

1996

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James Henrickson

California State University, Los Angeles

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Recommended Citation

Henrickson, James (1995) "Studies in Macrosiphonia (Apocynaceae): Generic Recognition of Telosiphonia," *Aliso: A Journal of Systematic and Floristic Botany*. Vol. 14: Iss. 3, Article 31.
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STUDIES IN *MACROSIPHONIA* (APOCYNACEAE): GENERIC RECOGNITION OF *TELOSIPHONIA*

JAMES HENRICKSON

*Department of Biology
California State University
Los Angeles, California 90032*

ABSTRACT

Woodson recognized two subgenera within *Macrosiphonia* (Apocynaceae: Apocynoideae), a South American subgenus *Eumacrosiphonia*, and a North American subgenus *Telosiphonia* each with five species. Both taxa are characterized by low subshrub-shrub, nonviny growth habits, white, long-tubed, vespertine corollas of a type associated with moth pollination. Their distinctive anther and style-tip characteristics show each is related to a group of genera around *Mandevilla* and *Mesechites*. The two subgenera, however, differ strongly from each other in inflorescence, style-head structure, and pollen size indicating that they are not sister taxa and that *Macrosiphonia* as currently recognized is polyphyletic. Thus the subgenus *Telosiphonia* is elevated to generic rank consisting of six species with one species and one variety described as new.

Key words: Apocynaceae, Apocynoideae, *Macrosiphonia*, Plant taxonomy, *Telosiphonia*.

INTRODUCTION

Preparation of a treatment of Apocynaceae for the Chihuahuan Desert Flora and the discovery of a new species have resulted in this revision of North American *Macrosiphonia* Müll. Arg. The last revision of the genus was completed by Woodson (1933), who incorporated two distinct elements in the genus, the true *Macrosiphonias* (his subgenus *Eumacrosiphonia*) consisting of five South American taxa, and five North American taxa that he recognized in subgenus *Telosiphonia* Woodson. The genus is a member of the subfamily Apocynoideae (then called Echitoideae) and within the subfamily is related to the large tropical genus *Mandevilla* Lindl., with which it shares distinctive anther and stigma structures (Woodson 1933).

The taxa *Mandevilla*, *Macrosiphonia* (s.l.) *Allo-markgrafia* Woodson, *Mesechites* Müll. Arg., *Tintinnabularia* Woodson, and *Quiotania* Zarucchi, if one wishes to recognize this weakly differentiated genus, form a distinctive group within the Apocynoideae. They all have anthers that are indurated throughout the abaxial surface except at their membranous terminal appendages. Their anther sacs are confined to the distal one half to two thirds of the interior anther and the expanded anther base is a sterile, somewhat flattened structure that is obtuse to truncate and either notched or auriculate at the base (except in *Mesechites* where anthers are fertile to the base). The short filaments join the anthers near the base of the anther sacs and connect shortly below the anthers to the corolla tube, except in *Tintinnabularia*, which has long filaments. The style heads are located directly beneath the fertile portion of the anthers and are surrounded by the sterile anther bases and filaments. The five anthers together form a

cap over the style head. The lower portion of the anther develops special hairs that are secretory and they become cemented to the style head by an adhesive material causing the style and anthers to form a gynostegium (Fallen 1986). In *Mandevilla*, this adhesive material is secreted by the filament hairs, while in other Apocynaceae the material is secreted by the style head (Fallen 1986). The adaxial filament surface often contains a dense beard of short to long, reflexed hairs that play a role in the formation of the gynostegium, called a retinacle by Pichon (1948).

The expanded style heads are rhomboid in shape but distinctly five ridged, at least at the base, with the ridges extending towards and contacting the medial portion of the filaments and fitting in the recess just below the fertile anther sacs. According to Fallen (1986) the style head is stigmatic in a zone below the five ridges. The clear adhesive material fills in the space between the five ridges and the upper filaments. By anthesis, the anther sacs are open, shedding pollen upon the style head. The pollen is prevented from reaching the stigmatic area at the base of the style head by the presence of the clear adhesive material that fills the area between the style head and the surrounding sterile part of the anthers and filaments. When a pollinator visits the flower, its proboscis is guided outside the androecium to holes between the filaments; upon withdrawal, the proboscis is drawn into the slits between the sclerified anther bases where downward pointing hairs scrape off the pollen in an area near the stigmas. The retreating proboscis is pulled through the adhesive material and up through the fertile anther sac area picking up pollen on the attached adhesive material (Fallen 1986). The system found in the Apocynoideae is considered the most advanced in the family (Fallen 1986).

The seven taxa are also distinguished by the presence of distinctive foliar glands (colleters) located along the distal petiole and the basal adaxial midrib (Thomas and Dave 1991). In subgenus *Exothostemon* of *Mandevilla* they are also scattered along the adaxial midrib. The glands are fusiform, 0.2–0.4 mm long and quite conspicuous. In the North American *Macrosiphonia* and in some *Mandevillas* the glands also occur in the stipular region at the base of the petiole. Similar fusiform glands, known as “squamellae” (Woodson and Moore 1938) occur scattered inside the base of the sepals in all the above groups as well as other members of both subfamilies. Colleters, however, are not unique to this group within Apocynaceae (Thomas and Dave 1991).

Woodson (1933, 1936) considered that the distinctive anther, stigma, and colleter features separate these taxa from the remainder of the subfamily. Leeuwenberg (1994) also places *Macrosiphonia*, *Mandevilla*, and *Mesechites* together in his tribe Echiteae, subtribe Echitinae, but he does not recognize *Allomarkgrafia* or *Quitotania*, and places *Tintanabularia* (sic) in a separate tribe Wrightieae, subtribe Wrightiinae.

Each of the above genera has some distinctive feature that distinguishes it from the others. *Allomarkgrafia* (six species: Gentry 1989) has highly branched, crowded inflorescences, divided racemes, distally constricted corolla tubes, filaments strongly decurrent on the inner corolla tube, nectaries larger than the ovary, and fusiform style tips (Woodson 1936:599). *Tintanabularia* (one species) has dichasially branched or subumbellate inflorescences, domatia in the axils of the secondary veins and midveins on the abaxial leaf surface, reduced corolla tubes with much elongated corolla throats, anthers with slender tips and long slender filaments and short, distinctive style tips (Woodson 1936:610). *Mesechites* (ten species,) again has highly branched inflorescences, distally narrowed corolla tubes, and narrowly tapered style heads. The recently described *Quitotania* (one species) is very similar to *Mandevilla* differing apparently in its lacking a narrow, basal corolla tube and in having an attenuate style head (Zarucchi 1991).

Mandevilla (ca. 150 species) can be distinguished from the two subgenera of *Macrosiphonia* by a series of vegetative and floral features. *Mandevilla* species are woody or woody-based lianas, less frequently subshrubs or herbs, while the two groups within *Macrosiphonia* are shrubs, subshrubs to strongly rhizomatous subshrubs—none is viny. Interestingly the northernmost *Mandevilla*, *M. karwinskii* (Müll. Arg.) Hemsl. is a rhizomatous subshrub with a habit similar to that found in some northern *Macrosiphonias*, except that its upper stems still tend to twine. Flowers of *Mandevilla* are mostly salverform to funnellform with moderately short tubes and they may or may not have ex-

panded throats. Inflorescences of *Mandevilla* are largely simple racemes, but may be reduced to single flowers. Inflorescences in North American *Macrosiphonia*, in contrast, are solitary or in monochasial-dichasial unbranched cymes; those of South American taxa appear to be derived from thyrses (Woodson 1935:31). *Mandevilla* flowers are diurnal, apparently pollinated by various diurnal-active insects. The distinctive white, long, salverform flowers of both subgenera of *Macrosiphonia* appear to be vespertine and appear strongly modified for moth pollination, (Endress 1994:319) most (not all) producing a strong perfume in the evenings. Although there are no published studies specifically verifying moth pollination in either subgenus of *Macrosiphonia*, Grant (1983) places both *M. macrosiphon* (Torr.) A. Heller and *M. brachysiphon* (Torr.) A. Gray on his predicted list of United States-Canada moth-pollinated species.

