5–8 mm long, those subtending pedicels 1–3 mm long; pedicels 1–6 mm long; peduncle, axes, bracts, and pedicels

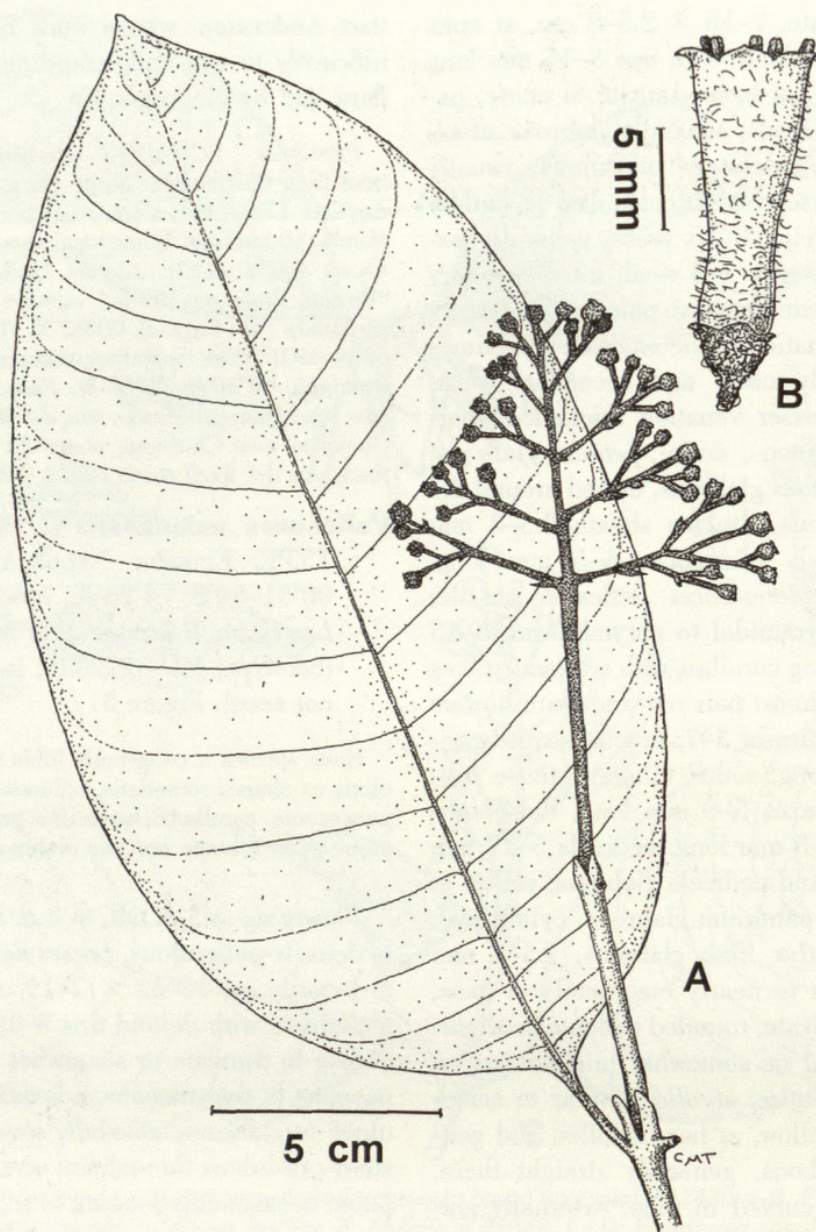


Figure 3. *Palicourea anianguana*.—A. Flowering branch, based on Balslev et al. 62299.—B. Flower, based on Lawesson et al. 39442.

densely tomentellous or hirsutulous, violet to red; flowers distylous, with hypanthium densely lanate, turbinate to cupuliform, 1.5–2 mm long; calyx limb 1–1.2 mm long, subtruncate to shallowly lobed, internally glabrous, externally densely lanate; corolla tubular to somewhat funnelform, white to violet or pink, somewhat swollen at base, generally straight there and in tube, externally densely pubescent with purple to violet trichomes 1–3 mm long, internally glabrous except for a densely villous ring ca. 2 mm wide at ca. $\frac{1}{3}$ of length of tube above base, tube 15–20 mm long, 3–4 mm diam. near middle, lobes triangular to deltoid, 2.5–3 mm long, acute; anthers in short-styled form partially exserted, ca. 5 mm long, in long-styled form included, positioned in upper $\frac{1}{3}$ of tube, ca. 5 mm long; stigmas in short form ca. 3 mm long, positioned near

middle of tube, in long form ca. 1.5 mm long, exserted; disk 1.5–2 mm long. Infructescences red-violet; fruit ellipsoid, 8–9 \times 7–8 mm, lanate; pyrenes with sharp longitudinal ridges. Rainforest in tierra firme at 260–350 m, northeastern Ecuador. [Subg. *Palicourea*, Sect. *Palicourea*.]

This species is distinguished by its stipules with well-developed obtuse to rounded lobes and short, truncate to concave sheaths, thin-textured leaves, well-developed pyramidal purple panicles, densely tomentellous to hirsutulous inflorescence axes, lanate calyces, corollas that are externally pubescent with long purple trichomes, fruit not at all flattened, and pyrenes with sharp longitudinal ridges. It is similar to *Palicourea lasiantha*, which has corollas externally pubescent with trichomes 0.5 mm long

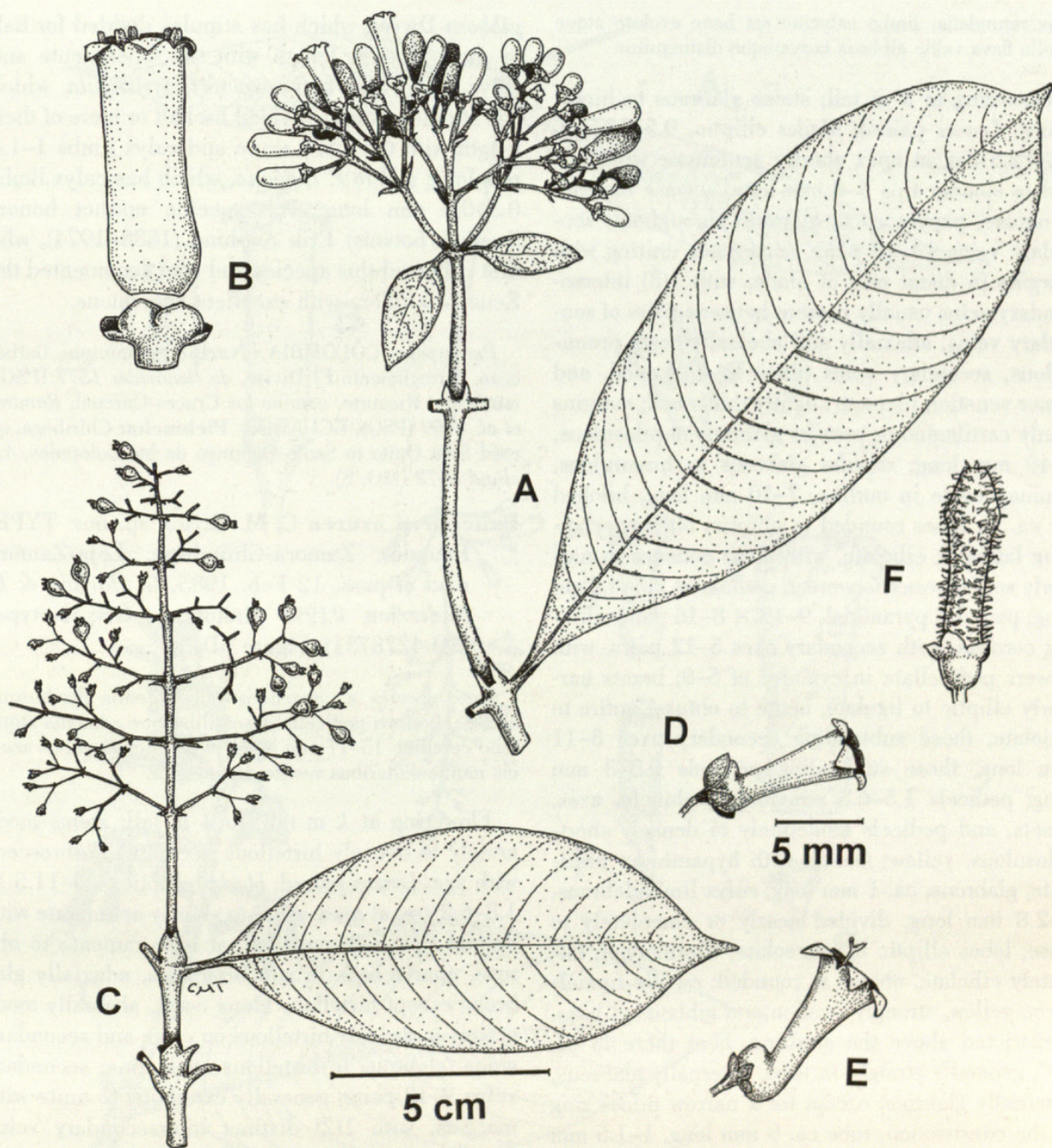


Figure 4. A, B, *Palicourea subalatooides*, based on *Asplund* 18928.—B. Calyx and corolla, partially dissected. C, D, *Palicourea asplundii*.—C. Flowering branch, based on *Asplund* 8672.—D. Flower, based on *Tipaz et al.* 280.—E. *Palicourea lugoana*, flower, based on *Lugo* 14.—F. *Palicourea gentryi*, flower in bud, based on *Neill* 7532. A, C to 5-cm scale; B, D–F to 5-mm scale.

or shorter and inflorescence branches, calyces, and fruits glabrous to puberulous; and to *P. lachnantha*, which has acute stipule lobes 2–8 mm long, calyx limb 1.8–2 mm long, and pyrenes with rounded ridges. *Palicourea anianguana* combines distinctive characteristics of both *P. lasiantha* and *P. lachnantha*, but it is not intermediate in these features and is consequently here considered a separate, local species. The specific epithet refers to the area where this new species has been collected, Añangu.

Paratypes. ECUADOR. **Napo:** Añangu, S bank of Río Napo 95 km downstream from Coca, 00°32'S, 76°23'W,

Balslev et al. 62299 (AAU); Añangu, NW corner of Parque Nacional Yasuní, 00°32'S, 76°22'–23'W, *Korning & Thomsen* 47044 (AAU); Añangu, in Parque Nacional Yasuní, 00°31'–32'S, 76°23'W, *Øllgaard et al.* 39247 (AAU, MO).

Palicourea asplundii C. M. Taylor, sp. nov. TYPE: Ecuador. Carchi: cantón Tulcán, Reserva Indígena Awá, parroquia Tobar Donoso, sector El Baboso, 00°53'N, 78°20'W, 3 Oct. 1991, G. Tipaz, D. Rubio & M. Taicuz 280 (holotype, MO-4990803; isotype, QCNE not seen). Figure 4C, D.

Haec species a congeneris stipularum interpetiolarium

lobis rotundatis, limbo calycino sat bene evoluto atque corolla flava valde gibbosa curvataque distinguitur.

Flowering at 3 m tall; stems glabrous to hirsutulous. *Leaves* paired; *blades* elliptic, 9.5–23.5 × 4.5–12.5 cm, at apex shortly acuminate with deltoid to slender tips 3–8 mm long, at base cuneate to obtuse, papyraceous, glabrous throughout; secondary veins 13–18 pairs, sometimes uniting with margins in distal part of blade, with 1(3) intersecondary veins usually present between pairs of secondary veins, adaxially and abaxially costa prominent, secondary veins plane to thickened, and minor venation plane to slightly thickened; margins thinly cartilaginous; *petioles* glabrous to pilosulous, 6–40 mm long; *stipules* glabrous to hirsutulous, laminar, ovate in outline, 7–10 mm long, bilobed for ca. 1/3, lobes rounded to elliptic, often overlapping laterally, ciliolate, with sinus concave to narrowly so. *Inflorescences* erect; peduncles 2.5–4.5 cm long; panicles pyramidal, 9–18 × 8–16 cm excluding corollas, with secondary axes 5–12 pairs, with flowers pedicellate in cymes of 5–9; bracts narrowly elliptic to ligulate, acute to obtuse, entire to ciliolate, those subtending secondary axes 3–11 mm long, those subtending pedicels 0.8–3 mm long; pedicels 1.5–6.5 mm long; peduncle, axes, bracts, and pedicels moderately to densely short-pilosulous, yellow; *flowers* with hypanthium turbinate, glabrous, ca. 1 mm long; *calyx* limb glabrous, 2–2.8 mm long, divided nearly or completely to base, lobes elliptic to lanceolate, triplinerved, minutely ciliolate, obtuse to rounded; *corolla* funnel-form, yellow, strongly swollen and gibbous at base, constricted above the swelling, bent there to ca. 90°, generally straight in tube, externally glabrous, internally glabrous except for a narrow pilose ring at the constriction, tube ca. 9 mm long, 1–1.5 mm diam. near middle, lobes deltoid, 1.5–1.8 mm long, acute; *anthers* in long-styled form ca. 1.8 mm long, included, positioned in upper 1/3 of tube; mature *stigmas* not seen; *disk* ca. 0.5 mm high. *Infructescences* similar to inflorescences; *fruit* ellipsoid to usually obovoid, laterally somewhat flattened, ca. 5 × 6 mm; mature *pyrenes* not seen, perhaps with 3–5 somewhat sharp longitudinal ridges. Wet forest at 1600–1800 m, northwestern Ecuador and adjacent Colombia. [Subg. *Montanae*, Sect. *Obovoideae*, Ser. 6.]

This species is distinguished by its laminar stipules with rounded relatively short lobes, yellow inflorescences and flowers, relatively well-developed and deeply divided calyx limb, strongly gibbous and bent corollas, and usually obovoid, laterally somewhat flattened fruits. It is similar to *Palicourea*

gibbosa Dwyer, which has stipules divided for half or more of their length with the lobes acute and calyx limb 0.8–1 mm long; to *P. lyristipula*, which has stipules usually divided for half or more of their length with the lobes acute and calyx limbs 1–1.8 mm long; and to *P. lugoana*, which has calyx limbs 0.3–0.9 mm long. The specific epithet honors Swedish botanist Erik Asplund (1888–1974), who first collected this species and who documented the Ecuadorian flora with excellent specimens.

Paratypes. COLOMBIA. **Nariño**: municipio Barba-coas, corregimiento El Divise, de Benavides 1577 (PSO); municipio Ricaurte, camino los Cruces-Curcuel, Ramírez et al. 8709 (PSO). ECUADOR. **Pichincha**: Chiriboga, on road from Quito to Santo Domingo de los Colorados, Asplund 8672 (MO, S).

Palicourea azurea C. M. Taylor, sp. nov. TYPE: Ecuador. Zamora-Chinchi: Loja-Zamora road at pass, 12 Feb. 1985, G. Harling & L. Andersson 21999 (holotype, GB; isotype, MO-4278731). Figure 5D, E.

Haec species a congeneris inflorescentia floribusque azureis, floribus pedicellatis sessilibusque admixtis atque tubo corollino 15–17 mm longo extus trichomatibus azur-eis multicellularibus vestito distinguitur.

