Cytological and Nomenclatural Notes on the Mesoamerican Species of *Aciotis* (Melastomataceae)

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ABSTRACT. A review of the Mesoamerican species of *Aciotis* is presented to facilitate the transfer of *Spennera alata*, an earlier name for the largely Central American species heretofore known as *A. levyana*. Original chromosome counts of $n = 30$ are reported for two species, *A. alata* and *A. rostellata*, together with brief descriptions, distributional notes, and a regional key to the three Mesoamerican species. Based on a preliminary evaluation of reported chromosome counts, $x = 10$ appears to be the probable base chromosome number of *Aciotis*.

Aciotis is one of about 30 capsular-fruited genera of the tribe Melastomeae (incl. Tibouchineae) restricted to the Neotropics. This natural genus of herbs and subshrubs is readily distinguished by its small 4-merous flowers borne in terminal panicles, terete hypanthia, eight unappendaged stamens, bilocular ovary, and reniform-cochleate seeds with a foveolate or costate-foveolate testa.

Because macromorphological differences among the approximately 30 recognized species (Mathies, 1981) are not always as sharp or as consistent as those encountered in other neotropical genera of the tribe, *Aciotis* has the reputation of being a taxonomically difficult genus (Wurdack, 1973). Recently, Mathies (1981) contributed to an evaluation of species limits, but the genus is still in need of a thorough field-oriented revisionary study.

Despite taxonomic difficulties, identity of the three described species of *Aciotis* from the Mesoamerican region has not been a major source of confusion. However, examination of type specimens and verification of the identity of taxonomic synonyms pertinent to a treatment of the genus for *Flora Mesoamericana* has brought to light the need for a new combination that has heretofore been overlooked. *Spennera alata*, therefore, is transferred here to *Aciotis* and a synopsis of the three Mesoamerican species is provided together with a key, original meiotic chromosome counts for two of the taxa, and a discussion of the probable base chromosome number of the genus.

CHROMOSOME NUMBERS OF *ACIOTIS*

Gametic chromosome numbers are reported here for two populations each of *A. alata* and *A. rostellata*. Meiosis was regular with $n = 30$ in all cells examined from each of these populations. Bud material for these counts was collected from natural populations in the field, fixed in modified Carnoy's solution (4 chloroform, 3 ethanol, 1 glacial acetic acid, v/v/v) for 24 hours, transferred to 70% ethanol, and stored under refrigeration. All counts were made using a Zeiss light microscope with phase contrast and a 100× oil immersion objective. Drawings of meiotic figures were made with camera lucida at a magnification of 2100×. Voucher collections for each of the counts reported here are as follows:

Aciotis alata (Beurling) Almeda. $n = 30$ (Figs. 1, 2).

Costa Rica. Limón: Forest Reserve at Agricultural College of the Humid Tropical Region ca. 11 km NE of the Guapiles/Limón Hwy. at a point 20 km SE of Guapiles, 250 m, 11 Feb. 1992, *Almeda et al. 6953* (CAS, CR).