Woodson (1933) distinguishes *Macrosiphonia* from *Mandevilla* on the basis of style-head structure noting that the style heads of *Mandevilla* are “pentagonal-umbraculiform,” i.e., the five prominent style ridges curve downward to a distance about equal to their point of divergence from the distal style conforming to a shape like a five-ribbed umbrella. In contrast style heads in both subgenera of *Macrosiphonia* are said to be “pentagonal-subglochidiate,” i.e., the five stigma-bearing ridges curve retrorsely well below their point of attachment to the distal style in a glochidate fashion. However, in my dissections of *Mandevilla* flowers, I have found some stigmas, e.g., *Mandevilla sellowii* (Müll. Arg.) Woodson and others, that approach the subglochidate condition found in *Macrosiphonia* where, in contrast, some flowers of *M. brachysiphon* produce style heads that are not glochidate. Thus I question the consistency of this characteristic.

Of the above characters, the nonviny, fruticose to suffrutescent growth habits, the long, white vespertine, presumably moth-pollinated flowers, and the glochidate stigmas were characteristics used by Woodson (1933) to maintain *Macrosiphonia* as a genus separate from *Mandevilla*.

Woodson (1933, 1935) clearly questioned whether the two subgenera of *Macrosiphonia* were congeneric, noting that their ranges roughly coincide with the extreme northern and southern distributions of *Mandevilla*. He noted it would be more logical to consider that the distinctive flowers arose independently in the two subgenera rather than representing the remnants of a once continuous distribution. He further noted that the distinctions between *Macrosiphonia* and *Mandevilla* were very tenuous at best.

MATERIALS AND METHODS

This study is based primarily in empirical evidence derived from studies of specimens of Apocynaceae

and from the literature. Material of North American *Macrosiphonias* was borrowed from or observed at A-GH, ARIZ, F, NY, RM, RSA-POM, TEX-LL, US.

RESULTS AND DISCUSSION

As noted above, the two subgenera, *Macrosiphonia* and *Telosiphonia*, both occur in arid zones outside the distribution of the largely tropical *Mandevilla*. Each appears to have modified the basic flower type towards moth pollination—both are characterized by long-tubed, white, salverform, vespertine flowers of a type visited by moths. Both are nonviny shrubs-subshrubs, with thickish, subcoriaceous leaves that are strongly vestitured beneath, green above.

The two subgenera, however, have distinct differences in inflorescence structure, style-head structure, and pollen size that give evidence that the two subgenera are not sister taxa. Species in both subgenera produce terminal flowers or inflorescences from actively growing shoots of the year (Fig. 1, 3A). The shoots cease vegetative growth, produce lateral shoots from the axillary buds of the terminal pair of leaves and these shoots often overtop the flowers. Members of subgenus *Telosiphonia* typically produce either one or two, rarely three, flowers in a reduced inflorescence derived from a determinate simple dichasia, with two bracts separating the peduncle from the longer or equal-lengthed pedicel—the small bracts do not directly subtend the calyces (Fig. 4B–C). When more than one flower is produced, the lateral flower(s) develop in the axils of the bracts on lateral pedicels (not peduncles) (Fig. 2A). Inflorescences are simple and the pedicel usually is much longer than the peduncles except in one species, *Macrosiphonia hypoleuca* (Benth.) Müll. Arg., which may have moderately long, rarely quite long, peduncles (Fig. 2A).

In the South American subgenus *Macrosiphonia* the taxa also produce terminal flowers bordered by axillary shoots. But the peduncles are greatly elongated, 10–45 cm long, while the pedicels are typically absent with the bracts directly subtending the calyces (Fig. 1A). This condition strongly differs from that found in subgenus *Telosiphonia*. When more than one flower is produced, the inflorescence branches at the bracts immediately below the flower, and the lateral axis consists of an elongated peduncle (not pedicel), which overtops the older flower, producing bracts directly under the next flower (Fig. 1A). If additional flowers are produced, they again are produced at the base of the previous flower and extend on an elongated peduncle. Woodson (1935) considers this to be a modification of a thyrses, not a simple dichasium as in the North American species.

The style heads of the two groups differ strongly. In the North American subgenus *Telosiphonia* the

style heads have five narrow ridges that extend and expand from the tip, each directly opposite a filament. The ridges are of uniform width and lack any basal skirt or collar (Fig. 2I, 4I). In the South American subgenus *Macrosiphonia* the style heads are larger and the five style ridges are narrow and marginally concave but expanded below, each having a distinct, thin, lower-margin skirt or collar that extends along the base of the projected ridge that indents around the adjacent filament (Fig. 1C). The style heads of the subgenus *Macrosiphonia* are also associated with abundant translucent adhesive material, while this is much less abundant, possibly absent, in subgenus *Telosiphonia*.

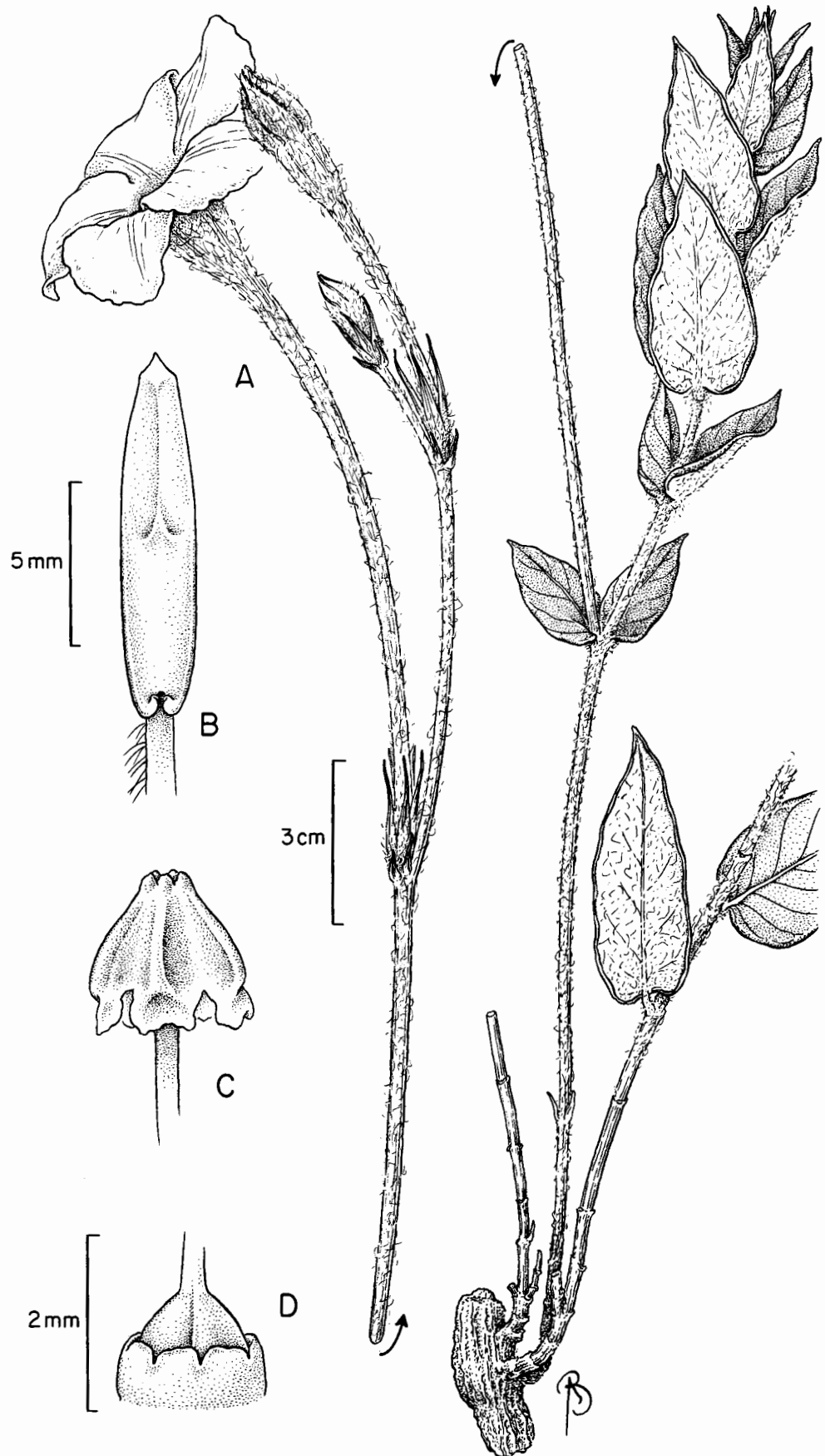
A routine survey of water-mounted pollen revealed that, while the pollen of both subgenera is triporate, as are most the Apocynoideae (Nilsson 1990), the pollen of the subgenus *Telosiphonia* is large (Erdtman 1966), ranging from 53 to 78 μm in diameter, but that of subgenus *Macrosiphonia*, is very large—the grains of *M. longiflora* (Desf.) Müll. Arg. measured 180 μm (0.18 mm) in diameter! This large pollen, however, may correlate with the large corolla size of that species.