Flowering at 1 m tall, to 4 m tall; stems moderately to densely hirtellous becoming glabrescent with age. *Leaves* paired; *blades* elliptic, 4.5–11.5 × 1.8–6.2 cm, at apex acute to shortly acuminate with deltoid tips 5–8 mm long, at base cuneate to obtuse, chartaceous to subcoriaceous, adaxially glabrous except hirtellous along costa, abaxially moderately to densely hirtellous on costa and secondary veins, glabrous to hirtellous on lamina; secondary veins 9–13 pairs, generally extending to unite with margins, with 1(2) distinct intersecondary veins usually present between pairs of secondary veins, adaxially venation plane, abaxially costa prominent, secondary veins prominent, and reticulated minor venation plane to thickened; margins thinly cartilaginous; *petioles* 5–12 mm long, hirtellous; *stipules* glabrous to hirtellous, united around the stem in a continuous truncate sheath 3–4 mm long, lobes narrowly triangular, 4–5 mm long, acute, entire to ciliolate. *Inflorescences* erect, sometimes tripartite and appearing sessile; peduncles 2–3 cm long; panicles pyramidal, 5–7.5 × 3–5 cm excluding corollas, with secondary axes 4–6 pairs, with flowers sessile and shortly pedicellate together in cymes of 3–7; bracts subtending secondary axes 4–8 mm long, triangular to ligulate or lanceolate, acute to obtuse, ciliolate, those subtending pedicels 2–4 mm long, triangular to narrowly so, acute, ciliolate; pedicels 0–4 mm long; peduncle,

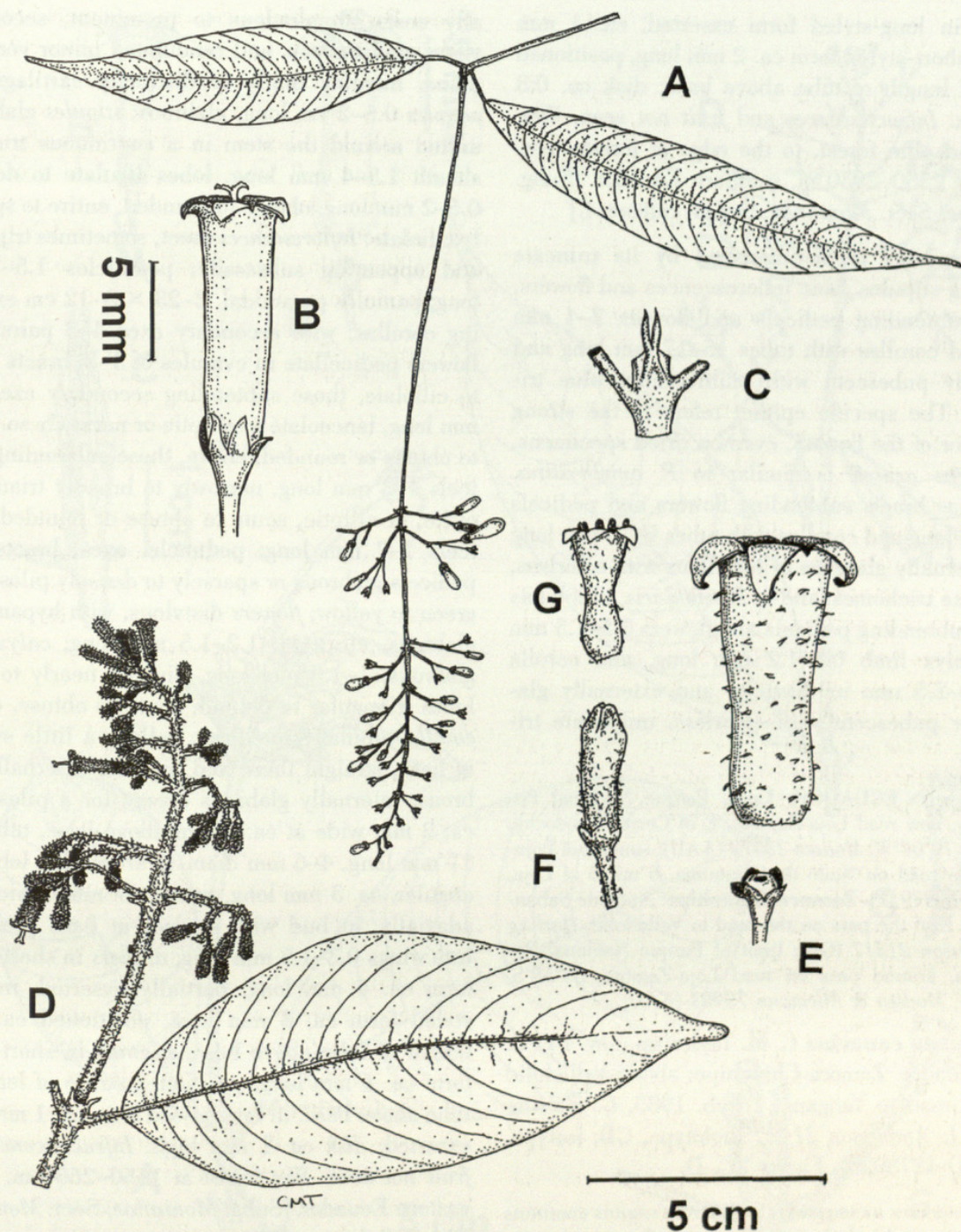


Figure 5. A–C. *Palicourea ulloana*.—A. Flowering branch, based on Barbour 4161.—B. Flower, based on Harling 27144.—C. Stipule, based on Barbour 4161. D, E. *Palicourea azurea*, based on Madsen 75572.—D. Flowering branch.—E. Calyx and corolla, partially dissected. F, G. *Palicourea jaramilloi*.—F. Flower in bud, based on Jaramillo & Wimmerskjold 5784.—G. Corolla at anthesis, based on Jørgensen et al. 459. A, D to 5-cm scale; B, C, E–G to 5-mm scale.

axes, bracts, and pedicels blue, moderately to densely hirtellous; flowers distylous, frequently pendulous, with hypanthium turbinate, glabrous, ca. 1 mm long; calyx limb glabrous to hirtellous, 1–2 mm long, lobed generally to base, lobes lanceolate to triangular, acute, equal to unequal on an individual flower; corolla tubular to somewhat funnelform, blue, a little swollen at base, generally straight there and in tube, externally sparsely to

densely pubescent with blue multicellular trichomes 0.3–1 mm long, internally glabrous except for a densely pilose ring ca. 2 mm wide at ca. $\frac{1}{4}$ of length of tube above base, tube 15–17 mm long, 3–5 mm diam. near middle, lobes triangular, 2.5–3.5 mm long, slightly thickened and hooked adaxially; anthers in long-styled form ca. 3 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base, in short-styled form ca. 3 mm long, partially exserted;

stigmas in long-styled form exerted, ca. 1 mm long, in short-styled form ca. 2 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base; disk ca. 0.8 mm high. *Infructescences* and *fruit* not seen. Wet, cloud and elfin forest, to the edge of forest vegetation, at 2550–2950 m, southern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 4, Subser. f.]

This species is distinguished by its truncate sheathing stipules, blue inflorescences and flowers, bracts subtending pedicels and flowers 2–4 mm long, and corollas with tubes 15–17 mm long and externally pubescent with multicellular blue trichomes. The specific epithet refers to the strong blue color of the flowers, even on dried specimens. *Palicourea azurea* is similar to *P. amethystina*, which has bracts subtending flowers and pedicels 1–2 mm long and corollas with tubes 9–15 mm long and externally glabrous or hirtellous with colorless, uniseriate trichomes; and to *P. stipularis*, which has bracts subtending pedicels and flowers 0.5–1.5 mm long, calyx limb 0.8–1.2 mm long, and corolla tubes 2–2.5 mm in diameter and externally glabrous or pubescent with colorless, uniseriate trichomes.

Paratypes. ECUADOR. **Loja:** Parque Nacional Podocarpus, new road Loja-Zamora, E of Cerro Yanococha, 03°59'S, 79°07'W, *Madsen* 75572 (AAU); summit of Loja-Malacotos road on Nudo de Cajanuma, 6 mi. S of Loja, *Wiggins* 10879 (F). **Zamora-Chinchi:** Nudo de Sabanilla, just E of the pass on the road to Valladolid, *Harling & Andersson* 21517 (GB); limit of Parque Nacional Podocarpus, around pass on road Loja-Zamora, 03°58'S, 79°07'W, *Madsen & Ellemann* 75983 (AAU).

Palicourea canarina C. M. Taylor, sp. nov. TYPE: Ecuador. Zamora-Chinchi: above Valladolid on road to Yangana, 1 Feb. 1985, *G. Harling & L. Andersson* 21411 (holotype, GB; isotype, MO-4278929). Figure 2C, D.

Haec species a congeneris stipularum vaginis continuis truncatis ac lobis latis brevibusque, inflorescentia pyramidalis atque corollae luteae tubulari-infundibuliformis sinibus (praesertim in alabastro) basi in alas breves aliquam vel bene evolutis distinguitur.

Flowering at 1 m tall, to 5 m tall; stems glabrous. *Leaves* paired; *blades* elliptic, 5.5–20.5 × 2–11 cm, at apex acute to shortly acuminate with tips to 5 mm long, at base acute to usually cuneate or obtuse, papyraceous to chartaceous, adaxially glabrous, abaxially glabrous to sparsely hirtellous or sometimes moderately to densely so along costa; secondary veins 8–12 pairs, usually extending to unite with margins, with 1(3) sometimes weak intersecondary veins usually present between pairs of secondary veins, adaxially costa plane to slightly canaliculate and remaining venation plane, abaxi-

ally costa prominulous to prominent, secondary veins prominulous, and reticulated minor venation plane; margins thinly to distinctly cartilaginous; *petioles* 0.5–2 cm long, glabrous; *stipules* glabrous, united around the stem in a continuous truncate sheath 1.5–4 mm long, lobes ligulate to deltoid, 0.5–2 mm long, obtuse to rounded, entire to sparsely ciliolate. *Inflorescences* erect, sometimes tripartite and appearing subsessile; peduncles 1.5–7 cm long; panicles pyramidal, 2–23 × 3–12 cm excluding corollas, with secondary axes 4–8 pairs, with flowers pedicellate in cymes of 3–7; bracts entire to ciliolate, those subtending secondary axes 3–8 mm long, lanceolate to elliptic or narrowly so, acute to obtuse or rounded, entire, those subtending pedicels 1–3 mm long, narrowly to broadly triangular, ovate, or elliptic, acute to obtuse or rounded; pedicels 1–7 mm long; peduncle, axes, bracts, and pedicels glabrous or sparsely to densely pilosulous, green to yellow; *flowers* distylous, with hypanthium glabrous, ellipsoid, 1.2–1.5 mm long; *calyx* limb glabrous, 1–1.5 mm long, divided nearly to base, lobes triangular to deltoid, acute to obtuse, entire; *corolla* tubular-funnelform, yellow, a little swollen at base, straight there and in tube, externally glabrous, internally glabrous except for a pilose ring ca. 2 mm wide at ca. 2 mm above base, tube 16–17 mm long, 4–6 mm diam. near middle, lobes triangular, ca. 3 mm long, acute, not much thickened adaxially, in bud with sinuses at base prolonged into wings 0.3–1.5 mm long; *anthers* in short-styled form ca. 4 mm long, partially exerted, in long-styled form ca. 3 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base; *stigmas* in short-styled form ca. 4 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base, in long-styled form ca. 1 mm long, exerted; *disk* ca. 1 mm high. *Infructescences* and *fruit* not seen. Wet forest at 1650–2600 m, southeastern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its stipules with truncate continuous sheaths and short broad lobes, pyramidal inflorescences, and tubular-funnelform yellow corollas with the sinuses in bud shortly to well expanded into short wings. The specific epithet refers to the yellow color of the flowers. This new species is similar to *Palicourea thyrsiflora*, which has usually narrower and longer stipule lobes, inflorescence branches yellow to usually red or orange, and corollas usually tubular and yellow becoming orange or red with age, with the sinuses between the lobes sometimes a little saccate but not developed into wings, and the buds generally truncate rather than rounded on the top.

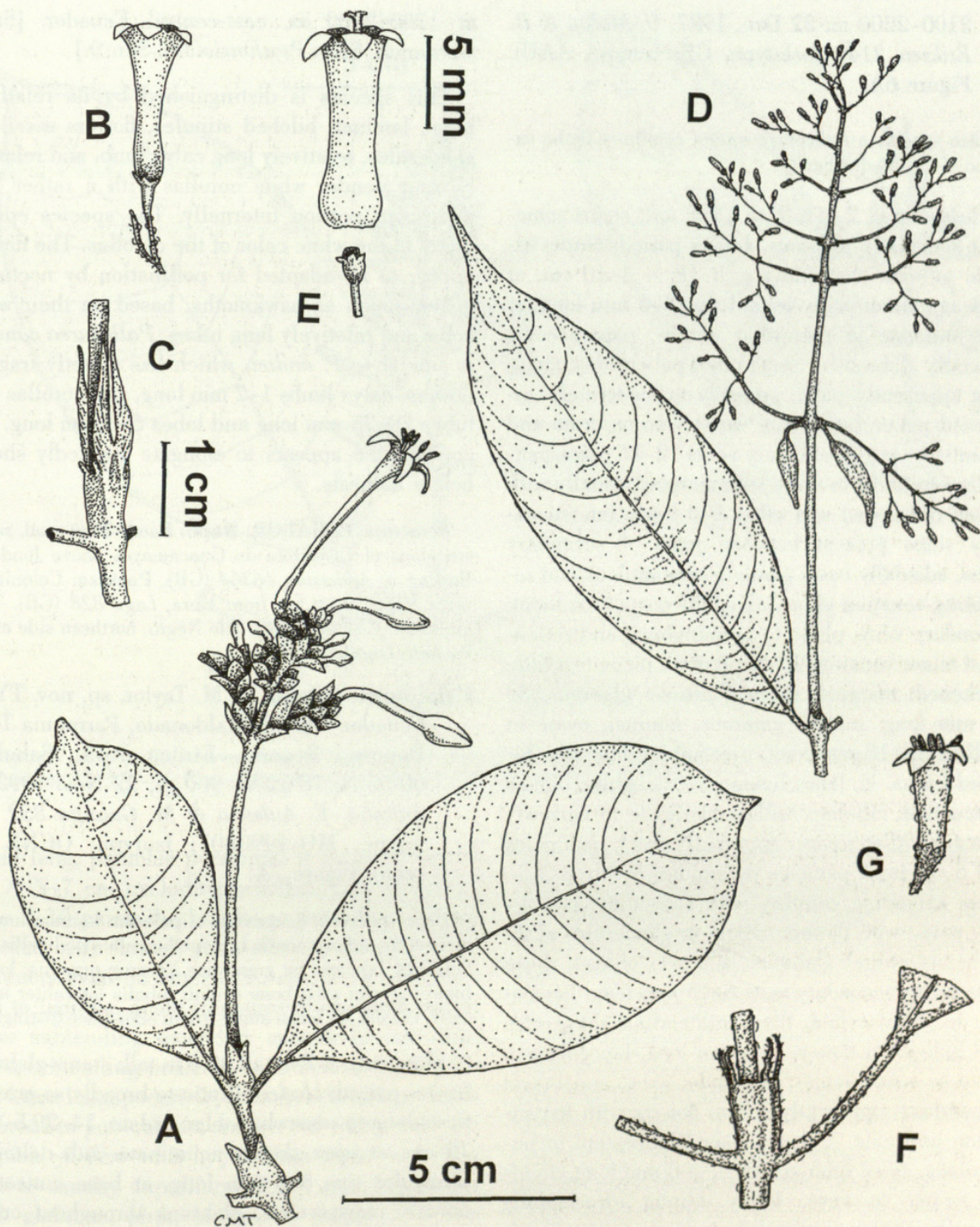


Figure 6. —A. *Palicourea candida*, flowering branch, based on Molau & Eriksen 2149. B, C, *Palicourea vulcanalis*, based on Ownbey 2699.—B. Flower.—C. Stipule. D, E, *Palicourea luteonivea*.—D. Flowering branch, based on Zaruma 776.—E. Calyx and corolla, partially dissected, based on Neill et al. 7401. F, G, *Palicourea prodiga*.—F. Stipule, based on Holm-Nielsen et al. 27163.—G. Flower, based on Holm-Nielsen et al. 27250. A, D, F to 5-cm scale; C to 1-cm scale; B, E, G to 5-mm scale.

Paratypes. ECUADOR. **Loja:** Nudo de Sabanilla, W slope on road to Yangana, Harling & Andersson 21713 (GB, MO); Nudo de Sabanilla, W slope on road to Yangana-Valladolid, Harling & Andersson 21825 (GB, MO). **Zamora-Chinchipe:** Nudo de Sabanilla-Valladolid, horse trail to Caserío Quebrada Honda, Harling & Ståhl 26313 (GB), Harling 27166 (GB); Romerillo, trail at limit of

Parque Nacional Podocarpus, 04°13'S, 78°56'W, Madsen & Bloch 75879 (AAU).

Palicourea candida C. M. Taylor, sp. nov. **TYPE:** Ecuador. Napo: E upper slopes of Cordillera de Guacamayos, 11–13 km S of Cosanga on the Baeza-Tena road, 00°40'S, 77°52'W,

2100–2200 m, 22 Dec. 1987, U. Molau & B. Eriksen 2149 (holotype, GB; isotype, AAU). Figure 6A.

Haec species a *Palicourea andrei* corolla et limbo calycino elongatis distinguitur.