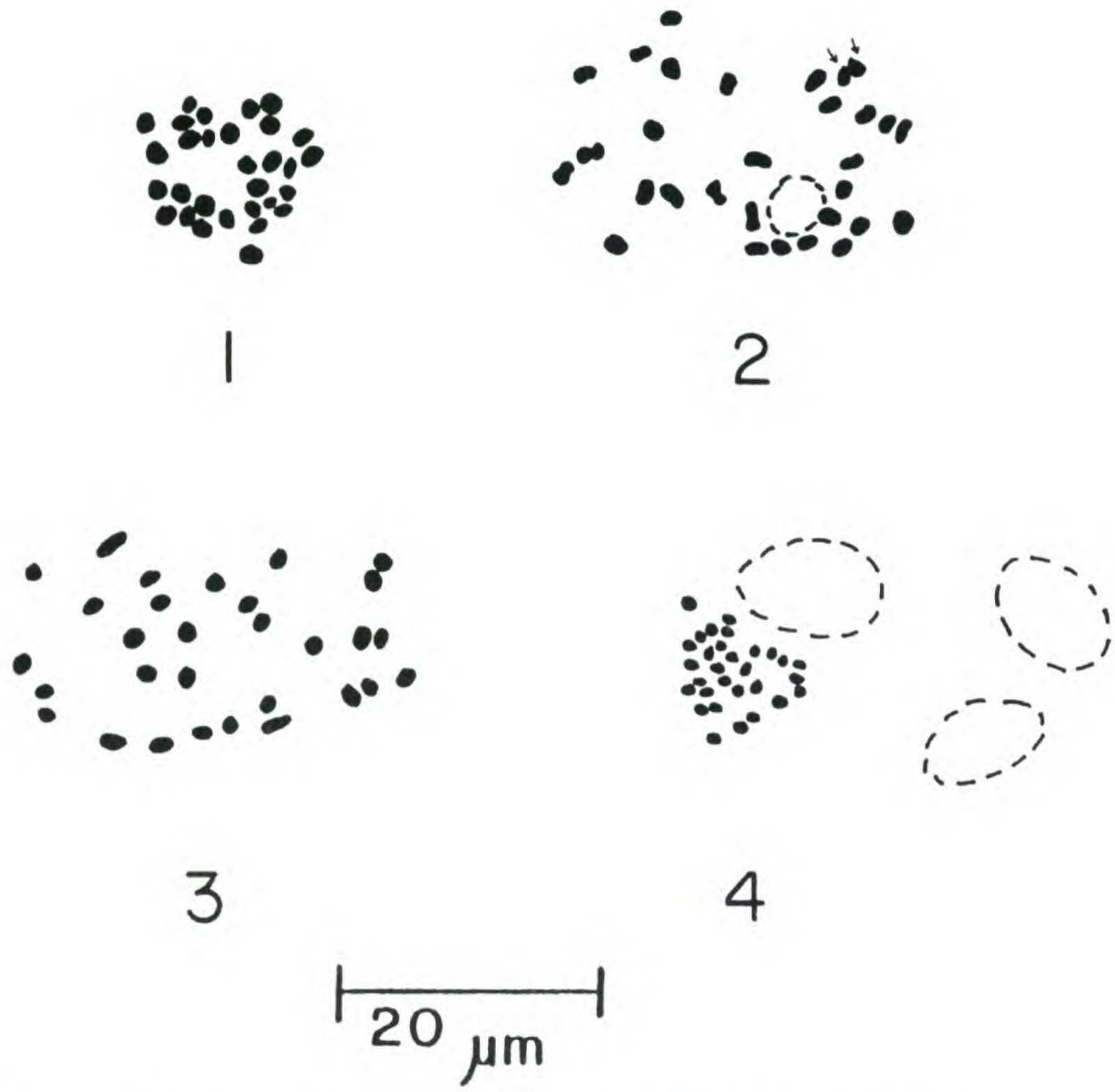
Panama. Panamá: Cerro Jefe, along summit road and along trail into the Chagres valley, 900 m, 19 Feb. 1988, *Almeda et al. 5836* (CAS, PMA).

Aciotis rostellata (Naudin) Triana. $n = 30$ (Figs. 3, 4).

Panama. Coclé: beyond La Mesa on road to the base of Cerro Gaital, 900–1100 m, 23 Feb. 1988, *Almeda et al. 5884A* (CAS, PMA).

Panama. Coclé: slopes above El Copé along abandoned trail to Continental Divide, 700–850 m, 24 Jan. 1989, *Almeda et al. 6379* (CAS, PMA).