There are also differences in the size of the hairs that extend into the throat from the inner surface of the free filaments. In the North American taxa they are short, about 0.3 mm in length (Fig. 4H), in the South American taxa they are much longer, to 1.5 mm long (see Fig. 4I in Meyer and Burkart 1979).

The data presented above indicate that substantial differences exist between the two subgenera of *Macrosiphonia*, as recognized by Woodson. It forces us to consider whether the two subgenera are sister taxa or are polyphyletic with the taxa being drawn together by their conspicuous large corollas associated with a convergent pollination system. The latter was suggested by Woodson (1935) who, incidentally, also annotated many North American herbarium sheets as belonging to his proposed genus *Telosiphonia*, which he later relegated to subgeneric rank.

The morphological differences noted above, particularly those of inflorescence and style structure, in my opinion, strongly support that *Macrosiphonia* is polyphyletic. While the amphitropical distribution can serve to delimit the two taxa, it in itself is not significant, as Raven (1963) notes many examples of genera and species with similar broad distributions. The distinctions between these two taxa, rather, is morphologically based. As both taxa occur in semiarid habitats, it may well be that some of their vegetative similarities, e.g., their subshrub-shrub growth habits, strong vestiture, may represent character convergence.

As to how to best treat the taxa nomenclaturely, there appear to be three options: (1) If both subgenera have been derived independently from *Mandevilla*, they are then both paraphyletic in relation to *Man-*



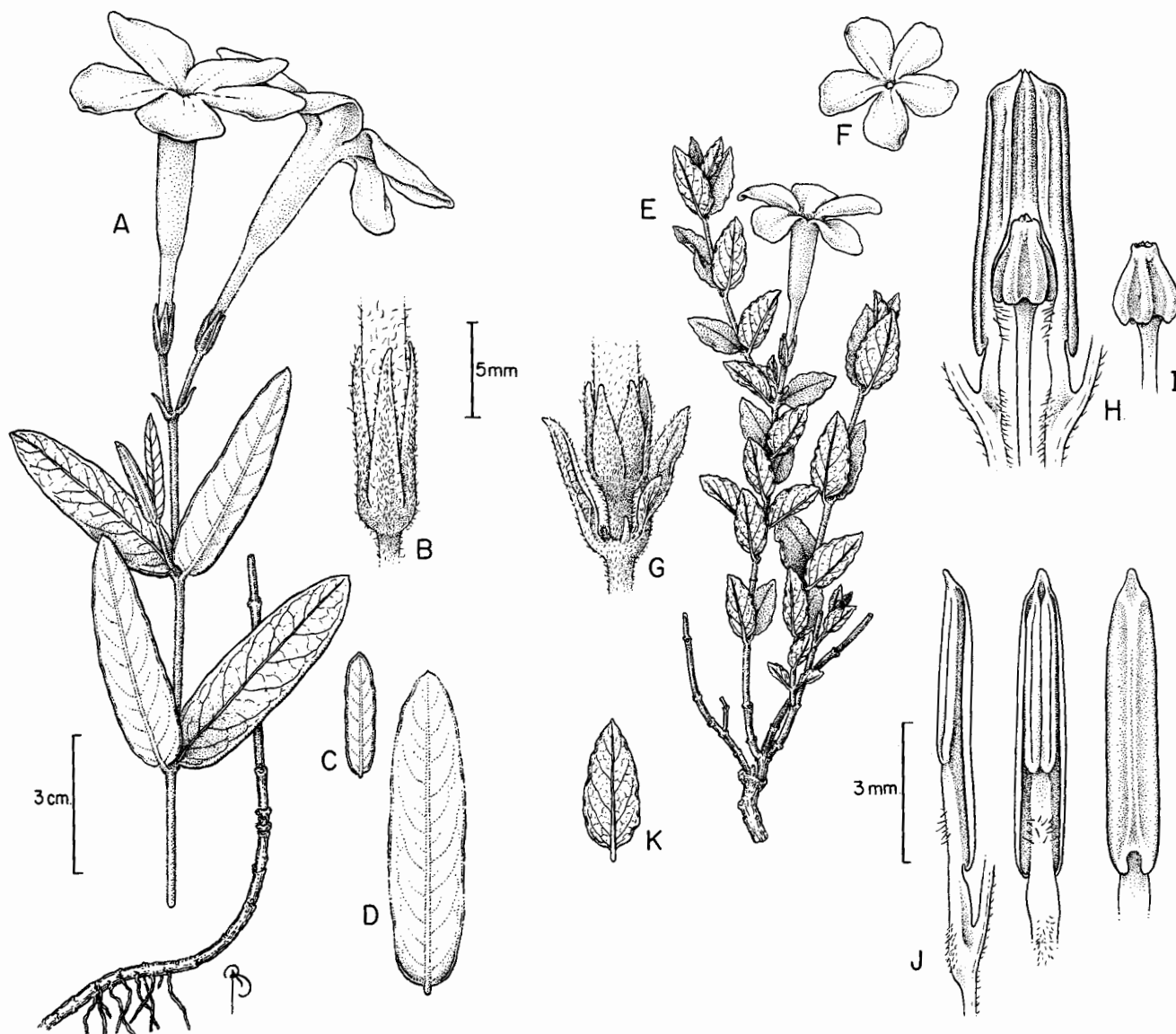


Fig. 2. *Telosiphonia hypoleuca* and *T. brachysiphon*.—A–D. *T. hypoleuca* var. *hypoleuca*.—A. Plant habit showing rhizomatous base, oblong leaves, and distinctive inflorescence with a much-elongated peduncle (the longest found in the genus) bearing two flowers each on short pedicels. (Hinton 13069 LL).—B. Calyx showing characteristic narrow, reddish sepals. (Hinton 13069 LL).—C–D. Leaf size variation (abaxial view); small (C. Richardson 1529 TEX) vs. large (D. Manning & Manning 53461 TEX).—E–K. *T. brachysiphon*.—E. Plant habit showing leaf branch with single flower. (E–F. Kearney & Peebles 14847 ARIZ).—F. Corolla lobes, face view. (E–F. Kearney & Peebles 14847 ARIZ).—G. Junction of peduncle and pedicel showing bracts, bracteoles on right side, colleter, and broad sepals.—H. Gynostegium showing cutaway of anthers at the corolla tube-throat transition and location of style head at base of anther sacs with five style ribs opposite the filaments.—I. Expanded five-ribbed style tip that is stigmatic on inner rib base.—J. Three views of anthers, lateral (showing attachment of filament to corolla) adaxial, and abaxial: note the anther sacs are restricted to the distal portion of the anther. [G–J. from preserved material from Arizona-Sonora Desert Museum, Tucson, Ariz. (Henrickson 22221 CSLA)].—K. Leaf (McLaughlin 4946 ARIZ). (Magnifications: for A, C–D, E–F, K use the 3 cm scale; for B, G use the 5 mm scale; for H–J use the 3 mm scale).

Fig. 1. *Macrosiphonia longiflora*.—A. Plant habit showing distinctive determinate inflorescence with greatly elongated peduncles but no pedicels (the bracts directly subtend the calyces); inflorescence branching occurs by development of new peduncles across from the bracts below a flower.—B. Anther (abaxial view) showing auriculate base; anther sacs are confined to distal half of anther.—C. Style head showing the five-angled upper portion, and the basal marginal skirt that appresses against the filaments—the stigmatic areas are inside the skirt.—D. Ovary and surrounding nectary. All from Krapovickas et al. 16711 (LL). (Magnifications as indicated).

devilla and one could support combining both subgenera within the older *Mandevilla*. (2) If the two subgenera are both derived from some other common ancestor basal to *Mandevilla*, they could be combined with this taxon. (3) If the two subgenera have been derived independently of one another, from diverse ancestors, then one could and should combine them with their respective groups or recognize both as distinct genera.