Flowering at 2 m tall, to 15 m tall; stems somewhat succulent, glabrous. *Leaves* paired; *blades* elliptic to somewhat obovate, 8–18 × 4–10 cm, at apex acuminate with deltoid tips 3–5 mm long, at base cuneate to somewhat obtuse, papyraceous, adaxially glabrous or costa often puberulous, abaxially apparently paler, sparsely to moderately appressed-puberulous, more densely so on costa and secondary veins; secondary veins 12–16 pairs, generally extending to unite with margins, usually with 1 well-developed and often 2–3 weak intersecondary veins present between pairs of secondary veins, adaxially costa plane to prominulous and remaining venation plane, abaxially costa prominent, secondary veins plane to prominulous, and reticulated minor venation inconspicuous, plane to a little thickened; margins ciliolate; *petioles* glabrous, 5–25 mm long; *stipules* glabrous, laminar, ovate in outline, 12–18 mm long, overlapping laterally, bilobed for ca. ½, lobes ligulate to triangular, obtuse to rounded, ciliolate, with sinus acute to narrowly concave. *Inflorescences* apparently erect; peduncles 3–7.5 cm long; panicles pyramidal, 3–3.5 × 3.5–5 cm excluding corollas, with secondary axes 1–2(3) pairs, with flowers sessile in glomerules of 2–4; bracts entire, glabrous, acute to obtuse, those subtending secondary axes 8–15 mm long, lanceolate to oblanceolate, those subtending glomerules and individual flowers 3–7 mm long, lanceolate to ovate or suborbicular; peduncle, axes, and bracts puberulous, apparently green; *flowers* with hypanthium turbinate, 1–3 mm long, glabrescent to puberulous; *calyx* limb glabrous, 4–6 mm long, divided nearly to base, lobes elliptic, overlapping laterally, obtuse to rounded, entire to minutely ciliolate; *corolla* salverform to narrowly funnelform, white, a little swollen at base, generally straight there and perhaps also in tube, externally sparsely to moderately puberulous, internally glabrous except for a pilosulous to villosulous zone ca. 18 mm long in upper part of tube and ending below stamen attachment, tube 32–42 mm long, 2–2.5 mm diam. near middle, lobes narrowly triangular to ligulate, 8–9 mm long, acute; *anthers* in apparent short-styled form exserted, ca. 7 mm long; *stigmas* in apparent short-styled form positioned ca. ⅓ of length of tube above base, ca. 3 mm long; *disk* not seen. *Inflorescences* and *fruits* not seen. Wet forest

at 1700–2200 m, east-central Ecuador. [Subg. *Montanae*, Sect. *Psychotrioides*, Ser. 9.]

This species is distinguished by its relatively large, laminar, bilobed stipules, flowers sessile in glomerules, relatively long calyx limb, and relatively long slender white corollas with a rather long pubescent portion internally. The species epithet refers to the white color of the corollas. The flowers appear to be adapted for pollination by nocturnal visitors such as hawkmoths, based on their white color and relatively long tubes. *Palicourea candida* is similar to *P. andrei*, which has sweetly fragrant flowers, calyx limbs 1–2 mm long, and corollas with tubes 20–25 mm long and lobes 6–8 mm long. The corolla tube appears to elongate markedly shortly before anthesis.

Paratypes. ECUADOR. **Napo**: Baeza-Tena road, southern slope of Cordillera de Guacamayos above Jondachi, Harling & Andersson 16364 (GB). **Pastaza**: Colonia Alvarez Miño, ca. 6 km from Mera, Lugo 828 (GB). **Tungurahua**: Cashurco, near Río Negro, northern side of Río Pastaza, Lugo 800 (GB).

Palicourea chignul C. M. Taylor, sp. nov. TYPE: Ecuador. Carchi: Maldonado, Parroquia Tobar Donoso, Reserva Etnica Awá, Sabalera, 00°55'N, 78°32'W, 900 m, 22 Nov. 1992, C. Aulestia, E. Aulestia & M. Guanga 852 (holotype, MO-4990807; isotype, QCNE not seen). Figure 7A.

Haec species a congeneris stipularum laminarium lobulis acutis, inflorescentia brevipedunculata pedicellis satis longis ac bracteis sat grandibus latisque praedita, lobulis limbi calycini satis bene evoluti lobulis lateraliter imbricatis, corolla sat longa atque fructu obovoideo distinguitur.

Flowering at 2 m tall, to 5 m tall; stems glabrous. *Leaves* paired; *blades* elliptic to broadly so or elliptic-oblong to somewhat oblanceolate, 14–29.5 × 7–18 cm, at apex shortly acuminate with deltoid to triangular tips 3–8 mm long, at base cuneate to obtuse, papyraceous, glabrous throughout or puberulous abaxially along costa; secondary veins 10–19 pairs, often looping to interconnect, without or usually with 1–2 weak intersecondary veins present between pairs of secondary veins, adaxially costa prominulous, secondary veins plane to prominulous, and minor venation plane, abaxially costa and secondary veins prominulous and minor venation plane to thickened; margins entire, thinly cartilaginous; *petioles* glabrous, 1.5–6.5 cm long; *stipules* glabrous or pubescent to minutely sericeous especially on distal parts, laminar, ovate in outline, 6–12 mm long, bilobed for ca. ½, lobes triangular, acute, entire, with sinus acute to concave and obtuse. *Inflorescences* generally erect; peduncles 0.5–

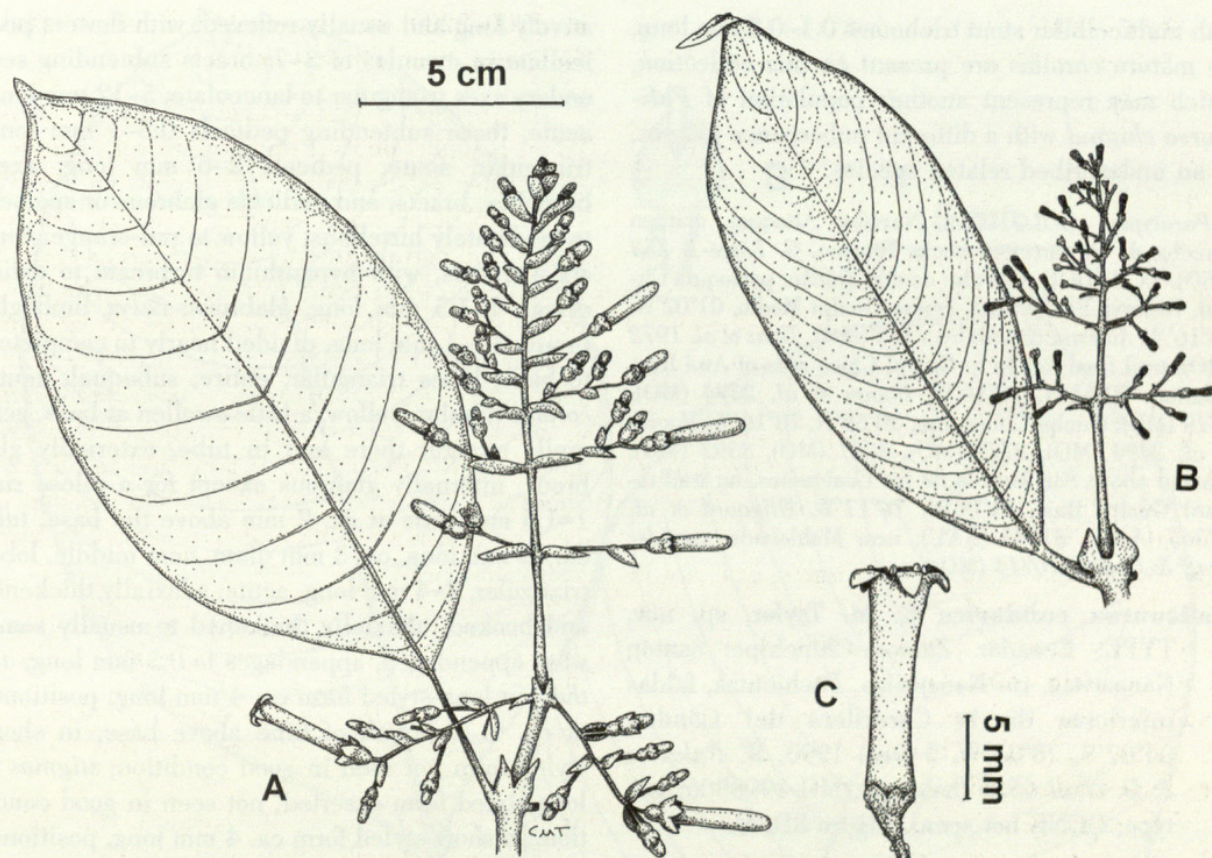


Figure 7. —A. *Palicourea chignul*, flowering branch, based on Hoover *et al.* 2494. B, C, *Palicourea deviae*, based on Løjnant 12337.—B. Flowering branch.—C. Flower. A, B to 5-cm scale.

2 cm long; panicles pyramidal to narrowly so, 5–14 × 5–7 cm excluding corollas, with secondary axes 5–10 pairs, the basalmost pair often strongly reflexed, with flowers pedicellate in cymes of 3–7; bracts ovate to lanceolate, elliptic or oblanceolate to ligulate, acute to obtuse or rounded, entire, those subtending secondary axes 6–15 mm long, those subtending pedicels 4–10 mm long; pedicels 4–14 mm long; peduncle, axes, bracts, and pedicels glabrous to puberulous, orange, red-orange, purple, or pink; flowers with hypanthium glabrous, turbinate to usually cupuliform, 2.5–4 mm long; calyx limb glabrous, pink, orange, or purple, 3–5 mm long, divided nearly to completely to base, lobes subequal to somewhat unequal on an individual flower, elliptic to suborbicular, reticulate-nerved, usually overlapping laterally, entire, obtuse to rounded; corolla tubular, orange to red or yellow, often grading in color along its length, swollen and a little gibbous at base, generally straight there and in tube, externally glabrous to usually minutely puberulous, internally glabrous except pilosulous in a ring ca. 1.5 mm wide at ca. $\frac{1}{3}$ of length of tube above base, tube 20–25 mm long, ca. 2 mm diam. near middle, lobes triangular, ca. 2 mm long, acute; disk shorter than calyx. *Infructescences* similar to inflorescences except purple to rose; fruit obovoid,

somewhat laterally flattened, 8–10 × 6–7 mm, glabrous, rose perhaps becoming black; pyrenes with 3–5 rather sharp longitudinal ridges. Wet forest at 900–1450 m, northwestern Ecuador to adjacent Colombia. [Subg. *Montanae*, Sect. *Obovoideae*, Ser. 6.]

This species is distinguished by its laminar stipules with acute lobes, shortly pedunculate inflorescences with relatively long pedicels and relatively large and broad bracts, well-developed calyx limb with laterally overlapping lobes, relatively long corolla, obovoid fruits, pyrenes with sharp longitudinal ridges, and combination of orange to purple or pink inflorescences with red to yellow corollas. It is similar to *Palicourea hospitalis*, which has longer inflorescences and shorter calyx limbs. The specific epithet is reported by several collectors to be the vernacular local name for this species.

One collection, Drew & Wiggins 41 (F), is provisionally referred here, though the material is inadequate for conclusive identification. It conforms to the characters of this species except that it was collected in Imbabura Province, Ecuador, and it has secondary inflorescence axes, pedicels, and calyx limbs that are sparsely to moderately hirtellous and corollas that are densely pubescent externally

with multicellular stout trichomes 0.1–0.2 mm long. No mature corollas are present on this collection, which may represent another population of *Palicourea chignul* with a different pubescence pattern, or an undescribed related species.

Paratypes. COLOMBIA. **Nariño:** Altaquer, margen derecha de la carretera hacia Tumaco, *G. López-J.* 253 (PSO). ECUADOR. **Carchi:** cantón Tulcán, parroquia Chical, Reserva Etnica Awá, centro Gualpí Medio, 01°02'N, 78°16'W, *Aulestia & Grijalva* 1152 (MO), *Tipaz et al.* 1972 (MO); trail from Pailón to Gualpí Chico area of Awá Reservation, 00°51'N, 78°16'W, *Hoover et al.* 2394 (MO), 2419 (MO); Gualpí Chico area, 00°58'N, 78°16'W, *Hoover et al.* 2494 (MO), 2778 (MO), 2781 (MO), 3392 (MO); plateau above San Marcos de los Coaiqueres, on trail toward Gualpí Bajo, 01°06'N, 78°17'W, *Øllgaard et al.* 57365 (AAU), 57445 (AAU); near Maldonado, *van der Werff & Gudiño* 10714 (MO).

***Palicourea condorica* C. M. Taylor, sp. nov.**

TYPE: Ecuador. Zamora-Chinchipe: cantón Nangaritza, río Nangaritza, Pachicutza, faldas inferiores de la Cordillera del Cóndor, 04°07'S, 78°37'W, 5 Dec. 1990, *W. Palacios & D. Neill* 6556 (holotype, MO-4990806; isotype, QCNE not seen). Figure 8D, E.

Haec species a congeneris foliis sat amplis, stipularum bilobarum sat grandium lobulis lanceolatis, inflorescentia subsessili ex pyramidalis rotundata, limbo calycino brevi atque corolla lutea tubulari distinguitur.

Flowering at 3 m tall, to 5 m tall; stems apparently somewhat succulent, glabrous to puberulous or hirtellous often becoming glabrescent with age. *Leaves* paired; *blades* elliptic to broadly so, 8.5–36(50) × 5.5–18(26) cm, at apex acuminate with deltoid tips 3–10 mm long, at base cuneate to obtuse and sometimes attenuate, papyraceous to chartaceous, adaxially glabrous, abaxially puberulous, more densely so on costa and secondary veins; secondary veins 9–17 pairs, usually extending to unite with margins or occasionally looping to interconnect in most distal part of blade, without or sometimes with 1(2) weak intersecondary veins present between pairs of secondary veins, adaxially costa prominulous and canaliculate and secondary veins and reticulated minor venation plane to slightly thickened, abaxially costa prominent, secondary veins thinly prominulous, and minor venation plane to thickened; margins thinly cartilaginous; *petioles* 2–9(14) cm long, puberulous; *stipules* moderately to densely puberulous, united around the stem in a continuous truncate sheath 2–4 mm long, lobes lanceolate to ovate, 15–20 mm long, acute, rounded laterally, margins entire, with sinus concave to truncate. *Inflorescences* erect, subsessile; panicles pyramidal, 6(20) × 9(22) cm excluding corollas, with secondary axes 3–5 pairs, the basal pair rel-

atively long and usually reflexed, with flowers pedicellate in cymules of 3–7; bracts subtending secondary axes triangular to lanceolate, 5–12 mm long, acute, those subtending pedicels 0.5–1 mm long, triangular, acute; pedicels 2–6 mm long; axes, branches, bracts, and pedicels glabrous or sparsely to moderately hirtellous, yellow to red-orange; *flowers* distylous, with hypanthium turbinate to cylindrical, 1–1.5 mm long, glabrous; *calyx* limb glabrous, 0.5–1 mm long, divided nearly to completely to base, lobes triangular, entire, subequal, acute; *corolla* tubular, yellow, a little swollen at base, generally straight there and in tube, externally glabrous, internally glabrous except for a pilose ring 1–1.5 mm wide at ca. 2 mm above the base, tube ca. 12 mm long, ca. 3 mm diam. near middle, lobes triangular, 2–4 mm long, acute, adaxially thickened and hooked, abaxially thickened to usually somewhat appendaged, appendages to 0.5 mm long; *anthers* in long-styled form ca. 4 mm long, positioned at ca. 2/3 of length of tube above base, in short-styled form not seen in good condition; *stigmas* in long-styled form exerted, not seen in good condition, in short-styled form ca. 4 mm long, positioned ca. 2/3 of length of tube above base; *disk* ca. 1 mm high. *Infructescences* and *fruit* not seen. Wet premontane forest at 900–1700 m, southern Ecuador. [Subg. *Montanae*, Sect. *Cephaeloides*, Ser. 11.]

This species is distinguished by its relatively large leaves, relatively large stipules with lanceolate lobes, subsessile pyramidal to rounded inflorescences, relatively short calyx limb, and tubular yellow corollas. It is similar to *Palicourea harlingii*, which has rounded-corymbiform inflorescences and calyx limbs 1.5–2 mm long; and to *P. macbridei* of Peru, which has purple flowers and calyx limbs 2–3 mm long with the lobes unequal on an individual flower. The specific epithet refers to the Cordillera del Cóndor, in the border region of Ecuador and Peru, where the type specimen was collected.

Paratypes. ECUADOR. **Morona-Santiago:** banks of the Río Ontza, Cordillera Cutucú, 02°40'S, 78°W, *Camp* 1182 (S); cantón Gualaquiza, Cordillera del Cóndor, Cuan-gos, 20 km E of Gualaquiza, 03°29'S, 78°14'W, *Gentry* 80116 (MO); Plan del Milagro at cross-road between Limón and Indanza, *Harling & Andersson* 24522 (GB, MO); along new road Méndez-Morona, Km 30–35, *van der Werff & Gudiño* 11261 (MO). **Zamora-Chinchipe:** cantón Nangaritza, Pachicutza, camino al Hito, 04°07'S, 78°37'W, *Palacios et al.* 8287 (MO).