The chromosome count of $n = 30$ reported here for two Panamanian populations of *A. rostellata* confirms an identical report for a Costa Rican population of this species by Solt and Wurdack (1980). This same gametic number, which is also reported here for Costa Rican and Panamanian populations of *A. alata*, is a new number for this species. Solt and Wurdack (1980) reported $2n = 24$ for this species (as *A. levyana*) from Costa Rican seedling ma-



Figures 1–4. Camera lucida drawings of meiotic chromosome figures of *Aciotis*. —1. *A. alata*, $n = 30$, metaphase I (*Almeda et al. 6953*). —2. *A. alata*, $n = 30$, diakinesis (*Almeda et al. 5836*). —3. *A. rostellata*, $n = 30$, late diakinesis (*Almeda et al. 5884A*). —4. *A. rostellata*, $n = 30$, telophase II (*Almeda et al. 6379*).

terial. Although multiple cytotypes within a species are not unknown in the Melastomataceae, I am inclined to regard unusual counts such as this one with skepticism, pending verification.

Meiotic chromosome counts have been reported for four species of *Aciotis* (Solt & Wurdack, 1980). One other species, *A.* aff. *aristellata* Markgraf, has $n = 30$. *Aciotis polystachya* (Bonpland) Triana has $n = 10$, *A. purpurascens* (Aublet) Triana has $n =$ ca. 40, and *A. laxa* (Richard) Cogniaux reportedly has $n = 26$. Although sampling is still limited, $x = 10$ is the only candidate for a generic base number indicated by the spread of reported numbers. A base of $x = 10$ is consistent with the commonly reported numbers of $x = 9$, 10, 11, and 12 for many genera in the tribe Melastomeae (Almeda, 1997; Almeda & Chuang, 1992; Solt & Wurdack, 1980). Assuming $x = 10$ is the probable base number for *Aciotis*, the two Mesoamerican species with $n = 30$ are hexaploid and the third, with $n =$ ca. 40, is octoploid. Despite the comparatively small morphological differences among species of *Aciotis*, this genus exhibits some surprising diversity in chromosome numbers. In this respect it is reminiscent of the pattern of species relationships demonstrated for the species of *Pilocosta* with multiple cytotypes. This pattern involves chromosomal evolution that promotes reproductive isolation but precedes significant amounts of morphological differentiation (Almeda, 1993).

In view of the polyploidy already evident for the small sampling of *Aciotis* to date, additional chromosome data will be essential in any attempt to better understand variation and interspecific relationships.

KEY TO THE MESOAMERICAN SPECIES OF *ACIOTIS*

1a. Leaf blades glabrous or sparsely and deciduously strigillose on both surfaces . . . . 2. *A. purpurascens*

1b. Leaf blades persistently pubescent on both surfaces.

2a. Distal internodes conspicuously winged, the wings 0.5–2.5 mm wide with scattered prevailingly eglandular, stiff hairs mostly (0.5–)1–3 mm long; petioles winged . . . . . 1. *A. alata*

2b. Distal internodes strongly angled but not conspicuously winged (wings, if present, less than 0.5 mm wide), densely glandular-pilose with hairs prevailingly 0.25–0.5 mm long; petioles essentially wingless . . 3. *A. rostellata*

SYNOPSIS OF *ACIOTIS* IN MESOAMERICA

1. Aciotis alata (Beurling) Almeda, comb. nov. Basionym: *Spennera alata* Beurling, Kongl. Vetensk. Acad. Handl. 40: 125. 1854. TYPE: Panama. Panamá: Portobello, in montibus, Apr. 1826, *Billberg s.n.* (holotype, S, photograph, CAS).

Aciotis levyana Cogniaux, Mart. Fl. Bras. 14(3): 460. 1885. Syn. nov. TYPE: Nicaragua. Chontales, *Levy 497* (holotype, P; isotypes, BR, F, G, GH, NY, US).