Unfortunately the data obtained from gross morphology do not give evidence of the exact phylogenetic origins of the subgenera of *Macrosiphonia*. The placement of both subgenera within *Mandevilla*, the first alternative, would place the strongly different inflorescence type of the South American *Macrosiphonias* in with the largely racemose *Mandevilla*. This would breakup the continuity of *Mandevilla*, and weaken its distinction from *Allomarkgrafia* and *Mesechites*, promoting recognition of a single highly variable genus based on the occurrence of foliar glands and a distinctive obtuse-truncated anther base. The distinctive inflorescence type of the South American *Macrosiphonias* would still be a discordant character within the expanded genus, and the genus would not correspond to the rather finely drawn genera occurring in the remainder of the Apocynoideae (Woodson 1933, 1935, Pichon 1950, Leeuwenberg 1994).

As noted above, the other recognized genera related to *Mandevilla* all differ in morphological characteristics that separate them from one another and from the subgenera of *Macrosiphonia*. Rather than combining the subgenera of *Macrosiphonia* into these distinctive genera and disrupting their continuity I have elected to recognize the North American taxa as a distinct genus by raising Woodson's subgenus *Telosiphonia* to the rank of genus. This allows recognition of the polyphyletic basis of the current *Macrosiphonia* while causing minimal nomenclatural disruption.

Before presenting the formal classification of the species of *Telosiphonia* I wish to comment on strong variation found in the constituent species. The plants apparently strongly respond to variation in available water resources. In wet years plants show luxuriant growth with large leaves and long internodes, but in dry years, plant growth is reduced and leaves, internodes and flowers are smaller. One finds strong variation in overall flower size with plants with large leaves producing large corollas, while other specimens with smaller leaves have much smaller corollas. Strong variation also occurs in flowers of single collections; overall variation of corolla size is widespread in the Apocynaceae (Bruce Hansen, pers. comm. 1995). The result is considerable variation in corolla sizes within a species, e.g., corollas range in total length in *T. hypoleuca* from 3 to 8.5 cm, in *T. brachysiphon* from 3.6 to 7.2 cm, in *T. macrosiphon-*

ia from 8.5 to 15 cm, etc. In most species the smallest corollas are half the size of the largest ones and in several taxa these extremes have been recognized nomenclaturely.

CLASSIFICATION

***Telosiphonia* (Woodson) Henr., comb. nov.**

Macrosiphonia Lindl. subgenus *Telosiphonia* Woodson, Ann. Missouri Bot. Gard. 20:778. 1933, (basonym). Type species: here designated: *Echites hypoleuca* Benth. = *Macrosiphonia hypoleuca* (Benth.) Müll. Arg. = *T. hypoleuca* (Benth.) Henrickson.

Shrubs, subshrubs, sometimes strongly rhizomatous, with white latex, branched or unbranched above. Leaves mostly opposite, short-petiolate to sessile; leaf blades rather coriaceous, entire, often undulate-margined, often bicolored, densely white tomentose beneath, less strongly vestitured above or equally vestitured on both surfaces, the stipular area, adaxial petiole and adaxial basal midrib with clusters of small fusiform glands (colleters). Flowers developing from the tip of active shoots of the season, often overtopped by lateral stems formed from the axils of the uppermost leaves; peduncles reduced to moderately long; bracts 2, small, leafy; pedicels usually longer than peduncles; the flowers solitary or if more, 1(–2), developing from axils of bracts forming a simple monochasium or dichasium; sepals 5(–6), linear-lanceolate, separate, entire, herbaceous or petaloid and drying reddish, with a single series of distinctive fusiform squamellae produced at the adaxial sepal base; corollas salverform, whitish, often marked with red in bud, vespertine, usually sweetly aromatic in the evening, the tubes slender, long, abruptly expanded to broader cylindrical throats, the lobes 5, asymmetrical, dextrorsely convolute, spreading; stamens 5, included in the basal throat, anthers indurate except at the membranous acute tip, connivent, fertile in the distal half with 2 parallel anther sacs, sterile in the lower half with the the base truncated, notched, often auriculate; the filaments short, attached medially at the top of the sterile portion, adnate to the corolla just below the anther base, the filament bearded inside with retrorse hairs; pollen spheroidal, triplicate, yellowish. Ovaries 2, surrounded with a sheathlike nectary consisting of 5 basally united, rectangular lobes; styles united just above ovary; style tip capitate, 5 ribbed, located at the base of fertile portion of anthers, with the ribs extending to the filaments, the ribs retrorsely extending making the style tip glochidate in shape, the lobes stigmatic near their base. Fruit of paired, terete to slightly tortuous, brownish elongate follicles; seeds elongate, attached marginally to the placentae; coma dense, distal, of straight, white to tawny hairs. With seven taxa in North America distinguished in the key below.

- A. Corolla tubes 0.4–1.5 times as long as the expanded corolla throats; corollas 4–7 cm long, the slender tubes 1–2.5 cm long.
- B. Leaves bicolor, green above, white-tomentose beneath, oblong, oblong-linear, oblong-lanceolate, oblong-ovate, 2–6(–9) cm long, 0.4–1(–2.2) cm wide, often undulate, erose-entire, revolute; peduncles (0)–6–30(–45) mm long; pedicels 6–10(–15) mm long; plants usually with erect shoots from rhizomes; cen. Chihuahua, n. Coahuila, s. to Durango, Sinaloa, San Luis Potosí, Nayarit, Jalisco, Michoacán, México. 1. *T. hypoleuca*
- BB. Leaves green throughout, oblong-ovate, oblong-elliptic to elliptic, 1.5–3 cm long, 0.7–1.5 cm wide, entire, thin, subglabrous to pilose-hirsute with erect hairs; peduncles abscent; pedicels 5–12 mm long; plants suffrutescent, branched; s. Arizona, n. Sonora, extreme w. Texas. 2. *T. brachysiphon*
- AA. Corolla tubes 2–4(–6.5) times as long as the expanded corolla throats; corollas (6.5)–7–15 cm long, the slender tubes 3.5–9.5 cm long.
- B. Plants suffrutescent, new leaf-bearing shoots of the season developing from the plant base, from older basal stems, or from rhizomes; calyx lobes (7)–11–19(–23) mm long, mostly green, foliaceous at least distally, often with some red medially at the base; leaves ovate to oblong-ovate, strongly hirsute-pilose above, (12)–14–33(–45) mm wide; trans-Pecos, s. cen. Texas, s. through Coahuila to e. Chihuahua, e. Durango, n. Zacatecas. 3. *T. macrosiphon*
- BB. Plants shrubs, the new shoots of the season developing from upper to mid stems; calyx lobes 5–12(–15) mm long, thin, mottled with red throughout or nearly so, drying dull rusty-red; leaves variable.
- C. Plants small shrubs, 1–5(–10) dm tall; leaves oblong-elliptical, oblong-ovate, to ovate, usually strongly crisped-undulate at the margins, moderately to sparsely hirsute-pilose above.
- D. Corolla tubes 50–80(–105) mm long, 3–5(–6.5) times as long as the corolla throat, the corolla throats 14–22 mm long; s. Texas (Webb to Hidalgo cos.) s. to Nuevo León, Tamaulipas, e. Coahuila, cen. San Luis Potosí, Hidalgo, and Puebla. 4a. *T. lanuginosa* var. *lanuginosa*
- DD. Corolla tubes 33–45 mm long, 1.6–2.3 times as long as the corolla throat, the corolla throats 18–26 mm long; s. Puebla, n. Oaxaca. 4b. *T. lanuginosa* var. *oaxacensis*
- CC. Plants divaricately branched shrubs, 3–14 dm tall; leaves more ovate to orbicular, margins crisped-undulate or not, densely hirsute above; Baja California, Sonora.
- D. Leaves ovate-orbicular, 1.5–3(–5.6) cm long, 1.2–3(–5.6) cm wide, entire, soft, bicolor, green, hirsute-pilose above, white-tomentose beneath; calyx lobes with hairs to 0.8 mm long; s. Baja California del Sur from Bahía Concepción to n. of La Paz, Espirito Santo, Carmen islands in Gulf of California. 5. *T. hesperia*
- DD. Leaves ovate, broadly obovate to obovate, 1.2–2.2(–3) cm long, 0.7–1.5(–1.7) cm wide, strongly bicolor or not, closely pubescent-hirtellous above; the calyx lobes often with a very close vestiture; coastal s. Sonora. 6. *T. nacapulensis*