***Palicourea corniculata* C. M. Taylor, sp. nov.**

TYPE: Ecuador. Napo: Baeza-Tena road, Cos-anga, 4 Feb. 1980, *G. Harling & L. Andersson* 16227 (holotype, GB; isotype, MO-4278911). Figure 9C, D, E.

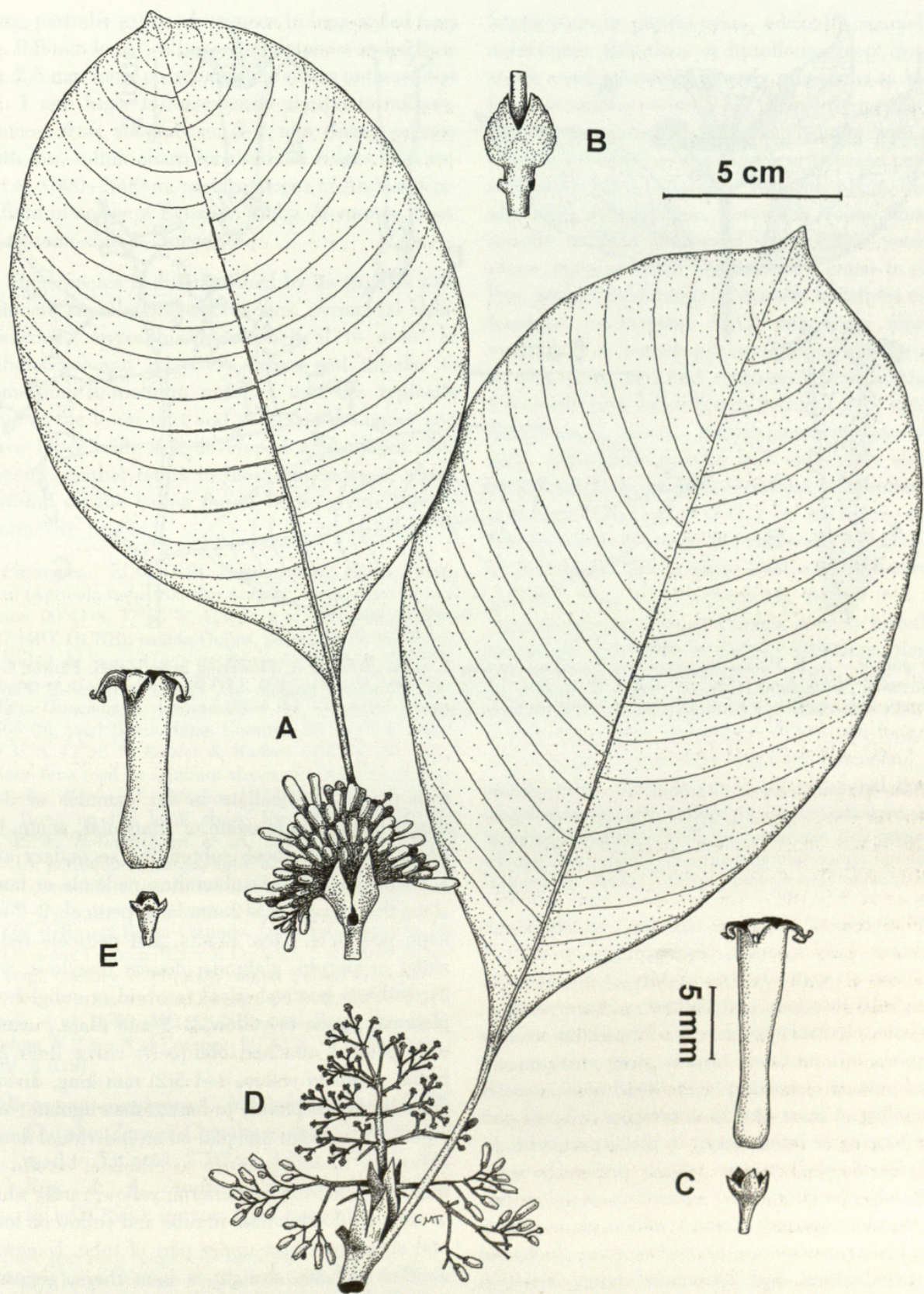


Figure 8. A–C, *Palicourea harlingii*, based on Harling & Andersson 16917.—A. Habit.—B. Stipule.—C. Flower, partially dissected. D, E, *Palicourea condorica*, based on Palacios et al. 8287.—D. Habit.—E. Flower, partially dissected. A, B, D to 5-cm scale; C, E to 5-mm scale.

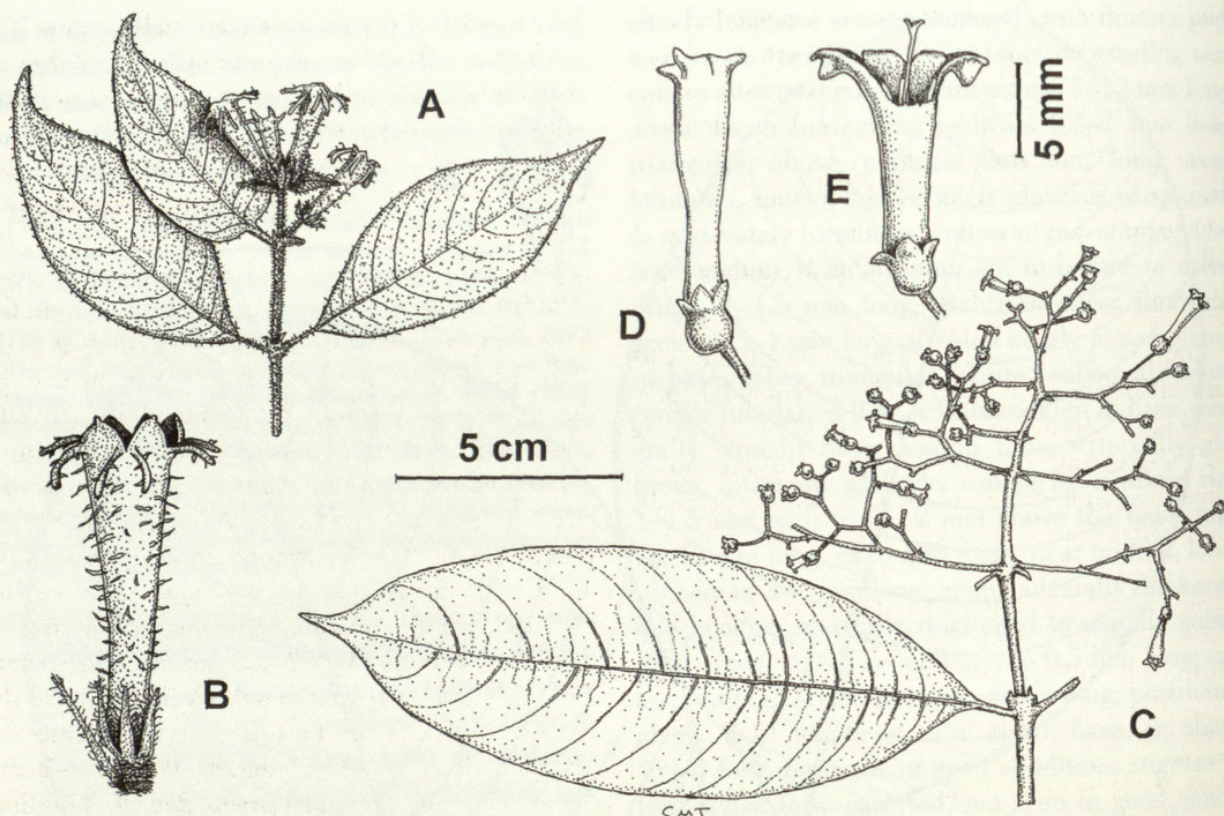


Figure 9. A, B, *Palicourea cornigera*, based on Harling & Ståhl 26319.—A. Flowering branch.—B. Flower. C–E, *Palicourea corniculata*, based on Balslev & Madsen 10339.—C. Flowering branch.—D. Flower in bud.—E. Flower, partially dissected. A, C to 5-cm scale; B, D, E to 5-mm scale.

Haec species a congeneris stipulis truncatis vaginantibus, hypanthio ex hemisphaerico ovoideo subglobosove diametro 2–3 mm atque corolla ex tubulari subinfundibuliformi typice inferne azurea et superne flava lobulis appendicibus bene evolutis praeditis habente distinguitur.

Flowering at (0.6)2 m tall, to 8 m tall; stems glabrous. *Leaves* paired; *blades* elliptic, 6.5–20 × 2–7 cm, at apex acute to usually acuminate with tips 5–10 mm long and deltoid, at base acute to cuneate, chartaceous, glabrous throughout or often sparsely to moderately hirsute along costa on abaxial surface; secondary veins 8–16 pairs, usually extending at least weakly to margins in basal part and looping to interconnect in distal part, with 1–2(3) intersecondary veins usually present between pairs of secondary veins, adaxially costa slenderly prominulous and remaining venation plane, abaxially costa prominulous, secondary veins thickened to prominulous, and reticulated minor venation plane to sometimes a little thickened; margins thinly cartilaginous; *petioles* glabrous, 0.8–2 cm long; *stipules* glabrous, united around the stem in a continuous truncate sheath 3–5 mm long, lobes deltoid to narrowly triangular, 1–2 mm long, acute to obtuse, entire. *Inflorescences* erect; peduncles 1–3 cm long; panicles pyramidal, 6.5–13 × 9–12.5 cm excluding corollas, with secondary axes 4–8 pairs,

with flowers pedicellate in lax cymules of 3–7; bracts lanceolate to ovate or triangular, acute, entire to ciliate, those subtending secondary axes 3–6 mm long, those subtending pedicels or borne along their length 0.5–2 mm long; pedicels 2–7 mm long; peduncle, axes, bracts, and pedicels red to violet or purple, glabrous; *flowers* distylous, with hypanthium hemispherical to ovoid or subglobose, glabrous, green to yellow, 2–3 mm diam., usually with pedicel attached obliquely; *calyx* limb glabrous, green to yellow, 1–1.5(2) mm long, divided partially to completely to base, lobes ligulate, subequal to somewhat unequal on an individual flower, obtuse to rounded, entire to ciliate; *corolla* tubular to somewhat funnelform, yellow, rarely white, or usually blue to violet in tube and yellow on lobes and sometimes also upper part of tube, somewhat swollen at base, straight to bent there, generally straight in tube, externally glabrous, internally glabrous except for a densely pilose ring ca. 1.5 mm wide at ca. 1/3 length of tube above base, tube 10–15 mm long, 2.5–4 mm diam. near middle, lobes triangular to somewhat deltoid, 2.5–3 mm long, acute, at apex with abaxial, carnosely, deltoid appendage 1.5–2.5 mm long; *anthers* in long-styled form ca. 2 mm long, included, in short-styled form ca. 4 mm

long, partially exserted; *stigmas* in long-styled form ca. 0.8 mm long, well exserted, in short-styled form ca. 2.5 mm long, positioned just below anthers; *disk* ca. 1 mm high. *Infructescences* similar to inflorescences; *fruit* subglobose, 5–7 mm diam.; *pyrenes* with low, rather sharp longitudinal ridges. Wet forest at 1800–2600 m, eastern slopes of Andean Cordillera in northern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its stipules with truncate sheaths and short lobes, pyramidal inflorescences, hypanthia hemispherical to ovoid or subglobose and relatively large, and tubular to somewhat funnelform corollas that are typically blue in the lower part and yellow in the upper and have lobes with well-developed appendages. The specific epithet refers to these appendages, which develop on the young flower buds, giving them a distinctive profile.

Paratypes. ECUADOR. **Napo:** cantón Quijos, Sierra Azul (Agrícola Industrial Río Aragón), campamento Estero Chico, 00°41'S, 77°56'W, *Alvarez et al.* 530 (MO, QCNE), 547 (MO, QCNE); cantón Quijos, parroquia de Baeza, comunidad de Santa Lucía de Bermejo, 00°31'S, 77°55'W, *Alvarez et al.* 855 (MO, QCNE), 1017 (MO, QCNE); Cordillera Guacamayo, *Asplund* 8824 (S); Cosanga, *Asplund* 9565 (S); road Baeza-Napo, Cosanga, 20 km S of Baeza, 00°37'S, 77°52'W, *Balslev & Madsen* 10339 (AAU, MO); Baeza-Tena road on southern slopes of Cordillera de Guacamayos, *Harling & Andersson* 16415 (GB); slopes of Guagra Urcu, on the loma above Río Bretania, 00°28'S, 77°45'W, *Holm-Nielsen et al.* 26779 (AAU), 26887 (AAU); parroquia Cosanga, entre el río Aliso y el río Cosanga, *Jaramillo et al.* 12048 (GB); parroquia Cosanga, a 6 km de la carretera Cosanga-El Aliso, *Jaramillo et al.* 12107 (GB); vía Baeza-Cotundo, *Little & Campuzano* 158 (MO); along Cosanga River at Cosanga, S of Baeza on trail to Tena, *Owmbey* 2693 (MO); cantón Quijos, Cosanga, entre el río Vinilla y el río Cosanga, 00°34'S, 77°52'W, *Palacios et al.* 9590 (MO, QCNE); road Baeza-Tena, road leading W 2 km N of Cosanga, 00°33'S, 77°53'W, *Persson et al.* 3 (GB).

***Palicourea cornigera* C. M. Taylor, sp. nov. TYPE:** Ecuador. Zamora-Chinchi: above Valladolid on road to Yangana, 2700 m, 2 Feb. 1985, *G. Harling & L. Andersson* 21465 (holotype, MO-4278930; isotype, GB). Figure 9A, B.

Haec species a congeneris corolla trichomatibus azureis 1–3 mm longis externe vestita ac sinibus lobulorum ad margines appendicibus corniformibus bene evolutis praeditis distinguenda.

Flowering at 0.5 m tall, to 2 m tall; stems occasionally clambering, densely pilosulous or hirtellous to hirsute. *Leaves* paired; *blades* elliptic, 4–15.5 × 1.4–4.5 cm, at apex acute to usually acuminate with tips slender, sometimes falcate, 1–1.5 cm long, at base acute to cuneate or obtuse, mem-

branaceous to papyraceous, adaxially sparsely to moderately pilosulous or hirtellous except densely so on costa, abaxially densely pilosulous to hirtellous; secondary veins 9–17 pairs, frequently extending to unite with margins, usually with 1–2 weak intersecondary veins present between pairs of secondary veins, adaxially venation plane, abaxially costa prominulous, secondary veins plane or usually a little thickened, and minor venation plane; margins thinly cartilaginous, entire to ciliate; *petioles* moderately to densely hirtellous or pilosulous to hirsute, 3–12 mm long; *stipules* moderately to densely pilosulous or hirtellous, united around the stem in a continuous truncate sheath 2.5–3 mm long, lobes linear, 2–5 mm long, spreading-pilose to hirsute. *Inflorescences* perhaps nodding, sometimes tripartite and apparently sessile; peduncles 1–3 cm long; panicles subcapitate or branched once, 1–2 × 2–2.5 cm excluding corollas, with flowers sessile to subsessile in glomerules of 3–5, bracts linear, those subtending glomerules 7–9 mm long, those subtending flowers 3–8 mm long; peduncle, axes, and bracts densely hirtellous to hirsute with blue to purple trichomes; *flowers* distylous, with hypanthium ca. 1 mm long, turbinate, densely pilose with linear blue trichomes 1–3 mm long; *calyx* limb green, 3.5–6 mm long, divided nearly to base, lobes narrowly lanceolate, unequal by ca. 25% or so on an individual flower, acute to acuminate, glabrous to moderately pubescent with blue linear trichomes 1–3 mm long; *corolla* funnelform, white to blue or sometimes yellow distally, a little swollen and gibbous at base, generally straight there and in tube, externally moderately to densely pubescent with linear blue trichomes 1–3 mm long, internally glabrous except for a densely pilose ring ca. 1/3 of length of tube above the base, tube 15–20 mm long, 3.5–5 mm diam. near middle, lobes deltoid, 2–2.5 mm long, slightly thickened at apex adaxially, with 2 linear pubescent appendages 3–5 mm long near base, one on each side; *anthers* in short-styled form ca. 3 mm long, partially exserted, in long-styled form ca. 2 mm long, positioned ca. 2/3 of length of tube above base; *stigmas* in long-styled form 0.5–1 mm long, exserted, in short-styled form ca. 3 mm long, positioned near or just above tube middle; *disk* not seen. *Infructescences* and *fruit* not seen. Wet forest at 1700–2700 m, southern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 4, Subser. f.]