Erect perennial herb or subshrub to 1 m tall; internodes quadrate with wings 1–3 mm wide bearing spreading simple hairs (0.5–)1–3 mm long. Leaves 5-nerved, oblong-ovate to ovate, 4–10(–17) × 1.5–4.5(–8) cm, upper and lower surfaces sparsely to moderately setose with smooth eglandular hairs mostly 1–2 mm long, apex acute to acuminate, base obtuse to rounded; margin ciliate-serrulate; petiole 0.5–2.5 cm long, winged and moderately to copiously beset with spreading simple hairs 1–2 mm long. Mature hypanthium 2–2.5 mm long, globose, sparsely puberulent with gland-tipped hairs mostly less than 0.5 mm long; calyx lobes 0.5 mm long and 1 mm wide basally between sinuses; petals white, 2–5 mm long, glabrous except for the apical glandular hair; stamens alternately somewhat unequal in size; anther thecae deep pink or white with tints of pink, oblong with a truncate to somewhat ventrally inclined apical pore; connective shallowly bilobed ventrally at the filament insertion; large anthers 0.75–1 × 0.25–0.5 mm, connective prolonged 0.25 mm; small anthers 0.5–0.75 × 0.5 mm long, connective prolonged 0.25 mm. Style 3.5–4.5 mm long.

Distribution, habitat, and phenology. Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Surinam (fide Mathies, 1981), Ecuador, Peru, and Brazil in wet disturbed sites, river banks, and forest margins at 0–800 (–1300) m. Collected in flower from January through September, in fruit from December through September. Mathies (1981) cited a single specimen of this species (*Maguire 24610*, NY) from Tafelberg Arrowhead Basin in Surinam, but Wurdack (1993) did not attribute it to any of the Guianas.

The type of *Aciotis levyana* and all subsequent collections correctly identified with this epithet are an exact match for the type of *Spennera alata.* Both have winged internodes and petioles, and leaf blades that are persistently pubescent on both surfaces with spreading eglandular hairs mostly 1–3 mm long. These diagnostic vegetative characters coupled with the central Panamanian collection locality for *S. alata* leave no doubt that it and *A. levyana* are conspecific.

In Triana's (1871) disposition of species originally described in *Spennera,* he relegated *S. alata* to the synonymy of *A. purpurascens* without comment. Cogniaux's (1885, 1891) placement of *S. alata* in the synonymy of *A. purpurascens* appears to have been in deference to Triana's taxonomic opinion. In both publications, Cogniaux listed *S. alata* in synonymy with the notation "ex Triana" in parentheses. Thus, one can only surmise that Cogniaux never critically examined the type of *S. alata* because he described the same taxonomic entity as a new species, *A. levyana,* in *Flora Brasiliensis* (Cogniaux, 1885). In view of Cogniaux's comprehensive knowledge of the Melastomataceae for his time, it is not surprising that his taxonomic judgment has gone unchallenged. Consequently, all subsequent regional treatments of the family have adopted his name for this widespread species (Gleason, 1940, 1958; Standley & Williams, 1963; Wurdack, 1973, 1980). Mathies (1981), the only monographer of *Aciotis* in this century, also used *A. levyana* for this taxon. Unfortunately, he made no mention of *S. alata* in the synonymy of *A. purpurascens* nor did he include it in the synonymy of any other described species.

Mathies (1981) also attributed *A. rubricaulis* (DC.) Triana to Panama based on *Dwyer & Correa 8003* (UC). Wurdack (1993) excluded Panama from the range of this species in his account of *Aciotis* for the Guianas. Examination of this cited collection shows that it has all the characters of what I consider typical *A. alata.* These two taxa are evidently closely related and in need of critical comparison. As presently understood, *Aciotis rubricaulis* purportedly differs in having 5(–7)-nerved leaves with hairs prevailingly 1–1.5 mm long, few-flowered panicles, and distinctly dimorphic stamens.

2. Aciotis purpurascens (Aublet) Triana, Trans. Linn. Soc. London 28: 52. 1871. Basionym: *Melastoma purpurascens* Aublet, Hist. Pl. Guiane 1: 402. t. 54. 1775. *Miconia purpurascens* (Aublet) A. P. DC., Prodr. 3: 179. 1828. TYPE: French Guiana, "territorio Caux," *Aublet s.n.* (holotype, BM).