1. **Telosiphonia hypoleuca** (Benth.) Henr. comb. nov. Fig. 2 A–D

Echites hypoleuca Benth. Pl. Hartweg. 23, 1839, (basonym). *Macrosiphonia hypoleuca* (Benth.) Müll. Arg. Linnaea 30: 452, 1860; *Rhodocalyx hypoleucus* (Benth.) Miers. Apocyn. S. Amer. 139, 1878. TYPE.—MEXICO. AGUASCALIENTES: Rosa de San Juan dictus, in petrosis Aguas Calientes, 1837–8 (fide McVaugh 1970), K. T. Hartweg 193. (holotype: unknown; isotypes: GH!, NY-2!). *Macrosiphonia wrightii* A. Gray. Syn. Fl. N. Amer. 2(1): 83, 1879. TYPE.—U.S.A. TEXAS: Brewster Co?, Mountains beyond the Limpio, Wright 558 [lectotype: (here designated) GH!; isotypes: GH!, NY!, US!]. A narrow-leaved extreme of the species.

Echites suaveolens M. Martens & Galeotti. Bull. Acad. Roy. Sci. Bruxelles 11(1): 356, 1844, not A. DC. in DC. Prodr. 8: 452, 1844; *Rhodocalyx suaveolens* (M. Martens & Galeotti) Miers. Apocyn. S. Amer. 139, 1878.

Echites uniflora Sessé & Mocino. Pl. nov. Hisp. 28, 1888. TYPE.—MEXICO. state unknown: illustration in Fl. Mex. Ic. 303. [holotype: MA, (fide Justin Williams); isotype: the A.DC copy at G, (microfische—Fl. du Mex. 794!)]

Rhizomatous suffrutescent perennials 1.5–7.5 dm tall; stems of season developing directly from the thick rhizomes or from the base of older stems of the previous years growth, rarely from larger subterranean roots, erect, strict or variably branched, woody; internodes (7)–20–35(–94) mm long, dark red-maroon, densely covered with persistent short crinkled hairs 0.1–0.3 mm long and with larger, curved, eventually deciduous hairs to 0.4 mm long. Leaves 2(–3) per node, opposite to subopposite; leaf blades linear, oblong, oblong-elliptical to oblong-ovate, (2.2)–3.5–5(–7.3) cm long, (4)–8–17(–21) mm wide, acute, sometimes rounded, always apiculate at the apex, rounded to usually slightly cordate at the base, entire, sometimes revolute, rarely undulate along the margins, strongly bicolor, the upper surface green, closely speckled with red, closely pubescent to hirtellous with curved or erect hairs 0.1–0.2 mm long, often rather rugose with veins impressed, the lower surface white, densely canescent-tomentose with matted crinkled arachnoid hairs to 1.0 mm long, the veins, except the midrib, obscure, yellow or reddish. Flowers 1–2(–3) at the tips of new-growth stems, usually overtopped by lateral branches; peduncles (0.5)–10–22(–36) mm long; bracts 4–7 mm long, linear; pedicels 7–15 mm long, the peduncle-pedicels vestitured as on the young stems; sepals 5, oblong-linear, 7.2–10(–12) mm long, 1.2–2 mm wide, attenuate, reddish, membranous; corollas white, externally tinged or striped with red or pink, (36)–50–70(–85) mm long, the tube (8)–15–30(–45) mm long, the throat (13)–17–25(–30) mm long, 7–9 mm wide, the lobes 15–29 mm long, 14–28 mm wide, the open corolla 38–65 mm in diameter; anthers 9–11.5 mm long, 1.5–2 mm wide. Paired fruit (8)–11.5–15 mm long, 3–5 mm wide, reddish brown, closely pubescent with tightly coiled hairs; seeds rusty-brown, 9–10 mm long; seed coma, whitish, turning tawny, 14–21 mm long.

Telosiphonia hypoleuca is characterized by its strongly bicolored, mostly oblong to oblong-ovate leaves, by its corollas with tubes shorter than to as long as the throats, by its narrow, thin sepals that dry a rusty-red color, and by a tendency to have an erect, single-stemmed growth habit. The species shows strong variation in corolla size, ranging from 3.6 to 8.5 cm in overall length. Inflorescences may have 1–2 or 3 flowers, with peduncles typically 10–22(–36) mm in length (the longest in the genus) and pedicels 7–15 mm in length. Growth habit also varies, ranging from plants with series of strict, erect stems developing from rhizomes to highly branched subshrubs-shrubs with new growth developing from nodes of the previous-years branches. The species is easily recognized by its bicolored, oblong leaves that range from linear to oblong-ovate. Occasional specimens have very narrow leaves and one such specimen was the basis of *Macrosiphonia wrightii*, but the specimen agrees with the species in all other floral and vegetative characteristics. The high degree of variation in plant and flower size is considered to reflect the season's environmental conditions as there is no correlation with flower and plant size with geography except that most plants have short corolla tubes to 2.5 mm long.

The species ranges widely from the mountains of trans-Pecos Texas to Chihuahua, Sonora, and Tamaulipas south to the state of México where it occurs in rocky pine-oak forests and woodlands, and grassland ecotones, mostly in igneous-derived soils from 450 m (Barrancas in Sonora) to mostly 1000–2600 m elevation (Fig. 5). Flowering occurs from June to August (September) following rains. The common name for this and most species of the genus is Flor de San Juan.

Representative specimens.—U.S.A. TEXAS. Jeff Davis Co.: 15 mi NW of Ft. Davis, 16 Jun 1926, *Palmer 30986a* (A); Presidio Co.: N slope of Chinati Mts, 4700 ft, 1 Jun 1947, *Hinkley 3850* (NY).—MEXICO. SONORA: Ridge S of Arroyo Gochico, E of San Bernardo, 1000–1100 m, 5–9 Aug 1935, *Pennell 19548* (GH, MICH, NY). SINALOA: Mesa Malqueson, Cerro Colorado, 8 Dec 1939, 2500 ft, *Gentry 5167* (ARIZ-2, GH, NY, RSA).—CHIHUAHUA: Sierra Charuco, Río Fuerte, 22 Jul 1935, *Gentry 1519* (ARIZ, GH, NY); SW of Matachic, 9.2 mi on Matachic-Cocomoariachic rd from Papiqochic, 28 Aug 1978, *Bye 8961* (MICH); Rocky hills near Chihuahua, Aug–Oct 1885, *Pringle 320* (A, GH, NY-2, RSA); 6 km E of Fierro, Sierra de Encinillas, 8 Jul 1941, *Stewart 762* (GH, LL).—COAHUILA: Sierra del Carmen, N of Rancho El Jardín, 28 Jul 1973, *Johnston et al. 11878* (LL).—DURANGO: Sierra de las Candelas, 30 mi NW of Santiago Papasquiaro, 2100–2200 m, 30 Jul 1959, *Straw & Forman 1750* (MICH, RSA); Cd. Durango and vicinity, Jul 1896, *Palmer 306* (GH, NY).—ZACATECAS: 7.2 mi NW of Valparizo, 7900 ft, 16 Aug 1969, *Taylor & Taylor 6160* (NY).—SAN LUIS POTOSÍ: Sierra de San Miguelito, ca. 8 km al O de Jesús María, 2100 m, 10 Jun 1955, *Rzedowski 5887* (MICH-2); Region of San Luis Potosí, 6000–8000 ft, 1878, *Parry & Palmer 574* (GH, NY-2).—TAMAULIPAS: 27 km SE of Miquihuana, rd to Palmillas, 23°37'N, 99°39'W, 2025 m, 13 Aug 1941, *Stanford et al. 894* (ARIZ, GH, NY).—NAYARIT: Hwy 15, ca 18 mi SE of Tepic, 25 Aug 1973, *Stevens 1788* (MICH, TEX); 10 km E of Jesús María, 1000 m, 20–21 Sep

1960, *Feddema 1409* (MICH). JALISCO: Sierra del Tigre, 3 mi S of Mazamitlan, 2100–2200 m, 20 Sep 1952, *McVaugh 13088* (MICH); 15 mi S of Aguascalientes, Cerro de las Gallos, 2150–2250 m, 18 Aug 1958, *McVaugh 16107* (MICH); Hills near Guadalajara, 23 Jun 1893, *Pringle 4393* (GH, MICH, NY, TEX).—GUANAJUATO: 36 km al SE de Guanajuato, carretera a Juventino Rosas, 2200 m, 14 Jul 1987, *Rzedowski 43778* (MICH).—MICHOACÁN: Zitacuaro-Tuzantla, 1 Aug 1938, *Hinton 13069* (MICH, POM). Hidalgo: 3 mi E of Tepiji del Río, 7400 ft, 9–10 Aug 1957, *Straw & Gregory 1168* (MICH, RSA).—MÉXICO: Mpio. Temascaltepec, Carboneras-Río Verde, 26 Jun 1935, *Hinton 7716* (ARIZ, GH, LL-2, MICH, NY-2, RSA).