This species is distinguished by its corollas that are externally pubescent with blue trichomes 1–3 mm long and bear two well developed horn-like appendages from the base on each side of the ab-

axial part of the lobes, hirtellous or pilosulous pubescence throughout, linear stipule lobes and bracts, sessile or subsessile flowers borne in one or a few glomerules, and well-developed calyx limb with narrow lobes. The paired appendages attached near the base on each side of each corolla lobe are unique in the genus and perhaps the family. The specific epithet refers to these appendages. When the flower is in bud, these appendages are spreading and can be mistaken for narrow corolla lobes, but the corolla lobes are broad and much shorter. *Palicourea cornigera* is similar in aspect to *P. calycina*, which lacks corolla lobe appendages.

Paratypes. ECUADOR. **Loja:** Nudo de Sabanilla, north part, *Harling et al.* 20520 (GB, MO). **Morona-Santiago:** road General Proaño-Aschli, Km 22, 02°15'S, 78°13'W, *Persson et al.* 34 (GB, MO). **Zamora-Chinchi:** Loja-Zamora road, E of pass, *Harling & Andersson* 22108 (GB, MO); along road Valladolid-Nudo de Sabanilla, *Harling & Madsen* 25255 (GB); Nudo de Sabanilla-Valladolid, horse trail to Caserío Quebrada Honda, *Harling & Ståhl* 26319 (AAU, GB).

Palicourea deviae C. M. Taylor, sp. nov. TYPE: Ecuador. Sucumbíos: Cartagena, Km 25 from El Carmelo on road towards La Bonita, 00°37'N, 77°30'W, 13 Apr. 1979, *B. Løjtnant, U. Molau & M. Madison* 12337 (holotype, AAU; isotype, GB). Figure 7B, C.

Haec species a congeneris lobulis stipularibus lanceolatis asymmetricis bene evolutis, limbo calycino 1.5–1.8 mm longo atque corolla ex azurea purpurea distinguitur.

Flowering at 3 m tall; stems moderately to densely hirsutulous becoming glabrescent with age. *Leaves* paired; *blades* elliptic to oblanceolate, 7–17 × 2.5–5.8 cm, at apex acuminate with tips 1–2 cm long, at base cuneate to obtuse, chartaceous to subcoriaceous, adaxially glabrous except hirtellous along costa, abaxially moderately to densely hirtellous throughout; secondary veins 13–14 pairs, usually extending to unite with margins at least in distal part, with 1(3) weak intersecondary veins usually present between pairs of secondary veins, adaxially with costa plane to slightly sulcate and secondary veins and reticulated minor venation impressed, abaxially with costa prominent, secondary veins prominent to prominulous, and minor venation prominulous to thickened; margins thinly cartilaginous, often somewhat revolute; *petioles* moderately to densely hirsutulous, 0.8–2 cm long; *stipules* moderately to densely hirsutulous or puberulous, united around the stem in a continuous sheath 5–7 mm long, with interpetiolar free portion 5–14 mm long, divided for ca. ½ to completely, lobes lanceolate, laterally expanded to auriculate at base, 2.5–6 mm wide, acute, entire to slightly

erose, with sinus acute to narrowly concave. *Inflorescences* erect to somewhat deflexed; peduncles 1.5–6.5 cm long; panicles pyramidal, 8–14 × 6–12 cm excluding corollas, with secondary axes 10–12 pairs, with flowers pedicellate in cymes of 3–7; bracts narrowly triangular, acute, those subtending secondary axes 4–11 mm long, those subtending pedicels 1.5–3 mm long; pedicels 1–6 mm long; peduncle, axes, bracts, and pedicels moderately to densely hirsutulous, purple to magenta; *flowers* with hypanthium 1–1.5 mm long, turbinate, moderately to densely pilosulous; *calyx* limb pilosulous, 1.5–1.8 mm long, divided nearly to completely to base, lobes lanceolate to elliptic or ovate, usually slightly unequal on an individual flower, obtuse to acute; *corolla* tubular, blue to purple, a little swollen and gibbous at base, generally straight there and in tube, externally glabrous or minutely puberulous on lobes, internally glabrous except for a pilose ring ca. 1 mm wide at ca. ¼ of length of tube above base, tube 13–14 mm long, ca. 3.5–4 mm diam. near middle, lobes deltoid, ca. 2 mm long, acute, adaxially and abaxially a little thickened at apex; *anthers* in short-styled form ca. 4 mm long, partially exerted; *stigmas* in short-styled form ca. 3 mm long, positioned just above middle of corolla tube; *disk* ca. 1 mm high. *Infructescences* similar to inflorescences; *fruit* subglobose to ellipsoid, ca. 5 × 4.5 mm, hirtellous; *pyrenes* with low rounded longitudinal ridges. Cloud forest at 2800 m, Ecuador and probably western Colombia. [Subg. *Montanae*, Sect. *Montanae*, Ser. 4, Subser. e.]

This species is distinguished by its well-developed stipules with a truncate continuous sheath and lanceolate, laterally expanded lobes, chartaceous to subcoriaceous leaves with the margins typically a little revolute, pyramidal purple inflorescences, calyx limb 1.5–1.8 mm long and divided nearly or completely to the base, tubular purple corollas, and subglobose to ellipsoid fruits. It is similar to *Palicourea toroi* of Colombia, which has calyx limbs 3.5–4 mm long; and to *P. stipularis*, which has narrowly triangular stipule lobes and calyx limbs 0.9–1.2 mm long. This handsome species is named in honor of botanist Wilson Devia of Tuluá, Colombia, who showed it to me in the Cordillera Central in Valle, Colombia, although only the one collection from Ecuador has been seen. In Colombia *P. deviae* flowers in the rainy season, when relatively fewer collections have been made, which may explain in part why it is so poorly represented in herbaria.

Palicourea gentryi C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: 17 km W of Lumbaque [sic; Lumbaquí] (70 km W of Lago Agrio), 1130 m,

4 Nov. 1974, A. Gentry 12437 (holotype, MO-2791014; isotypes, MO-2779141, MO-3131952). Figure 4F.

Haec species a *Palicourea subalata* inflorescentia minore congestioreque bracteis longiores gerente, hypanthio cupuliformi majore, limbi calycini lobulis subaequalibus atque corolla extus villosa distinguitur.

Flowering at 2 m tall, to 4 m tall; stems glabrous. *Leaves* paired; *blades* elliptic, 10–19 × 3.5–7.4 cm, at apex acute to usually acuminate with tips 8–18 mm long, at base acute to somewhat tapered, papyraceous, adaxially glabrous, abaxially sparsely to moderately hirtellous, more densely so on costa and secondary veins; secondary veins 11–18 pairs, generally extending weakly to unite with margins, without or with 1–2 weak intersecondary veins sometimes present between pairs of secondary veins, adaxially costa thinly prominulous and remaining venation plane to a little thickened, abaxially costa prominent, secondary veins prominulous, and reticulated minor venation plane; margins ciliolate; *petioles* glabrous, 5–30 mm long; *stipules* glabrous, united around the stem in a continuous truncate sheath 1.5–3 mm long, lobes narrowly triangular, 5–7.5 mm long, acute. *Inflorescences* perhaps erect, sometimes tripartite and appearing sessile; peduncles 2–5.5 cm long; panicles rounded-corymbiform, 1–3 × 2–7 cm excluding corollas, with secondary axes 1–3 pairs, with flowers pedicellate in cymules of 4–9; bracts subtending secondary axes elliptic to lanceolate, 6–10 mm long, acute, ciliolate, those subtending pedicels narrowly triangular to lanceolate, acute to acuminate, 1–4 mm long; pedicels 3–6 mm long; peduncle, axes, bracts, and pedicels glabrous, perhaps yellow; *flowers* with hypanthium cupuliform, glabrous, 1.5–2 mm long; *calyx* limb glabrous, 1–1.2 mm long, divided for $\frac{2}{3}$ – $\frac{3}{4}$, lobes deltoid, entire; *corolla* tubular to somewhat funnel-form, white to yellow, a little swollen at base, generally straight there and in tube, externally moderately to densely villous with linear multicellular trichomes ca. 1 mm long, internally glabrous except for a densely villous ring ca. 1 mm wide at ca. 4 mm above base, tube ca. 13 mm long, ca. 2 mm diam. near base, lobes triangular, ca. 3 mm long, acute, slightly thickened at apex; *anthers* in long-styled form ca. 2.5 mm long, positioned in upper $\frac{2}{3}$ of tube; *stigmas* not seen; *disk* ca. 0.8 mm high. *Inflorescences* and *fruit* not seen. Wet forest at 800–1130 m, east-central Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is similar to *Palicourea subalata*, from which it can be distinguished by its smaller, more congested inflorescences with longer bracts,

longer cupuliform hypanthium, calyx limb with lobes subequal on an individual flower, and corollas villous externally. This species is named in honor of American botanist Alwyn H. Gentry (1945–1993), whose work on the floristics and diversity of the Andean flora has contributed to our knowledge of many *Palicourea* species.

Paratype. ECUADOR. **Napo**: de la carretera entre Reventador y Lumbaqui, 10 km al sur, Río Tigre, 00°05'S, 77°24'W, Neill 7532 (AAU).

Palicourea harlingii C. M. Taylor, sp. nov. TYPE: Ecuador. Pastaza: cantón Pastaza, along road between Mera and Río Anzu, which is 11.7 km N of main plaza in Mera, on Puyo-Baños road, 01°20'S, 78°06'W, 5 Apr. 1992, T. B. Croat 73584 (holotype, MO-4990802). Figure 8A–C.

Haec species a *Palicourea condorica* stipulis laminaribus (non vaginantibus), inflorescentia rotundato-corymbiformi, bracteis floralibus longioribus atque limbo calycino 1.5–2 mm longo distinguitur.

Flowering at 2.2 m tall, to 5 m tall; stems glabrous. *Leaves* paired; *blades* elliptic to broadly so, 19–27.5 × 11–19 cm, at apex shortly acuminate with deltoid tips 5–10 mm long, at base cuneate to obtuse and sometimes attenuate, papyraceous, adaxially glabrous, abaxially puberulous especially on costa and secondary veins; secondary veins 16–18 pairs, generally extending to unite with margins, without or with 1–2 weak intersecondary veins present between pairs of secondary veins, adaxially costa prominulous and canaliculate and secondary veins and reticulated minor venation plane to slightly thickened, abaxially costa prominent, secondary veins thinly prominulous, and minor venation plane to thickened; margins thinly cartilaginous; *petioles* glabrous to puberulous, 5.5–11 cm long; *stipules* moderately to densely puberulous, laminar, ovate in outline, with undivided interpetiolar portion 3–5 mm long, lobes 20–25 mm long, lanceolate to ovate, rounded to subauriculate laterally, acute to acuminate, entire, with sinus concave to truncate. *Inflorescences* erect, subsessile; panicles rounded-corymbiform, rather congested, 3–5 × 4–6 cm excluding corollas, with secondary axes 2–3 pairs, with flowers pedicellate and sessile together in cymules of 3–5; bracts ciliolate, those subtending secondary axes 5–12 mm long, lanceolate to narrowly elliptic, acute, those subtending pedicels 3–5 mm long, lanceolate to oblanceolate, acute to obtuse; pedicels 0–5 mm long; axes, bracts, and pedicels glabrous, yellow; *flowers* with hypanthium 1.2–1.5 mm long, turbinate to cylindrical, glabrous; *calyx* limb glabrous, 1.5–2 mm

long, divided nearly or completely to base, lobes triangular to ovate, acute to acuminate, ciliolate; *corolla* tubular, yellow, somewhat swollen at base, generally straight there and in tube, externally glabrous, internally glabrous except for a pilose ring 1.5–2 mm long at ca. $\frac{1}{3}$ of length of tube above base, tube ca. 16 mm long, ca. 3 mm diam. near middle, lobes 1.5–2 mm long, triangular, adaxially thickened and hooked, abaxially with appendages 0.5–1 mm long; anthers in long-styled form ca. 5 mm long, positioned ca. $\frac{3}{4}$ of length of tube above base; *stigmas* in long-styled form exerted, ca. 1 mm long; *disk* ca. 1 mm long. *Infructescences* and *fruit* not seen. Wet forest at 1200–1380 m, north-eastern Ecuador. [Subg. *Montanae*, Sect. *Cephaloides*, Ser. 11.]

This species is distinguished by its relatively large leaves, relatively long, bilobed, laminar stipules, subsessile corymbiform-rounded inflorescences, relatively well-developed floral bracts and calyx limb, and tubular yellow corollas with the lobes abaxially appendaged, especially in bud. It is similar to *Palicourea condorica*, which can be distinguished by its stipules with continuous truncate sheaths, pyramidal inflorescences, and shorter floral bracts, calyx limb, and abaxial thickenings on the corolla lobes. This handsome species is named in honor of Swedish botanist Gunnar Harling, whose extensive work has contributed significantly to our scientific knowledge of the Ecuadorian flora.

Paratype. ECUADOR. **Pastaza:** Colonia Játiva, ca. 7 km N of Mera, Harling & Andersson 16917 (GB, MO).

Palicourea jaramilloi C. M. Taylor, sp. nov.
TYPE: Ecuador. Loja: Loja-Saraguro Km 18, 03°54'08"S, 79°14'54"W, 21 Apr. 1994, P. M. Jørgensen, C. Ulloa, H. Vargas & G. Abendaño 459 (holotype, MO-5006718; isotypes, LOJA not seen, QCA not seen, QCNE not seen). Figure 5F, G.

Haec species a *Palicourea azurea* corollae luteae tubo ca. 7 mm longo distinguitur.

Flowering at 1 m or perhaps less, to 2 m tall; stems weak to scrambling, densely hirtellous. *Leaves* paired; *blades* elliptic to rather narrowly so, 5–14.5 × 2–5.5 cm, at apex acute to usually acuminate with tips 3–8 mm long, at base cuneate to obtuse, subcoriaceous, adaxially nitid and glabrous or sparsely hirtellous along costa, abaxially moderately to densely hirtellous; secondary veins 8–13 pairs, extending to unite with margins or often looping to interconnect with each other and margin in a closely set reticulum, with 1–2(3) weak intersecondary veins usually present between pairs of sec-

ondary veins, adaxially costa thinly prominulous and secondary veins and reticulated minor venation plane to thickened, abaxially costa prominent, secondary veins prominulous, and minor venation thickened; margins cartilaginous, often rather thickly so, entire or ciliolate; *petioles* hirtellous, 5–15 mm long; *stipules* moderately to densely hirtellous, often becoming glabrescent and indurate with age, united around the stem in a continuous truncate sheath 4–6.5 mm long, strongly quadrate, usually somewhat costate on angles, lobes narrowly triangular, 5–8 mm long, acute, with sinus truncate. *Inflorescences* erect, often tripartite and apparently sessile; peduncles 2–4 cm long; panicles pyramidal, 6.5–14 × 5–12 cm excluding corollas, secondary axes 5–12 pairs, with flowers subsessile to shortly pedicellate together in cymules of 5–11; bracts narrowly triangular to deltoid or ovate, acute, those subtending secondary axes 3–8 mm long, those subtending pedicels 1–3 mm long; pedicels 0.5–4 mm long; peduncle, axes, bracts, and pedicels moderately to densely hirtellous, yellow or greenish yellow; *flowers* with hypanthium hirtellous, turbinate to cylindrical, 1–1.5 mm long; *calyx* limb hirtellous, 1–1.2 mm long, divided for ca. $\frac{1}{2}$, lobes deltoid; *corolla* tubular to somewhat funnelform, yellow or greenish yellow to red, a little swollen at base, generally straight there, straight to curved in tube, externally moderately to densely hirtellous with trichomes to 0.5 mm long, in bud more densely so on lower part of tube, internally glabrous except for a villous ring ca. 1 mm wide at ca. $\frac{1}{3}$ of length of tube above base, tube ca. 7 mm long, 1.5–2 mm diam. near middle, lobes deltoid, ca. 1.5 mm long, at apex somewhat thickened abaxially; *anthers* in short-styled form ca. 2 mm long, partially exerted; *stigmas* in short-styled form ca. 2 mm long, positioned at ca. $\frac{3}{4}$ of length of tube above base; *disk* ca. 0.8 mm high. *Infructescences* similar to inflorescences; *fruit* ellipsoid, often somewhat flattened laterally, ca. 5 × 4 mm; *pyrenes* with 3–5 low rounded longitudinal ridges. Wet forest at 2600–3400 m, southern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 4, Subser. f.]