Aciotis purpurascens (Aublet) Triana var. *alata* Cogniaux, Mart. Fl. Bras. 14(3): 474. 1885. TYPE: Panama. Chagres, Isthmus of Panama, *Fendler 149* (lectotype, here designated, GH; isolectotypes, F, K, MO, US, W). [In naming this variety, Cogniaux cited two syntypes in the protologue, *Fendler 149* and *Billberg s.n.* The latter, which is the type of *A. alata,* was evidently never seen by Cogniaux. Consequently, his

diagnosis of this variety clearly describes the taxon here recognized as *A. purpurascens*. According to P. Bamps (in litt., 7 January 1997) no specimen of *Fendler 149* is represented among the holdings of *Aciotis* at BR. For expanded synonymy of *A. purpurascens*, see Mathies (1981).]

Suffrutescent herb or subshrub 0.5–1 m tall often with purple-tinted uppermost internodes and lower leaf surfaces; the internodal wings mostly less than 1.5 mm wide, glabrous or inconspicuously puberulous with hairs 0.25–0.5 mm long. Leaves 5–7-nerved, narrowly ovate to oblong-ovate, (6–)8–15 × 2.5–5.5 cm, glabrous or sparsely and deciduously strigillose on both surfaces with hairs 0.5 mm long or less, apex acute to subacuminate, base obtuse to rounded or somewhat cordulate, margin obscurely ciliolate-serrulate; petiole 1–1.5(–2.2) cm long, winged and glabrous or with inconspicuous hairs like those of internodal wings. Hypanthium 2–2.5 mm long, globose, glabrous or sparingly glandular-setulose; calyx lobes 0.3–0.5 mm long; petals white or flushed with pink, 4–5 mm long, glabrous except for an apical glandular hair; stamens alternately somewhat unequal in size; anther thecae linear-oblong with a truncate pore and an obscurely bilobed ventro-basal appendage; large anthers 1.2–1.5 × 0.3 mm, connective prolonged 0.7–1 mm; small anthers ca. 1 mm long, connective prolonged 0.7–1 mm. Style to 4 mm long.

Distribution, habitat, and phenology. Costa Rica, Panama, Colombia, Venezuela, all the Guianas, Ecuador, Peru, Brazil, Grenada, and Trinidad in moist disturbed sites, roadsides, trail margins, and river banks in rainforest at 0–1200(–1400) m. Collected in flower and fruit from February through November. Mathies (1981: 111) attributed this species to Nicaragua and Bolivia, but he cited no specimens from these countries and a lack of dots on his distribution maps also indicates that he saw no authentic material from these areas.

3. Aciotis rostellata (Naudin) Triana, Trans. Linn. Soc. London 28: 51. 1871. Basionym: *Spennera rostellata* Naudin, Ann. Sci. Nat. Bot. Ser. 3, 14: 143. 1850. TYPE: Mexico. Tabasco: Teapa, *Linden 637* (holotype, P; isotypes, BR (3 sheets), G, K, NY).

Suffrutescent herb 4–6 dm tall; internodes quadrate and strongly angled but not conspicuously winged or wings (if present) less than 0.5 mm wide, densely glandular-pilose with hairs prevailingly 0.25–0.5 mm long. Leaves 5–7-nerved, broadly elliptic to elliptic-ovate or ovate, (3–)5–10(–15) × 2–5 cm, upper and lower surfaces sparsely to copiously appressed or spreading glandular-puberulent, apex acuminate, base obtuse to rounded; margin ciliolate-serrulate; petiole 0.7–3.1 cm long, carinate or with narrow wings mostly less than 0.25 mm wide, moderately to copiously beset with glandular spreading hairs mostly 0.25–0.5 mm long. Mature hypanthium 2.5–3.5 mm long, globose, glandular-puberulent with hairs mostly less than 0.25 mm long; calyx lobes 0.5 mm long and 0.5–1.5 mm wide with a sparse abaxial glandular puberulence restricted to a median vertical line; stamens alternately unequal in size; anther thecae deep pink, linear oblong or narrowly elliptic with a truncate apical pore; connective exappendiculate; large anthers 1 × 1 mm, connective prolonged 0.25 mm; small anthers 0.5–0.75 × 0.25 mm, connective prolonged 0.25 mm. Style 3.5–4 mm long.