2. *Telosiphonia brachysiphon* (Torr.) Henr., comb. nov. Fig. 2 E–K

Echites brachysiphon Torr. in Emory. Rep. U.S. Mex. bound. 2: 158, 1859, (basionym); *Macrosiphonia brachysiphon* (Torr.) A. Gray. Syn. Fl. N. Amer. 2(1): 83, 1873. TYPE.—MEXICO. SONORA: gravelly hillside, San Bernardino, Aug 1852, *G. Thurber 764* [lectotype: (here designated) NY!; isotypes: (GH!, NY!).

Macrosiphonia dulcis A. Nelson. Amer. J. Bot. 21: 577, 1934. TYPE.—U.S.A. ARIZONA. Cochise Co.: lower slopes of Miller Peak, Huachuca Mts., 22 Aug 1907, *L.N. Goodding 2413* (holotype: RM!; isotypes: NY!, POM!). A large flowered form.

Macrosiphonia brachysiphon var. *magnifica* Woodson. Ann. Missouri Bot. Gard. 26: 97, 1939. TYPE.—MEXICO. SONORA: ridge S of Arroyo Gochico, E of San Bernardo, open granite slopes, 650–850 m, 5–9 Aug 1935, *F.W. Pennell 19524* (holotype: US!).

Macrosiphonia woodsoniana Standl. Field Mus. Nat. Hist., Bot. Ser. 22(1): 43, 1940. TYPE.—MEXICO. CHIHUAHUA: Guasaremos, Río Mayo, 30 Jul 1936, *H.S. Gentry 2342* (holotype: F!; isotypes: A! ARIZ-2!).

Subshrubs with stems of season developing from the plant base or from stems of previous year, (10–)20–30(–40) cm tall, the upper stems unbranched or sparsely branched; rhizomes present and the plants often colonial in rocky areas; young stems initially greenish-yellow, turning maroon brown; internodes (5–)10–25(–36) mm long, very closely pubescent with sparse to dense curved hairs to 0.1 mm long. Leaves 2(–3) per node, rarely subopposite; leaf blades ovate, broadly ovate, suborbicular, narrowly ovate to oblong-ovate, oblong-obovate, (8–)14–30(–36) mm long, (3.5–)6–15(–25) mm wide, erect-ascending, green throughout, mostly longer than the subtended internodes, acute, rounded, acuminate, always apiculate at the tip, obliquely cuneate, rounded to slightly cordate at the base, with margins entire to loosely to tightly undulate, the upper surface dark to olive green, often minutely speckled with maroon, the veins often maroon, sparsely hirtellus to pubescent with erect to antrorsely curved hairs 0.1–0.3 mm long, the lower surface yellow green with the vein reticulæ maroon, densely hirtellous-pubescent with erect or atrorsely curved hairs 0.1–0.2 (–0.6) mm long. Flowers 1(–2) at tips of new-growth stems, usually overtopped by 1–2 axillary branches; peduncles 0.2–1(–3) mm long; bracts 1–2, linear, 1.5–4 mm long; pedicels 7–13(–16) mm long, vestitured as stem; sepals 5(–6), oblong-ovate, 4–9.2 mm long, 1–2.2 mm wide, acute-acuminate, thin, drying maroon red, hairy as pedicels outside and in distal middle por-

tion inside; corollas white, the tube usually greenish, externally tinged with red or pink along upper throat and lobes in bud, opening in late afternoon, salverform, aromatic, (36–)45–65(–72) mm long, tube (13–)15–20(–26) mm long, ca. 1.5 mm wide, the throat (11–)15–20(–25) mm long, ca. 5 mm wide, the lobes 5, (10–)15–20(–25) mm long, 10–21 mm wide, spreading; anthers 7.5–8.2 mm long; free filaments 1.5–2 mm long. Mature fruit 5.5–12 cm long, 4–5 mm wide, brown-maroon; seeds 5–7 mm long, rust colored; seed coma 10.5–12 mm long, white, turning rusty with age.

The species is characterized by its largely suffrutescent growth habit with new stems developing from the base of the previous year's plant, by the concolorous leaves with a close vestiture of mostly tightly curled hairs, the corollas with short basal tubes, and small calyces that dry a maroon-red collar.

Disjunct collections from the vicinity of Alamos, Sonora and adjacent Chihuahua differ in having larger corollas, a more shrubby growth habit, and rather narrow undulate-margined leaves. Collections from these populations have been described by Woodson as *Macrosiphonia brachysiphon* var. *magnifica* and by Standley as *M. woodsoniana*. The Gentry collection described by Standley also has slightly denser leaf and stem vestiture and a widely branched shrub habit. Most all of the characteristics found in these and other collections from the region fit well within the variation of *T. brachysiphon* and thus the taxa are not recognized here. While the corollas of the plants are large, they do not exceed the size found in scattered collections throughout the range of *T. brachysiphon*. It is not known if the tendency of these plants to have a shrubby growth habit is a factor of their occurrence in a nondesert habitat or if it is the product of past introgression with *T. lanuginosa*, which also has larger corollas and undulate-margined leaves. However, the corollas of *T. lanuginosa* are much larger, and have much longer tubes than those found in the above noted collections.

The species grows in limestone and igneous rocky desert scrub-grassland to oak woodlands from southwestern Arizona (Pima, Santa Cruz, Cochise cos.) southwest New Mexico (Grant Co.), extreme west Texas (El Paso Co.), south into adjacent northern Sonora and Chihuahua, and again in southern Sonora and adjacent Chihuahua, mostly from 1000–1600 m elevation (Fig. 5). It flowers from late June through August.

Representative specimens.—U.S.A. ARIZONA. Pima Co.: 8 mi S of Vail, 4000 ft, 31 Aug 1903, *Jones s.n.* (ARIZ, GH, US); N end of Santa Rita Mts, 5800 ft, 13 Aug 1976, *McLaughlin et al.* 1358 (ARIZ); S side of Las Guijas Mts, below Mesquite Root Dam, 3700 ft, 6 Aug 1988, *McLaughlin* 4868 (ARIZ). Santa Cruz Co.: Temporal Canyon Rd, 3.6 mi from rt 62 in Patagonia, 23 Aug 1974, *Reeves & Lehto* 1154 (ARIZ, NY). Cochise Co.: Montezuma Cañón, Hu-

achuca Mts, 10 Aug 1909, *Gooding* 372 (ARIZ, GH, NY); 16 mi NE of Douglas, along US 80, 26 Jul 1971, *Pinkava et al.* 817 (NY).—NEW MEXICO. Hidalgo Co.: Guadalupe canyon, Handley Ranch, 17 Aug 1979, *Spellenberg & Repass* 5379 (NY). Grant Co.: Howell's Ridge, Little Hatchet Mts, 11–12 Aug 1973, *VanDevender & Spaulding s.n.* (ARIZ).—TEXAS. El Paso Co.: Franklin mts. 1.1 mi NE of top of Anthony's Nose, 31°58'10"N, 106°29', 19 Jul 1995, *Worthington* 25068 (TEX).—MEXICO. SONORA: Cañón de las Estacas, region of Río Bavispe, 26 Jul 1940, *White* 3047 (ARIZ, GH, MICH); 21 km N of Imuris on Mex 15, 10 Aug 1985, *Felger & Dimmitt* 85–803 (ARIZ).—CHIHUAHUA: Río Bonito, 25 Aug 1936, *LeSueur* 1202 (ARIZ, GH).