This species is distinguished by its dense hirtellous pubescence, stipules with truncate, continuous sheaths that are usually costate on the angles, subcoriaceous leaves, yellow inflorescences and flowers, rather long floral bracts, corollas with tubes ca. 7 mm long and hirtellous externally, and ellipsoid laterally flattened fruits. It is similar to *Palicourea azurea*, which has blue to purple corollas with tubes 15–16 mm long. The well-developed stipule sheaths with costate angles are similar to

those of *P. flavescens*. This species is named in honor of Ecuadorian botanist Jaime Jaramillo, who has collected extensively in Ecuador and contributed significantly to our knowledge of the flora of this country.

Paratypes. ECUADOR. **Loja:** carretera Loja-Zamora, desde el Km 16 al 24, Jaramillo & Winnerskjold 5784 (AAU); Loja-Saraguro, Km 58, turnoff towards Fierro Urco, Km 1–2, 03°41'49"S, 79°16'22"W, Jørgensen *et al.* 483 (MO); road Pichig-Fierro Urco, Km 11 (ca. 15 km SW of Saraguro), 03°41'S, 79°20'W, Madsen 85448 (AAU); ca. 10 km SW of Loja, along road past University towards La Violeta, van der Werff & Palacios 9074 (MO). **Zamora-Chinchi:** road Loja-Zamora, Km 14, 04°S, 79°00'W, Holm-Nielsen *et al.* 3959 (AAU, S).

Palicourea lugoana C. M. Taylor, sp. nov. TYPE: Ecuador. Pastaza: Mera, 4 Mar. 1940, M. Lugo 14 (holotype, S). Figure 4E.

Haec species a congeneris folii costa prominente adaxialiter canaliculata, lobulis stipularibus ex obtusis rotundatis, limbo calycino 0.3–0.9 mm longo atque corolla flava valde gibbosa curvataque distinguitur.

Flowering at 1.3 m tall, to 6 m tall; stems glabrous. *Leaves* paired; *blades* elliptic to elliptic-oblong, 7.5–23 × 4–12 cm, at apex acute to shortly acuminate with deltoid tips 3–5 mm long, at base cuneate to obtuse, papyraceous, glabrous on both surfaces; secondary veins 9–17 pairs, spreading, broadly curved, usually extending to unite with margins at least in distal part of blade, with 1–2(3) intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous and narrowly to broadly canaliculate, secondary veins thinly prominulous, and minor venation reticulated and plane, abaxially costa prominulous to prominent, secondary veins plane to thickened, and minor venation plane; margins thinly cartilaginous, entire; *petioles* 1.5–3.5 cm long; *stipules* glabrous, laminar, ovate to ligulate in outline, laterally rounded and overlapping, 5–10 mm long, bilobed for ca. 1/3–1/2, lobes ligulate to triangular, obtuse to rounded, with sinus concave, minutely ciliate. *Inflorescences* erect, sometimes tripartite and appearing sessile; peduncles 2.5–4.5 cm long; panicles pyramidal, 10.5–21 × 11–25 cm excluding corollas, with secondary axes 8–12 pairs, the basal pair typically 1.5–2 times as long as the next pair, with flowers pedicellate in cymes of 3–7; bracts narrowly triangular, acute, those subtending secondary axes 2–6 mm long, those subtending pedicels 1–2 mm long; pedicels (2)4–8 mm long; peduncle, axes, bracts, and pedicels moderately puberulous to short-pilosulous, yellow; *flowers* distylous, with hypanthium turbinate, slender, puberulous to glabrous, ca. 1 mm long; *calyx* limb glabrous to

puberulous, 0.3–0.9 mm long, divided nearly to completely to base, lobes slightly to strongly unequal on an individual flower, lanceolate to triangular, acute to obtuse, entire; *corolla* funnelform, yellow, strongly gibbous and swollen at base, strongly constricted and bent to 90° just above this, generally straight in tube, externally glabrous, internally glabrous except for a narrow pilose ring at the constriction, tube 8–10 mm long, ca. 2 mm diam. near middle, lobes deltoid to triangular, 2–2.5 mm long, acute; *anthers* in long-styled form ca. 1.3 mm long, included, positioned in upper 1/3 of tube, in short-styled form partially exerted, ca. 1.3 mm long; *stigmas* in long-styled form ca. 0.8 mm long, exerted, in short-styled form ca. 1.5 mm long, positioned near middle of tube; *disk* ca. 0.8 mm long. *Infructescences* similar to inflorescences; *fruit* obovoid, somewhat flattened laterally, ca. 5 × 4.5 mm, glabrous; *pyrenes* with 3–5 low rounded longitudinal ridges. Wet forest at 1160–1380 m in central Ecuador, to 2000 m in northwestern Colombia. [Subg. *Montanae*, Sect. *Obovoideae*, Ser. 6.]

This species is distinguished by its leaves adaxially with secondary veins prominulous and costa prominulous to prominent and canaliculate, laminar stipules that are divided for ca. 1/3–1/2 of their interpetiolar length with lobes obtuse to rounded, pyramidal yellow inflorescences, calyx limb 0.3–0.9 mm long and lobed nearly or completely to base, corollas strongly gibbous at base and bent and constricted just above this, and obovoid fruits. It is similar to *Palicourea gibbosa*, which has stipules that are divided for 1/2 or more of their interpetiolar length and with acute lobes, leaves with generally longer and more slender tips and the costa not canaliculate adaxially, generally smaller inflorescences with shorter peduncles, and longer calyx limb; and to *P. asplundii*, which has calyx limbs 2–2.8 mm long. The specific epithet honors Ecuadorian plant collectors Manuel and Holguer Lugo, who have helped to document much of the Ecuadorian flora with excellent specimens.

Paratypes. COLOMBIA. **Antioquia:** municipio Frontino, region of Murri, ca. 13 road-km from Nutibara, 06°40'N, 76°20'W, McPherson 13368 (MO). ECUADOR. **Pastaza:** cantón Pastaza, along road between Puyo and Baños, ca. 3 km W of Mera at second bridge, Croat 49714 (MO); along road between Mera and Río Anzu, 11.7 km N of main plaza in Mera, 01°20'W, 78°06'W, Croat 73584 (MO); Mera, Mangayacu, Harling 3189 (S); Mera, Harling 3395 (S).

Palicourea luteonivea C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: Puerto Misahuallí, 8 km río abajo, margen derecha del río Napo, Reserva Florística Jatún Sacha, 01°04'S,

77°36'W, 2 Oct. 1986, J. Zaruma 776 (holotype, MO-3596709; isotypes, AAU, GB, QAME). Figure 6D, E.

Haec species a *Palicourea thyrsiflora* inflorescentiae ramis luteis atque corolla alba distinguitur.

Flowering at 3 m tall, to 6 m tall; stems glabrous. *Leaves* paired; *blades* elliptic to elliptic-oblong, 10–22 × 2.5–8 cm, at apex acuminate with slender tips 1–1.5 cm long, at base cuneate to obtuse or somewhat rounded, papyraceous, adaxially glabrous, abaxially puberulous especially on costa and secondary veins; secondary veins 9–12 pairs, usually looping widely to interconnect near margins, with 1–3 intersecondary veins usually present between pairs of secondary veins, adaxially costa prominulous and remaining venation reticulated and raised, abaxially costa prominulous to prominent, secondary veins prominulous, and minor venation raised; margins thinly cartilaginous; *petioles* 1–2 cm long, glabrous; *stipules* glabrous, united around the stem in a continuous truncate sheath 1.5–3 mm long, lobes deltoid to ligulate, 1–1.5 mm long, acute to obtuse, entire. *Inflorescences* erect, often tripartite and apparently sessile; peduncles 4.5–10 cm long; panicles pyramidal, 10.5–15 × 10–16 cm excluding corollas, with secondary axes 5–8 pairs, with flowers pedicellate in cymes of 3–9; bracts triangular to narrowly so, acute, entire to ciliolate, those subtending secondary axes 3–5 mm long, those subtending or borne along pedicels 0.3–1 mm long; pedicels 2–4 mm long; peduncle, axes, bracts, and pedicels glabrous, yellow; *flowers* apparently distylous, with hypanthium turbinate to ellipsoid, somewhat flattened, glabrous, ca. 1 mm long; *calyx* limb glabrous, 0.5–1 mm long, divided for ¼–½ of its length, lobes deltoid, entire to ciliolate; *corolla* tubular, white, at base swollen and somewhat gibbous, somewhat bent there, generally straight in tube, externally glabrous, internally glabrous except for a pilose ring ca. 1.5 mm wide just above basal swelling, tube ca. 11 mm long, ca. 2.5 mm diam. near middle, lobes triangular, 2.5–3 mm long, acute, sometimes somewhat thickened at apex; *anthers* in long-styled form included, positioned at ca. ¾ of length of tube above base, ca. 2.5 mm long; *stigmas* in long-styled form exerted, ca. 0.8–1 mm long; *disk* ca. 1 mm high. *Infructescences* apparently similar to inflorescences; *fruit* ellipsoid to somewhat obovoid, laterally flattened, ca. 4 × 4.5 mm; *pyrenes* with low angled longitudinal ridges. Wet forest at 450–1440 m, southern Colombia to Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its stipules with

continuous truncate sheaths and relatively short lobes, pyramidal yellow inflorescences, relatively short, shallowly lobed calyx limb, and white corollas. It is similar to *Palicourea thyrsiflora*, which has yellow to orange or red inflorescence branches and corollas. One fruiting specimen, Jørgensen 56420, is provisionally placed here; if this is correct, then *P. luteonivea* also differs from *P. thyrsiflora* in its ellipsoid to somewhat obovoid fruits with less marked ridges. *Palicourea luteonivea* may represent only a distinctive color form of *P. thyrsiflora*, but the consistent color differences support its recognition. The specific epithet refers to this distinctive combination of yellow inflorescence branches and white corollas. *Palicourea luteonivea* is also similar to *P. petiolaris* and *P. leuconeura*, with similarly colored flowers and inflorescences, but these latter species can be separated by their funnellform corollas that are bent strongly, to as much at 90°, in the lower part of the tube.

Paratypes. COLOMBIA. **Caquetá**: municipio de Florencia, carretera Florencia-Suaeza, Km 28, vereda "Las Brisas," 01°36'N, 75°37'W, Ramírez et al. 4984 (JAUM, MO). ECUADOR. **Morona-Santiago**: eastern slopes of the Cordillera, valley of Ríos Negro and Chupianza (on trail from Sevilla de Oro to Méndez), Camp 829 (S); Cordillera Cutucú, ridge just S and W of Río Itzintza, ca. 02°40'S, 78°W, Camp 1292 (S); road Limón-La Unión, Km 10–12, Harling 26048 (GB); Bomboiza, Misión Salesiana Shuar, 03°25'S, 78°35'W, Neill et al. 7401 (MO). **Zamora-Chinchipe**: Valladolid, track NW of village, 04°34'S, 79°08'W, Jørgensen 56420 (AAU); Nangaritza, Pachicutza, camino al Hito, Cordillera del Cóndor, 04°07'S, 78°37'W, Palacios et al. 8348 (MO, QCNE).

Palicourea prodiga Standley ex C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: cantón de Quijos, margen derecha del Río Cosanga, 3 km arriba del puente de Cosanga, 00°36'S, 77°52'W, 18 Oct. 1990, W. Palacios 6385 (holotype, MO-5006739; isotype, QCNE not seen). Figure 6F, G.

Haec species a *Palicourea flavescente* foliis stipulisque sat amplis, partibus omnibus pubescentia densa vestitis atque inflorescentia floribusque luteis distinguitur.

Flowering at 2 m tall, to 4 m tall; stems densely hirtellous to usually hirsute. *Leaves* paired; *blades* elliptic to somewhat broadly so, 13.5–28 × 6.5–18 cm, at apex acuminate with deltoid to slender tips 8–25 mm long, at base cuneate to obtuse or rounded, papyraceous, hirtellous throughout, usually more densely so on costa and secondary veins; secondary veins 19–27 pairs, spreading, broadly curved, generally extending to unite with margins, with 1–3 intersecondary veins usually present between pairs of secondary veins, adaxially venation generally plane, abaxially costa prominent, second-

ary veins prominulous, and reticulated minor venation plane to usually thickened; margins thinly cartilaginous, sparsely to moderately ciliate; *petioles* 1–3.8 cm long, hirtellous to hirsute; *stipules* moderately to densely hirtellous to usually hirsute, united around the stem in a continuous truncate sheath 8–22 mm long, this generally quadrate, costate on the angles, weaker in interpetiolar portions and frequently splitting there, the costate angles terminating in narrowly triangular to linear lobes 6–10 mm long, acute. *Inflorescences* erect; peduncles 3.5–7 cm long; panicles pyramidal, 10–19 × 7.5–19 cm excluding corollas, with secondary axes 8–10 pairs, with flowers pedicellate in cymes of 5–11; bracts triangular to narrowly so or lanceolate, obtuse to acute, entire to ciliolate, those subtending secondary axes 2–16 mm long, those subtending pedicels 1–2 mm long; pedicels 1–3 mm long; peduncle, axes, bracts, and pedicels densely pilosulous to hirtellous, pale green to yellow; *flowers* distylous, with hypanthium turbinate, sparsely hirtellous, ca. 1 mm long; *calyx* limb sparsely to moderately hirtellous, 0.8–1.2 mm long, divided for $\frac{1}{2}$ – $\frac{2}{3}$, lobes triangular to deltoid, acute, ciliolate; *corolla* funnellform, yellow, a little swollen at base, generally straight there, straight to slightly curved in tube, externally sparsely to moderately hirtellous, internally glabrous except for a pilose ring ca. 0.5 mm wide at ca. $\frac{1}{3}$ of length of tube above base, tube 5–6 mm long, ca. 1.5 mm diam. near middle, lobes triangular to ligulate, 2.5–3 mm long, acute; *anthers* in long-styled form ca. 1.2 mm long, just included, in short-styled form ca. 1.5 mm long, exerted; *stigmas* in long-styled form ca. 1 mm long, exerted, in short-styled form ca. 2.5 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base; *disk* ca. 1 mm high. *Infructescences* similar to inflorescences except color unknown; young *fruit* ellipsoid, perhaps somewhat flattened laterally, ca. 4.5 × 4.5 mm; *pyrenes* with 3–5 low rounded longitudinal ridges. Wet forests at 2100–2900 m, central Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. d.]

This species is distinguished by its relatively large leaves, relatively large stipules with costate quadrate sheaths and narrow lobes, dense pubescence on all parts, yellow inflorescences, and yellow relatively short corollas. The corollas appear to be unusually short for *Palicourea*, but while those of one specimen (Ownbey 2663) are 5–6 mm long, the collection notes describe the tubes in the field as “12 mm long,” indicating that the corollas of this species shrink significantly when dried. *Palicourea prodiga* is similar to *P. flavescens*, which has smaller leaves and stipules, pilosulous rather than hir-

tellous or hirsute pubescence, flowers white to yellow becoming blue when old, and a generally higher elevational range, 2785–3200 m. This specific epithet was proposed by Standley in sched. but never published; it apparently refers to the unusually large leaves and stipules. Standley also wrote this name on several specimens that are here excluded from *P. prodiga*, in particular specimens of a purple-flowered plant from Peru with somewhat spathaceous stipules.

Paratypes. ECUADOR. **Napo:** slopes of Guagra Urcu, on the loma above upper Río Borja, 00°28'S, 77°44'W, Holm-Nielsen et al. 27026 (AAU); upper slopes of Guagra Urcu, 00°28'S, 77°44'W, Holm-Nielsen et al. 27163 (AAU), 27250 (AAU); Guagra Urcu, the pass between Río Borja and Río Suno, 00°28'S, 77°43'W, Holm-Nielsen et al. 27295 (AAU); upper Río Suno, near Guagra Urcu, 00°28'S, 77°42'W, Holm-Nielsen et al. 27525 (AAU), 27550 (AAU); Quijos River region below Baeza, region of Río San Juan, 15 km NW of Chaco, Ownbey 2663 (MO).

***Palicourea subalatoidea* C. M. Taylor, sp. nov.**

TYPE: Ecuador. Pastaza: Misahuallí to Tena to Puyo to Mera, along road 65 km S of Tena, 01°05'–29°S, 78°00'W, 19 Dec. 1986, B. Hammel 16026 (holotype, MO-4990805). Figure 4A, B.