Distribution, habitat, and phenology. Southern Mexico (Chiapas, Tabasco, and Veracruz), Belize, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Colombia in disturbed sites, savannas, river banks, and forest margins at 0–750(–1300) m. Collected in flower from February through November, in fruit from February through December.

This species exhibits some variation in the development of internodal and petiolar wings and in the length and density of glandular pubescence on petioles and branches. Some populations (*Orcutt 6514*, DS) have carinate internodes and petioles with glandular hairs mostly 0.25 mm long, whereas others (*Hammel 11963*, CAS) have winged internodes and petioles with glandular hairs that are 0.25–0.5 mm long. Mathies (1981) proposed as part of this complex two additional, unpublished, new taxa that he named "almedae" and "liesneri" from Costa Rica and Panama, respectively. The former has internodal and petiolar wings that are 0.25 mm wide, internodal hairs 0.5 mm long, and petiolar hairs 0.25–0.5 mm long. The latter has internodal wings 0.5–0.75 mm wide, petiolar wings 0.5 mm long, internodal hairs 0.25–0.5 mm long, and petiolar hairs 0.25–1.5 mm long. The significance of these modal differences is difficult to assess. Chromosome information is needed to determine whether they can be correlated with different ploidy levels.

Aciotis indecora (Bonpland) Triana, a widespread South American species, was also attributed to Belize and Guatemala by Mathies (1981). Examination of representative Central American material cited by Mathies (*Gentle 7907*, CAS) leaves no doubt that morphologically it is well within the range of *A. rostellata* as interpreted here.

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Literature Cited

Almeda, F. 1993. *Pilocosta* (Melastomataceae) revisited: A new species, polyploidy, and the base chromosome number of the genus. Novon 3: 311–316.

———. 1997. Chromosome numbers and their evolutionary significance in some neotropical and paleotropical Melastomataceae. BioLlania Edición Esp. No. 6: 167–190.

——— & T. I. Chuang 1992. Chromosome numbers and their systematic significance in some Mexican Melastomataceae. Syst. Bot. 17: 583–593.

Cogniaux, C. A. 1885. Melastomaceae (*Aciotis*). *In* C. F. P. von Martius, Flora Brasiliensis 14(3): 458–479.

———. 1891. Mélastomacées. *In* A. & C. de Candolle (editors), Monographiae phanerogamarum 7: 1–1256. G. Masson, Paris.

Gleason, H. A. 1940. The Melastomaceae of the Yucatan Peninsula. Carnegie Inst. Wash. Publ. 522: 325–373.

———. 1958. Melastomataceae. *In* R. E. Woodson, Jr. & R. W. Schery (editors), Flora of Panama. Ann. Missouri Bot. Gard. 45: 203–304.

Mathies, P. S. 1981. A revision of *Aciotis* (Melastomataceae). Ph.D. Dissertation. Mississippi State University.

Solt, M. L. & J. J. Wurdack. 1980. Chromosome numbers in the Melastomataceae. Phytologia 47: 199–220.

Standley, P. C. & L. O. Williams. 1963. Melastomaceae. *In* Flora of Guatemala. Fieldiana, Bot, 24: 407–525.

Triana, J. 1871. Les Mélastomacées. Trans. Linn. Soc. London 28: 1–188.

Wurdack, J. J. 1973. Melastomataceae. *In* T. Lasser (editor), Flora de Venezuela 8: 1–819. Instituto Botánico, Caracas.

———. 1980. Melastomataceae. *In* G. Harling & B. Sparre (editors), Flora of Ecuador 13: 1–406. Dept. of Systematic Botany, Univ. Göteborg & Sect. for Botany, Rijksmuseum, Stockholm.

———. 1993. Melastomataceae (*Aciotis*). *In* A. R. A. Görts-van Rijn (editor), Flora of the Guianas 13: 9–21. Koeltz Scientific Books, Königstein.