3. *Telosiphonia macrosiphon* (Torr.) Henr., comb. nov. Fig. 3 A–G

Echites macrosiphon Torr. in Emory. Rep. U.S. Mex. bound. 2: 158, pl. 43, 1859, (basionym); *Macrosiphonia macrosiphon* (Torr.) A. Heller. *Muhlenbergia* 1: 2, 1900. *Macrosiphonia berlandieri* A. Gray. Syn. Fl. N. Amer. 2(1): 83, 1878 nom. superfl. & illegit. (Gray substituted the epithet "*berlandieri*" for Torrey's *macrosiphon*, which he apparently considered a tautonym.) TYPE.—U.S.A. NEW MEXICO: without locality, 1851–52, *C. Wright* 1664 [lectotype: (here designated) NY!; isotypes: GH-2!, NY-2!, US!].

Suffrutescent, erect-stemmed plants 1–4(–5) dm tall, tending to form new woody shoots of season from a root crown or from lower branches of the previous season, rhizomatous, more colonial in rocky habitats; young stems yellow-green, turning maroon red, densely velutinous tomentose with tightly coiled hairs and other longer curved hairs 0.2–0.8 mm long, these diminishing in extent, but the longer hairs remaining on older stems; internodes (10–)20–40(–62) mm long. Leaves opposite, rarely subopposite, erect-ascending, ovate, obovate, oblong-ovate, to elliptical, rarely orbicular-reniform, (15–)20–40(–60) mm long, (9–)14–35(–45) mm wide, acute to rounded, rarely retuse, always apiculate at the tip, rounded to cordate, occasionally broadly cuneate at the base, entire, often revolute, often irregularly, coarsely to strongly undulate at the margins, the blades flat or thickish and variably cupped, bicolored, the upper surfaces green to gray green, closely velutinous with erect, usually curved hairs 0.2–0.5(–0.8) mm long with the veins impressed, the lower surfaces more yellowish-white, densely tomentose with curved and tightly crinkled hairs 0.5–1.0 mm long with the yellow mid, secondary and tertiary veins often raised; petioles 3–6(–9) mm long, vestitured as the leaf midribs. Flowers terminal, usually solitary at the stem tips, overtopped with 1(–2) lateral leafy shoots; peduncles 0.5–1 mm long; bracts narrowly lanceolate, 5–9 mm long; pedicels 4–9(–13) mm long, vestitured as the young stems; sepals 5, oblong-lanceolate, oblong, oblong-ovate, acuminate to attenuate at the tip, (11–)13–18(–25) mm long, (2.5–)3–4(–5) mm wide, tending to elongate as fruits mature, cuneate, sometimes the outer ones somewhat cordate at the base, entire, sometimes tightly undulate, greenish and herbaceous throughout, often mottled or

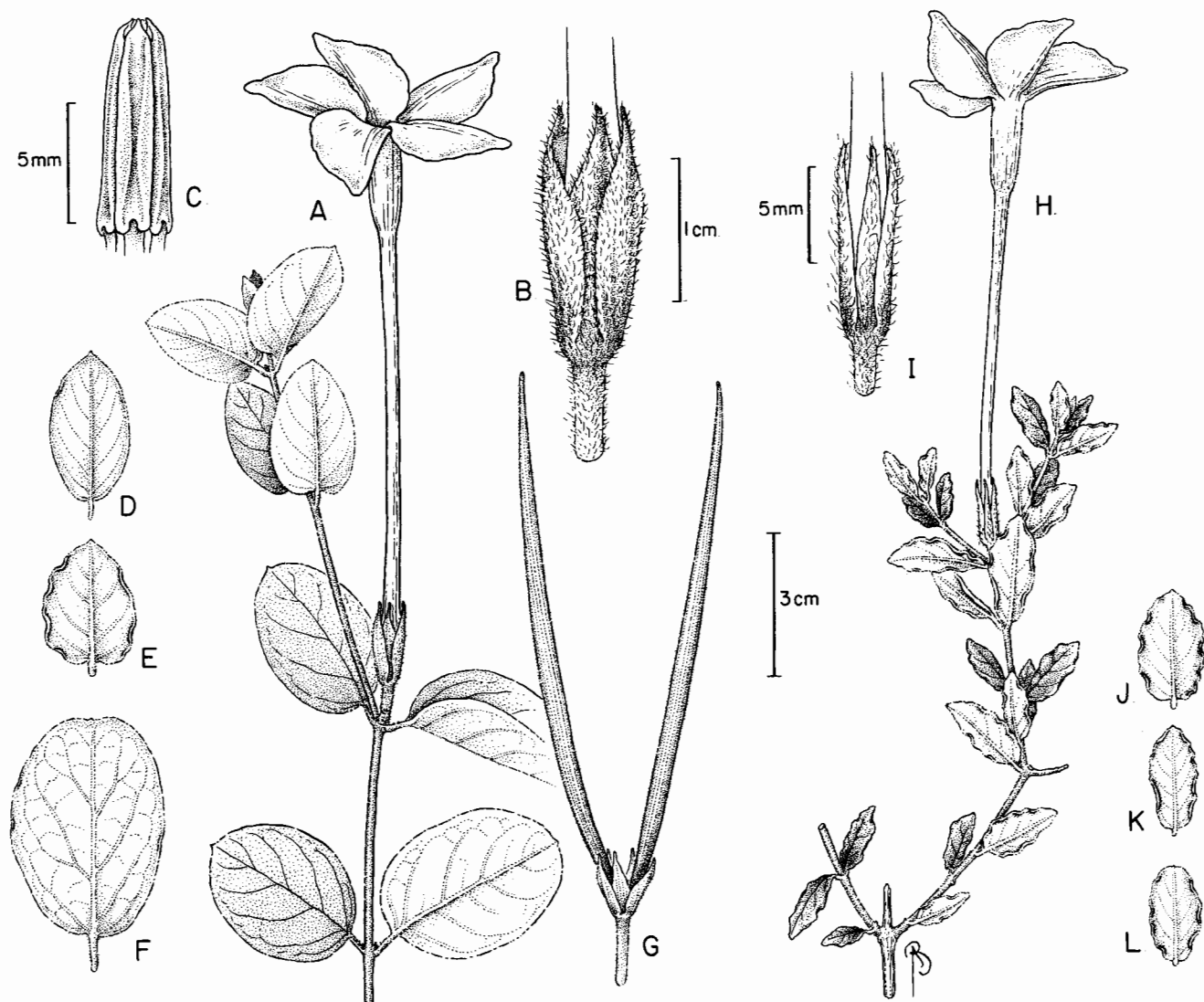


Fig. 3. *Telosiphonia macrosiphon* and *T. lanuginosa*.—A–G. *T. macrosiphon*.—A. Stem showing foliage, terminal flower, one axillary leafy shoot. (A–B. from Correll 33658 LL).—C. Abaxial view of anthers showing auriculate bases. (Chiang et al. 7501B LL).—D–E. Leaf variation (abaxial view): leaves range from broadly elliptical (D. Lewton 894 TEX) broadly ovate with undulate margins (E. Warnock & McBryde 15185 TEX) to large and obovate (F. Correll & Wasshausen 27907 LL).—G. Fruit with persistent sepals (Warnock & McBryde 15185 TEX).—H–L. *T. lanuginosa* var. *lanuginosa*.—H. Stem showing foliage, single terminal flower subtended by two axillary shoots. (Correll and Johnston 25641 LL).—I. Calyx and pedicel; the sepals are narrow and reddish (Powell & Turner 2344 TEX).—J–L. Leaf variation (abaxial view): leaves are typically undulate and range from ovate (J. Correll & Wasshausen 27700 LL) narrowly elliptical (K. Everitt s.n. TEX) to broadly elliptical (L. Powell & Turner 2344 TEX). (Magnifications as indicated, for A, D–H, J–K use 3 cm scale).

lined with maroon red or in the basal medial portion with the tips more herbaceous, velutinous with curved to spreading persistent hairs 0.3–0.8 mm long; corollas white, often tinged with pink to maroon-red where exposed in bud, drying rusty brown, (8.5–)10–14(–15) cm long, the tubes (4.6–)6.5–8.5(–9.5) cm long, the throats (13–)17–25(–30) mm long, 4–6 mm wide, the lobes (22–)25–32(–40) mm long to 18–34 mm wide; anthers 8–9.2 mm long, 1.3–1.7 mm wide. Fruit (5.7–)10–15 cm long, 3.5–4 mm wide, closely pubescent with curved hairs; seeds rusty-brown, 9–11 mm long, the comose hairs 16–20 mm long.