Haec species a congeneris stipularum vaginis truncatis ac lobulis bene evolutis lateraliter convexis, inflorescentia rotundato-corymbiformi ex rubra lutea, pedicello et limbo calycino bene evolutis atque corolla carnosa tubulari distinguitur.

Flowering at 1 m tall, to 8 m tall; stems with angles sharp to somewhat costate or shortly winged, glabrous to sparsely hirtellous. *Leaves* paired; *blades* elliptic, 5–22 × 2.5–8.2 cm, at apex acute to usually acuminate with slender tips 5–15 mm long, at base cuneate to acute and sometimes attenuate, papyraceous, adaxially glabrous, abaxially glabrous to sparsely hirtellous; secondary veins 7–21 pairs, usually extending at least weakly to margins, with 1(3) rather weak intersecondary veins usually present between pairs of secondary veins, adaxially costa thinly prominulous and remaining venation plane to a little thickened, abaxially costa prominent, secondary veins prominulous, and lesser venation plane to thickened; margins thinly cartilaginous; *petioles* glabrous to sparsely hirtellous, 4–10 mm long; *stipules* glabrous to sparsely hirtellous, united around the stem in a continuous truncate sheath 1.5–4 mm long, lobes triangular to slightly lanceolate, 4–16 mm long, acute, entire. *Inflorescences* erect, sometimes tripartite and apparently sessile; peduncles 1–8 cm long; panicles rounded-corymbiform, 1.5–6.5 × 2.5–9.5 cm excluding corollas, with secondary axes 2–4 pairs, as-

ending and usually equal to or exceeding the axis, with flowers pedicellate in cymes of 2–7; bracts entire, those subtending primary branches 5–10 mm long, triangular to lanceolate, acute, often with two short acute lobes at base, those subtending pedicels 1–3.5 mm long, narrowly triangular to lanceolate or oblanceolate, acute to obtuse; pedicels 3–10 mm long; peduncle, axes, bracts, and pedicels glabrous, red to orange or yellow; flowers distylous, with hypanthium cylindrical to cupuliform, glabrous, ca. 1.5 mm long; calyx limb glabrous, 2–3 mm long, divided for ca. $\frac{2}{3}$ – $\frac{3}{4}$ its length, lobes ovate to elliptic or suborbicular, slightly imbricated, entire, obtuse to rounded; corolla tubular, yellow, slightly swollen and asymmetric at base, generally straight there and in tube, carinose, externally glabrous, internally glabrous except for a pilose ring ca. 2 mm wide at ca. $\frac{1}{3}$ of length of tube above base, tube ca. 15 mm long, ca. 5 mm diam. near middle, lobes triangular to deltoid, ca. 1.5 mm long, acute, at apex a little thickened; anthers in long-styled form ca. 3.5 mm long, positioned ca. $\frac{2}{3}$ of length of tube above base, in short-styled form ca. 3.5 mm long, partially exerted; stigmas not seen; disk ca. 1 mm high. Young infructescences similar to inflorescences; young fruit subglobose to obovoid, ca. 5 × 5 mm, glabrous; pyrenes with very low, perhaps rather sharp longitudinal ridges. Wet forest at 800–1160 m, eastern slopes of Andes in central to southern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its stipules with relatively well-developed, truncate sheaths and well-developed triangular to lanceolate lobes, rounded-corymbiform red to yellow inflorescences, well-developed pedicels and calyx limb, and carinose tubular corollas. It is similar to *Palicourea subalata*, which has narrowly triangular stipule lobes 2–6.5 mm long, calyx limb 0.5–1.5 mm long with narrowly triangular lobes that are unequal on an individual flower, and less carinose corollas with lobes that are thickened abaxially at apex. The specific epithet refers to this similarity. The corollas appear to elongate in the tube markedly shortly before anthesis.

Paratypes. ECUADOR. **Morona-Santiago:** 2–4 km N of Arapicos, Lugo 5955 (GB, MO); 2–6 km S of Arapicos, Lugo 5989 (GB, MO). **Napo:** cantón Gonzalo Pizarro, río Tigre, afluente del río Dashiño, de la carretera Lumbaqui-Reventador, Km 73, 10 km al S, 00°05'S, 77°24'W, Neill & Palacios 7666 (MO). **Pastaza:** Mera, Asplund 18928 (S); along road between Puyo and Diez de Agosto and Arajuno, 18 km NE of main Puyo-Macas road (beginning 3.7 km from center of Puyo at Hotel Europa), 8.2 km NE of Diez de Agosto, 01°27'S, 77°51'W, Croat 59024 (MO); cantón Pastaza, between Shell and Mera, 5.3 km NW of

center of Shell, along gravel road 1.1 km N of highway, 01°27'S, 78°04'W, Croat 73527 (MO); Shell-Mera, Fagerlind & Wibom s.n. (S); 3.5 km N of Puyo, Fagerlind & Wibom 1193 (S); 2 km from Puyo, road to Tena, Harling 3235 (S); Mera, Allpayacu, Harling 3342 (S); Mera, Harling 3728 (S); Puyo-Puerto Napo road, San José ca. 17 km NE of Puyo, Harling & Andersson 17107 (GB); ca. 18 km E of town of Río Negro towards Puyo, Humbles 6103 (MO); Puyo-Macas road, 5 km after Veracruz, 01°33'S, 77°54'W, Jørgensen & Løgaard 56476 (AAU); Canelos, Lugo 4493 (GB, MO); 10–20 km N of Canelos, Lugo 4579 (GB, MO); Puyopungo-Pomona, ca. 3 km E of Puyopungo, Lugo 5124 (GB, MO); Hacienda San Antonio de Barón von Humboldt, 2 km al NE de Mera, 01°27'S, 78°06'W, Neill et al. 6117 (MO); Madre Tierra, between Hacienda Zulay and Río Pastaza, 01°34'S, 78°02'W, Øllgaard 99587 (AAU); 5 km al NE de Mera, carretera al río Anzu, 01°26'S, 78°06'W, Palacios et al. 171 (MO); Km 10 on Puyo-Puerto Napo road, 01°25'S, 78°00'W, Stein 2994 (MO).

Palicourea subtomentosa (Ruiz & Pav.) C. M. Taylor, comb. nov. Basionym: *Psychotria subtomentosa* Ruiz & Pav., Fl. peruv. 2: 61, t. 210, fig. a. 1799. *Cephaelis subtomentosa* (Ruiz & Pav.) Spreng., Syst. veg. 1: 749. 1825. TYPE: Peru. Huánuco: “in Peruviae Andinae montibus nemorosis ad Chinchao, Mesapata et Maychainio runctiones, fl. Jun et Jul,” Ruiz & Pavón s.n. [type, MA not seen photo (Rockefeller/F neg. # 29657) MO].

Palicourea subtomentosa is distinguished by its usually relatively small vegetative parts with pilosulous to hirtellous pubescence throughout, broadly pyramidal to rounded inflorescences, and pilosulous funnellform corollas with tubes 6–10 mm long. It is similar to *P. buchtienii*, and these two species were apparently confused by Standley in his original description of that species. *Palicourea buchtienii* is distinguished from *P. subtomentosa* by its glabrescent leaves, white to yellow corollas that are moderately pilosulous to glabrous externally with tubes 11–14 mm long and lobes with cylindrical abaxial appendages 0.3–0.8 mm long, and yellow inflorescence branches; in the areas where *P. buchtienii* and *P. subtomentosa* both grow, *P. subtomentosa* has blue flowers and inflorescences. Standley (1936) treated *Psychotria subtomentosa* as a poorly known species of *Psychotria* that was narrowly endemic in Peru, apparently overlooking the pilose ring inside the poorly preserved corollas on the specimens that he examined. Based on this feature and supported by the colored inflorescences and corollas, this species is here transferred to *Palicourea*. Two subspecies of *Palicourea tomentosa* are here distinguished:

1. Inflorescences blue to purple or lavender with the

internodes of the primary axis usually at least shortly developed; corollas blue to purple or lavender, or white with blue or purple trichomes; northern Peru to central Bolivia, in cloud forest at 1900–3400 m.

..... *Palicourea subtomentosa* subsp. *subtomentosa*

1. Inflorescences yellow, with the internodes of the primary axis usually hardly developed; corollas yellow to white with the trichomes not colored or perhaps yellow; southern Ecuador, in wet forest at 2210–2700 m.

..... *Palicourea subtomentosa* subsp. *lojana*

***Palicourea subtomentosa* subsp. *lojana* C. M.**

Taylor, subsp. nov. TYPE: Ecuador. Zamora-Chinchipe: above Valladolid on road to Yangana, 2300 m, 1 Feb. 1985, G. Harling & L. Andersson 21367 (holotype, MO-4278926; isotype, GB). Figure 2B.

Haec subspecies a subspecie typica inflorescentiae ramis luteis atque corolla ex lutea alba differt; in Aequitoris australi tantum crescit.

Flowering at 0.5 m tall, to 5 m tall; stems sometimes weak to clambering, often suffrutescent, moderately to usually densely pilosulous to hirtellous. *Leaves* paired; *blades* elliptic, 4–15 × 1.2–6 cm, at apex acute to infrequently acuminate with tips ca. 5 mm long, at base acute to infrequently cuneate, papyraceous, moderately to densely pilosulous throughout, usually more densely so on costa and secondary veins; secondary veins 5–15 pairs, usually uniting with margins or infrequently looping to interconnect, without or sometimes with 1–2 weak intersecondary veins present between pairs of secondary veins, adaxially venation plane or costa slightly raised, abaxially costa and secondary veins prominulous and minor venation plane or thickened; margins thinly cartilaginous, entire; *petioles* moderately to densely hirtellous or pilosulous, 3–12 mm long; *stipules* moderately to densely hirtellous to pilosulous, united around the stem in a continuous sheath 1.5–3 mm long, lobes narrowly triangular, 1.5–3 mm long, acute, entire to slightly erose, with sinus concave to subtruncate. *Inflorescences* erect or perhaps somewhat deflexed; peduncles 2.5–4.5 cm long; panicles broadly pyramidal to usually broadly rounded, 1.5–3 × 3–5 cm, with secondary axes 1–3 pairs, with lower internodes of primary axis shortly or hardly expanded and secondary axes appearing subverticillate, with flowers sessile to shortly pedicellate together in cymes of 5–7; bracts narrowly triangular to linear, acute, those subtending secondary axes 3–6 mm long, those subtending flowers 0.8–2 mm long; pedicels 0–2.5 mm long; peduncle, axes, bracts, and pedicels moderately to densely pilosulous to hirtellous, yellow; *flowers* distylous, with hypanthium turbinate

to cylindrical, moderately to usually densely pilosulous, 0.6–1 mm long; *calyx* limb moderately to densely pilosulous, 0.6–1.2 mm long, lobed for ca. ½–⅔, lobes deltoid to narrowly triangular or ovate, acute, sometimes unequal on an individual flower; *corollas* funnelform, white to yellow, slightly swollen at base, straight there and in tube, externally densely pilosulous with trichomes often blue or purple, internally glabrous except for a rather diffuse villous ring ca. 2 mm wide, tube 6–10 mm long, 1.1–1.2 mm diam. near middle, lobes triangular, 1.2–2 mm long, at apex smooth or sometimes with thickened projections to ca. 0.3 mm long abaxially; *anthers* in short-styled form ca. 3 mm long, partially exerted; *stigmas* in short-styled form ca. 1.5 mm long, positioned near middle of tube, in long-styled form ca. 0.3 mm long, exerted; *disk* 0.8–1 mm long. *Infructescences* similar to inflorescences or often with internodes of primary axis expanding; *fruit* ellipsoid, 5–6 × 4.5–5 mm, laterally flattened, pilosulous, blue; *pyrenes* with 3–5 distinct longitudinal angles. Wet forest at 2210–2700 m, southern Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

Plants from southern Ecuador differ from plants of Peru and Bolivia only in this separate geographic range and their inflorescence development and inflorescence and corolla colors, which are yellow rather than blue to purple. No other features separate these two populations, nor is any gradual variation evident between them. Therefore, the plants from Ecuador are here recognized as a separate subspecies. The subspecific epithet commemorates the city and province of Loja, in the region from which this subspecies is known.

Paratypes. ECUADOR. **Loja**: Nudo de Sabanilla, northern part, Harling et al. 20570 (GB, MO); Nudo de Sabanilla, western slope on road Yangana-Valladolid, Harling & Andersson 21789 (GB); Nudo de Sabanilla, western slope, ca. 10 km above Yangana on road to Valladolid, Harling & Andersson 23620 (GB); Cerro Toledo, road to “La Torre” ca. 7 km SE of Yangana, Harling & Andersson 23825 (GB, MO); Cerro Bangala, ca. 10 km E of Yangana, Harling 25328 (GB). **Zamora-Chinchipe**: cantón Zamora, Podocarpus National Park near El Tambo, 40 km NW of Zamora on road to Loja, 03°58’S, 79°07’W, Gentry 79947 (MO).

***Palicourea ulloana* C. M. Taylor, sp. nov. TYPE:**

Ecuador. Morona-Santiago: 17–18 km N of Gualaquiza on road to Indanza, 17 Apr. 1985, G. Harling & L. Andersson 24226 (holotype, GB; isotype, MO-4278740). Figure 5A, B, C.

Haec species a congeneris stipularum vaginis membranaceis truncatis ac lobis cartilagineis coarctatis, inflorescentia ex anguste pyramidalis cylindrica, limbo calycino

0.8–2.2 mm longo, corollae roseae rubraeve tubo 8–13 mm longo atque fructu pyrenas quattuor continente distinguitur.

Flowering at 0.5 m tall, to 2 m tall; stems often weak or clambering, moderately to densely hirsutulous sometimes becoming glabrescent with age. *Leaves* paired, *blades* elliptic, 4.5–14 × 1.4–5 cm, at apex acuminate with slender tips 0.8–1.8 cm long, at base acute to cuneate, papyraceous, adaxially glabrous or sparsely hirtellous along midrib, abaxially glabrous or moderately to densely hirtellous along midrib and sometimes on secondary veins; secondary veins 10–12 pairs, extending to unite with margins, with 1–2(3) intersecondary veins present between pairs of secondary veins, adaxially costa thinly prominulous, secondary veins thickened to prominulous, and reticulated minor venation plane to thickened, abaxially costa prominent, secondary veins prominulous, and minor venation plane to thickened; margins thinly to strongly cartilaginous; *petioles* glabrous to hirtellous, 3–10 mm long; *stipules* glabrous to hirtellous, united around the stem in a membranaceous, truncate sheath 1–2.5 mm long, sometimes splitting intrapetiolarly, interpetiolarly with a cartilaginous triangular portion 2–3 mm long, this costate on margins and terminating in 2 closely set lobes 2–3.5 mm long, narrowly triangular, acute, entire to usually ciliate. *Inflorescences* deflexed to pendulous; peduncles 3–9 cm long; panicles narrowly pyramidal to cylindrical, 3.5–10.5 × 2–3 cm excluding corollas, with secondary axes 4–8 pairs, not much developed, usually terminating in 1 cymule or solitary flowers, with flowers pedicellate in lax cymules of 2–3; bracts triangular to narrowly so, entire to ciliate, acute, those subtending secondary axes 2–5 mm long, those subtending pedicels 1–3 mm long; pedicels 3–7 mm long; peduncle, axes, bracts, and pedicels glabrous to densely hirtellous, purple to red; *flowers* distylous, with hypanthium glabrous, ca. 1 mm long, turbinate to cupuliform; *calyx* limb glabrous, 0.8–2.2 mm long, divided nearly to completely to base, lobes narrowly triangular to narrowly ligulate, subequal to usually strongly unequal on an individual flower, acute, entire or ciliate; *corolla* tubular to somewhat funnelform, red to pink or purple, slightly swollen at base, somewhat to strongly bent there, straight in tube, externally glabrous, internally glabrous except for a pilose ring ca. 1 mm wide at ca. ¼ of length of tube above base, tube 8–13 mm long, 2.5–4 mm diam. near middle, lobes 2–3 mm long, acute, triangular, a little thickened at apex; *anthers* in long-styled form ca. 3 mm long, positioned ca. ⅔ of length of tube above base, in short-styled form ca. 3 mm long,

partially exerted; *stigmas* 4, in long-styled form ca. 1 mm long and just exerted, in short-styled form not seen; *disk* ca. 0.8 mm high. *Infructescences* similar to inflorescences; *fruit* oblate, ca. 4 × 3 mm, glabrous, blue; *pyrenes* 4, triangular with outer surface rounded, smooth. Wet and cloud forest at 1900–2600 m, north-central Ecuador to northern Peru. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its leaves with the secondary veins usually extending to the margins, which are rather thickened, its unusual stipules with a triangular cartilaginous portion terminating in closely set narrow lobes, narrowly pyramidal to cylindrical inflorescences with the branches simple, calyx limb 0.8–2.2 mm long with the lobes often strongly unequal on an individual flower, pink to red tubular to somewhat funnelform corollas, and oblate fruit with four pyrenes that are smooth on the outer surface. The four pyrenes and stigma lobes are unique in subgenus *Montanae*; the unusual stipule morphology resembles that of *Palicourea vulcanalis*. *Palicourea ulloana* is similar in aspect to *P. myrtifolia*, which has laminar stipules with broader lobes and corollas with tubes that are 5–9 mm long and gibbous and strongly bent at the base; and to *P. calantha*, which has calyx limbs 0.8 mm long and corollas yellow. This distinctive, attractive species is named in honor of Ecuadorian botanist Carmen Ulloa Ulloa, whose work has contributed significantly to our knowledge of the montane regions where *P. ulloana* lives.

Paratypes. ECUADOR. **Morona-Santiago**: road from Limón (General Plaza) to Cuenca, ca. 4 km above Plan del Milagro, 03°00'S, 78°30'–40'W, Stein 2833 (MO). **Napo**: cantón Quijos, Sierra Azul (Agrícola Industrial Río Aragón), colinas de Tundal, 00°40'S, 77°54'W, Alvarez et al. 309 (MO, QCNE), 339 (MO, QCNE); cantón Quijos, parroquia de Baeza, comunidad de Santa Lucía de Bermejo, 00°31'S, 77°55'W, Alvarez et al. 968B (MO, QCNE); slopes of Guagra Urcu, on loma above upper Río Borja, 00°28'S, 77°44'W, Holm-Nielsen et al. 26995 (AAU); carretera Baeza-Tena, a 17 km de Baeza en la localidad de Logma Playa, Jaramillo et al. 12216 (GB); Quijos river region below Baeza, region of Río San Juan 15 km NW of Chaco, Ownbey 2662 (MO); Archidona-Tena region, S of Río Parro, Cordillera de Guacamayos, W of Tena, Ownbey 2740 (MO); cantón Quijos, Cosanga, Hacienda Guacamayos, Río Cosanga, microcuenca del Río Vinillos, 00°36'S, 77°51'S, Palacios & Freire 5034 (MO). **Tungurahua**: El Mirador, Sierra de León, valley of Río Pastaza below Baños, Steere & Camp 8274 (F). **Zamora-Chinipe**: Nudo de Sabanilla-Valladolid, horse-trail to Caserio Quebrada Honda, Harling 27144 (GB), 27177 (S); new road Loja-Zamora, trail to Podocarpus patch at Quebrada del Diablo, van der Werff & Palacios 9241 (MO), 9240 (MO). PERU. **Amazonas**: Bagua province, ca. 20 km (by trail) E of La Peca, Barbour 2818 (MO); Bagua

province, Cordillera Colán SE of La Peca, Barbour 4161 (MO).

Palicourea vulcanalis Standl. ex C. M. Taylor, sp. nov. TYPE: Ecuador. Napo: Cordillera de Guacamayos above Urcusiqui on trail between Baeza and Tena, 6000 ft., 11 Mar. 1944, M. Ownbey 2699 (holotype, F-1150284; isotype, MO-1600100). Figure 6B, C.

Haec species a congeneris stipularum vaginis bene evolutis ac lobulis coarctatis anguste lanceolatis 12–15 mm longis unoquoque glandulam ad basim gerente distinguitur.

Shrubs, height not recorded; stems glabrous or puberulous becoming glabrescent with age. *Leaves* paired; *blades* elliptic, 11.5–20 × 3–7.8 cm, at apex acuminate with slender tips 1.5–2 cm long, at base cuneate to acute, papyraceous, adaxially glabrous, abaxially puberulous throughout but more densely so on costa and secondary veins; secondary veins 10–14 pairs, generally looping to interconnect, with 1–2 weak intersecondary veins usually present between pairs of secondary veins, adaxially costa thickened to prominulous and lesser reticulated venation thickened, abaxially costa prominent, secondary veins prominulous, and minor venation thickened; margins thinly cartilaginous, entire; *petioles* glabrous to puberulous, 7–15 mm long; *stipules* glabrous to puberulous, united around the stem in a truncate continuous sheath 7–9 mm long, lobes narrowly to very narrowly lanceolate, 12–15 mm long, 1–2 mm wide near base, finely nerved, acute to acuminate, entire, closely set, each subtended at the leaf-side base by a gland 0.5–1.5 mm long, with sinus acute. *Inflorescences* apparently ascending or perhaps deflexed or with peduncle bent at base; peduncles 2–8 cm long; panicles pyramidal, 5–10.5 × 14–18 cm excluding corollas, with primary axis apparently sometimes flexuous, secondary axes 10–15 pairs, the basalmost frequently reflexed and ca. twice as long as next pair, with flowers pedicellate in cymes of 5–9; bracts narrowly triangular to linear, acute, those subtending secondary axes 6–18 mm long, those subtending flowers 3–6 mm long; pedicels 3–6 mm long; peduncle, axes, bracts, and pedicels puberulous, red; *flowers* with hypanthium glabrous, cylindrical, 1.2–1.5 mm long; *calyx* limb glabrous, 0.8–1.2 mm long, divided for 2/3 to most of its length, lobes lanceolate to ovate, obtuse to acute, often somewhat unequal on an individual flower; *corolla* funnel-form, white, a little swollen at base, generally straight there and in tube, externally glabrous, internally glabrous except for a villous ring ca. 1 mm wide at ca. 1/3 of length of tube above base, tube

ca. 8 mm long, ca. 1.2 mm diam. near middle, lobes triangular to deltoid, 1–1.2 mm long, acute; *anthers* in short-styled form ca. 1.2 mm long, positioned in throat, included or partially exerted; *stigmas* in short-styled form ca. 1.5 mm long, positioned ca. 2/3 of length of tube above base; *disk* ca. 0.5 mm high. *Infructescences* similar to inflorescences except violet; *fruit* ovoid, laterally flattened, ca. 5 × 4.5 mm, glabrous; *pyrenes* with 3–5 smooth angles. Wet forest at 1800–2000 m, east-central Ecuador. [Subg. *Montanae*, Sect. *Montanae*, Ser. 3, Subser. c.]

This species is distinguished by its unusual stipule morphology, with the truncate sheath well developed and the lobes closely set, relatively long and narrow, finely nerved, and each subtended on the leaf side by a gland to as much as 1.5 mm long. This stipule morphology is similar in general aspect to that of *Palicourea toroi* and *P. deviae*, but in both of these latter species the stipules are laminar and the lobes lack well-developed glands at the base. *Palicourea vulcanalis* is also distinguished by its relatively long inflorescences with the lowermost branches usually reflexed and about twice as long as the next pair, relatively long narrow bracts, white corollas with tubes ca. 8 mm long, ovoid laterally flattened fruits, and pyrenes with smooth angles rather than longitudinal ridges. This epithet was applied by Standley to the specimen designated here as the type, but never published; it apparently refers to the habitat of this species, in highlands of volcanic origin.

Paratype. ECUADOR. Napo: cantón El Chaco, margen derecha del río Quijos, Finca "La Ave Brava" de Segundo Pacheco, 00°12'S, 77°39'W, Palacios 5395 (MO).

INDEX TO SPECIES CLASSIFIED

The position of each species in the classification is indicated by the numbers and letters following each name, which correspond to the numbers and letters designating the infraspecific taxa in the classification presented above. Asterisks (*) indicate names published in this work, above.

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Palicourea acanthacea C. M. Taylor II, I, 11
Palicourea acetosoides Wernham II, E, 3, c
Palicourea adusta Standl. II, F, 5
Palicourea affinis Standl. I, C, 2
Palicourea albert-smithii Standl. II, E, 4, e
Palicourea albocaerulea C. M. Taylor II, E, 4, f
Palicourea alpina (Sw.) DC. II, E, 3, c
Palicourea amapaensis Steyererm. I, B
Palicourea amethystina (Ruiz & Pav.) DC. II, E, 4, e
Palicourea amplissima (Standl. ex Steyererm.) C. M. Taylor II, F, 7
Palicourea andaluciana Standl. II, F, 7
Palicourea anderssoniana C. M. Taylor* II, E, 3, c
Palicourea andrei Standl. II, H, 9

- Palicourea angustifolia* Kunth II, E, 3, c
Palicourea aniangwana C. M. Taylor* I, A
Palicourea anisoloba (Müll. Arg.) Boom & M. T. Campos I, c, 2
Palicourea antioquiensis Standl. II, E, 4, f
Palicourea apicata Kunth II, F, 7
Palicourea aschersonianoides (Wernham) Steyerf. II, H, 8
Palicourea asplundii C. M. Taylor* II, F, 6
Palicourea attenuata Rusby I, A
Palicourea azurea C. M. Taylor* II, E, 4, f
Palicourea bella (Standl.) Dwyer II, I, 10
Palicourea bellula C. M. Taylor II, I, 10
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Palicourea bracteosa Standl. I, C, 1, a
Palicourea brenesii Standl. II, E, 4, e
Palicourea buchtienii Standl. II, E, 3, c
Palicourea buntingii Steyerf. I, A
Palicourea calantha Standl. II, E, 3, c
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Palicourea calophlebia Standl. II, E, 4, f
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Palicourea chimboracensis Standl. II, E, 4, e
Palicourea chiriquina Standl. II, F, 5
Palicourea condorica C. M. Taylor* II, I, 11
Palicourea conferta (Benth.) Sandw. I, C, 1, b
Palicourea coriacea Mart. I, C, 1, a
Palicourea corniculata C. M. Taylor* II, E, 3, c
Palicourea cornigera C. M. Taylor* II, E, 4, f
Palicourea corymbifera (Müll. Arg.) Standl. I, D
Palicourea crocea (Sw.) Roem. & Schult. I, C, 1, a
Palicourea croceoides Ham. I, C, 1, a
Palicourea cymosa (Ruiz & Pav.) DC. I, C, 1, b
Palicourea danielis Standl. II, E, 3, c
Palicourea demissa Standl. II, E, 4, e
Palicourea densa Standl. II, E, 4, f
Palicourea denslowiae J. H. Kirkbr. II, E, 4, g
Palicourea deviae C. M. Taylor II, E, 4, e
Palicourea dimorphandrioides C. M. Taylor II, I, 11
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Palicourea guianensis Aubl. I, A
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Palicourea heilbornii Standl. II, E, 4, e
Palicourea herrerae Standl. II, E, 3, c
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Palicourea holmgrenii Standl. II, E, 3, c
Palicourea hospitalis Standl. II, F, 6
Palicourea huberi Steyerf. I, C, 1, a
Palicourea ionantha Standl. II, E, 3, c
Palicourea iquitoensis K. Krause I, C, 1, b
Palicourea irwinii Steyerf. I, D
Palicourea jahnii Standl. II, H, 8
Palicourea jaramilloi C. M. Taylor* II, E, 4, f
Palicourea justicioides Standley II, E, 4, f
Palicourea jatun-sachensis C. M. Taylor I, C, 1, b
Palicourea kalbreyeri Standl. II, F, 6
Palicourea killipii Standl. II, I, 10
Palicourea lachnantha Standl. I, A
Palicourea lancifera Standl. & L. O. Williams II, E, 4, f
Palicourea lancigera Steyerf. I, C, 1, a
Palicourea lasiantha K. Krause I, A
Palicourea lasiophylla Standl. I, C, 1, a
Palicourea lasiorrhachis Oerst. II, F, 5
Palicourea latifolia K. Krause II, E, 4, e
Palicourea lehmannii (Rusby) Standl. II, E, 4, e
Palicourea leucantha Donn. Sm. II, E, 3, c
Palicourea leuconeura Standl. II, H, 8
Palicourea lineariflora Wernham II, H, 9
Palicourea lineata Benth. II, G
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Palicourea longistipulata (Müll. Arg.) Standl. I, C, 1, a
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Palicourea macrantha Loes. II, H, 9
Palicourea macrobotrys (Ruiz & Pav.) DC. I, C, 2
Palicourea macrocalyx Standl. II, E, 4, f
Palicourea mansoana (Müll. Arg.) Standl. I, A
Palicourea marcgravii A. St.-Hil. I, C, 1, a
Palicourea melheana Jung-Mend. I, C, 2
Palicourea mello-barretoii Standl. I, C, 1, a
Palicourea mexiae Standl. II, F, 7
Palicourea montinaga Standl. II, F, 5
Palicourea myrtifolia K. Schum. & K. Krause II, F, 6
Palicourea nigricans K. Krause I, B
Palicourea nitidella (Müll. Arg.) Standl. I, C, 1, a
Palicourea nubigena Standl. II, F, 7
Palicourea obovata (Ruiz & Pav.) DC. II, G
Palicourea obtusata K. Krause II, F, 5
Palicourea ochnoides Dwyer II, I, 10
Palicourea officinalis Mart. I, C, 1, a
Palicourea orosiana C. M. Taylor II, F, 5
Palicourea orquidea C. M. Taylor II, I, 11
Palicourea ovalis Standl. II, E, 4, e
Palicourea pachycalyx Standl. I, A
Palicourea padifolia (Willd. ex Roem. & Schult.) C. M. Taylor & Lorence II, E, 3, c
Palicourea pauciflora Standl. II, F, 7
Palicourea pendula C. M. Taylor II, F, 5
Palicourea pennellii Standl. II, E, 3, c
Palicourea perquadrangularis Wernham II, E, 4, e
Palicourea petiolaris Kunth II, H, 8
Palicourea pittieri Standl. II, H, 8
Palicourea plowmanii C. M. Taylor I, C, 1, b
Palicourea ponasae K. Krause II, E, 3, c
Palicourea prodiga Standl. ex C. M. Taylor* II, E, 3, d
Palicourea psittacorum Standl. II, E, 3, c

Palicourea pulchra Griseb. II, H, 8
Palicourea punicea (Ruiz & Pav.) DC. I, C, 1, b
Palicourea purpurea C. M. Taylor II, E, 4, e
Palicourea quadrifolia (Rudge) DC. I, D
Palicourea quadrilateralis C. M. Taylor II, E, 4, g
Palicourea rigida Kunth I, A
Palicourea rigidifolia (Dwyer & M. V. Hayden) Dwyer II, E, 3, c
Palicourea salicifolia Standl. II, F, 7
Palicourea semirasa Standl. I, A
Palicourea skotakii C. M. Taylor II, I, 11
Palicourea sodiroi Standl. II, F, 6
Palicourea sopkinii C. M. Taylor II, I, 11
Palicourea spathacea C. M. Taylor II, I, 10
Palicourea standleyana C. M. Taylor II, E, 4, f
Palicourea stenosepala Standl. II, I, 10
Palicourea steyermarkii C. M. Taylor II, H, 8
Palicourea stipularis Benth. II, E, 4, e
Palicourea subalata Standl. ex Steyer. II, E, 3, c
Palicourea subalatoidea C. M. Taylor* II, E, 3, c
Palicourea subscandens Standl. ex Steyer. II, G
Palicourea subspicata Huber I, C, 1 a
Palicourea subtomentosa (Ruiz & Pav.) C. M. Taylor* II, E, 3, c
Palicourea sulphurea (Ruiz & Pav.) DC. II, F, 7
Palicourea tamaensis (Standl. & Steyer.) Steyer. II, I, 11
Palicourea tectoneura K. Schum. & K. Krause II, E, 3, d
Palicourea tepuicola Steyer. I, A
Palicourea tetraphylla Cham. & Schltdl. I, C, 2
Palicourea thermydri J. H. Kirkbr. II, E, 4, g
Palicourea thyrsiflora (Ruiz & Pav.) DC. II, E, 3, c
Palicourea tilaranensis C. M. Taylor II, H, 8
Palicourea toroi Standl. II, E, 4, f
Palicourea triphylla DC. I, C, 2
Palicourea tubuliflora Dwyer II, F, 7
Palicourea tumidonodosa Dwyer II, F, 7
Palicourea tunjaensis C. M. Taylor II, E, 4, f
Palicourea ulloana C. M. Taylor* II, E, 3, c
Palicourea vaginata Benth. II, F, 7
Palicourea vestita C. M. Taylor II, F, 5
Palicourea virens (Müll. Arg.) Standl. I, D
Palicourea vulcanalis Standl. ex C. M. Taylor* II, E, 3, c
Palicourea weberbaueri K. Krause II, E, 3, c
Palicourea wilesii C. D. Adams II, H, 8
Palicourea zarucchii C. M. Taylor II, H, 8

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