Telosiphonia macrosiphon is distinguished by its suffrutescent growth habit with the shoots of the season developing from the base of the previous year's shoots, rootstocks, or rhizomes, by its long-tubed corollas, by the large, mostly herbaceous, greenish sepals, by the very short peduncles and slightly longer pedicels, and the coarse, thickish, velutinous-tomentose, bicolored leaves with the veins strongly raised beneath.

On the eastern margin of its range the species appears to blend into *T. lanuginosa* as they both form small plants with coarse, densely vestitured leaves.

The possible introgression and distinction of these taxa is discussed under *T. lanuginosa*. *Telosiphonia brachysiphon* also has a subshrub habit, but this taxon is easily distinguished by its thin, green leaves, short corolla tubes and its Arizonian-Sonoran distribution. As with other species of the genus, the taxon is highly variable in flower size, leaf size and texture with sizes reflecting environmental conditions.

The species occurs mostly on dry rocky limestone and igneous-derived slopes, plains, grasslands, centered within the Chihuahuan Desert in association with species of *Acacia*, *Fouquieria*, *Dasylirion*, *Agave*, and *Chilopsis*, etc. The species ranges from central Texas, eastern Coahuila, west nearly to El Paso, Texas, and eastern Chihuahua, Durango and northern Zacatecas (Fig. 5). Collection data indicate an elevational range of 300–1700 m with flowering following rains from May through September.

Representative specimens.—U.S.A. TEXAS. Comal Co.: Comanche Spring, New Braunfels, Jun 1849, *Lindheimer 984* (GH, F, TEX, US). Kerr Co.: Lacey's Ranch, 2 Jun 1916, *Palmer 10018* (US). Edwards Co.: Barksdale, 11 Oct 1916, *Palmer 10995* (US). Crockett Co.: 15 mi N of Juno, 1500 ft, 7 Jun 1952, *Warnock 15185* (SRSC, TEX). Uvalde Co.: 4.2 mi E of Kinney Co., along hwy 334, 30 Jun 1993, *Turner 93-76* (TEX). Val Verde Co.: 2 mi SE of Del Rio, 8 Jul 1958, *Correll & Johnston 19441* (GH, LL). Terrell Co.: 10 mi NW of Sanderson, off Hwy 285, 2 Aug 1945, *Lundell & Lundell 14194* (LL, MICH). Pecos Co.: 25 mi SW of Ft. Stockton, 3850 ft, 26 Jul 1960, *Warnock 19970* (SRSC). Reeves Co.: Barrilla Hills, 20 mi E Balmorhea, 7 May 1946, *Cory 52179* (GH, MICH, NY, RM, US). Jeff Davis Co.: Mt Locke, Davis Mts, 2 mi below observatory, 15 May 1947, *Warnock 5690* (SRSC, TEX). Brewster Co.: Chisos Mts, 5 Aug 1931, *Muller 8123* (F, MICH, NY, TEX, US). Presidio Co.: Sierra Tierra Vieja, Gettysburg Peak, 11 Jun 1941, *Hinckley 1660* (LL, NY). Culberson Co.: Apache Mts, 4 mi N of Kent, 3800 ft, 27 Jul 1960, *Warnock 19776* (SRSC). Hudspeth Co.: Eagle Mts., W of Eagle Peak, 35 mi SE of Sierra Blanca, 1000 m, 23 Aug 1946, *Waterfall 6726* (GH, NY).—MEXICO. COAHUILA: W slopes of Sierra del Carmen, 10 km E of Hacienda de la Encantada, 15 Sep 1941, *Stewart 1692* (GH); Cañón de Tinaja Blanca, E slope of Sierra de las Cruces, W of Santa Elena Mines, 22 Jun 1941, *Stewart 592* (GH, LL); Rancho Santa Teresa, S of Castaños, 19 Jun 1936, *Wynd & Mueller 188* (A, ARIZ, NY); Cañón del Rayo near Sierra del Diablo, 25–29 Jul 1941, *Stewart 938* (GH); Sierra de Parras, 5500 ft, 5 Sep 1940, *Shreve & Tinkham 9868* (ARIZ); 11 km NE Jimulco, 2100 m, 28 Jun 1941, *Stanford et al. 60* (ARIZ, GH, NY).—CHIHUAHUA: Sierra del Virulento, 2–3 mi E of Rancho Virulento, 65 mi S of Ojinaga, 11 Aug 1941, *Johnston 8077* (GH, LL); Rocky hills near Chihuahua, Aug–Oct 1885, *Pringle 694* (A, GH, NY-4, MICH, RSA); Los Reyes, 8 mi S of Cd. Jimenez, 4600 ft, 30 Jul 1939, *White 2113* (ARIZ, GH, MICH).—DURANGO: 12 mi W of La Zarca towards El Palmito, 2000 m, 28 Jul 1959, *Straw & Forman 1720* (MICH, RSA).—ZACATECAS: 2 km S of San Miguel, rd to Cedrus, 24°55'N, 102°07'W, 1 Jul 1973, *Johnston et al. 11541* (LL).

4. *Telosiphonia lanuginosa* (M. Martens & Galeotti) Henr., comb. nov.

Echites lanuginosa M. Martens & Galeotti, Bull. Acad. Sci. Roy. Bruxelles 11(1): 357, 1844, (basionym).

Divaricately branched shrubs 2–5(–10) dm tall, when small tending to produce the new season's

branches on the upper stems of the previous year, in tropical areas tending to form distinct shrubs, (rarely rhizomatous in var. *oaxacensis*); young stems yellow-green, turning maroon red with age, initially closely velutinous with both tightly coiled and longer curved hairs 0.2–0.5 mm long, these diminishing with age, but the longer hairs persisting; internodes 15–35(–55) mm long. Leaves oblong-ovate, oblong-obovate, oblong-oblong-ovate, narrowly elliptical, sometimes broadly ovate, 15–30(–40) mm long, 7–16(–27) mm wide, acute, rounded to truncate, always apiculate at the tip, rounded to slightly cordate at the base, entire, revolute, usually coarsely or tightly undulate at the margins, bi-colored, the upper surface greenish, velutinous or hirtellous with erect, usually curved hairs 0.1–0.2 mm long with the veins impressed, the lower surfaces grayish-white, densely velutinous-tomentose with densely crinkled and wavy hairs 0.4–1 mm long with raised yellowish veins; petioles 1–3 mm long, vestitured as the adjacent young stems. Flowers 1(–2), terminating new-growth stems, often overtopped by axillary branches; peduncles 0.5–1.5 mm long; bracts lanceolate, 5–7 mm long; pedicels 3.5–9 mm long; sepals oblong-lanceolate, (7.8–)9–11(–12.5) mm long, 1.5–2(–3) mm wide, thin, acute-acuminate, typically somewhat membranous, stripped or mottled with reddish maroon outside, not herbaceous nor green, with coarse and moderately curved to straight hairs 0.3–1(–1.6) mm long, these tending to persist; corollas white, the lobes often pinkish or reddish maroon outside where exposed in bud, sometimes strongly maroon externally, 9.5–14.5 cm long, the tubes (3.3–)5–8(–10.5) cm long, the throat 14–22(–26) mm long, the lobes 15–35 mm long, 13–23 mm wide; anthers 7.3–9 mm long, 1.3–1.5 mm wide. Fruit 5.4–10 cm long; mature seeds dark rusty brown, 8–9 mm long, comose hairs 1.3–1.7 mm long.

Telosiphonia lanuginosa, the first North American species described, is characterized by its small membranous, reddish sepals with a vestiture of moderately long hairs, by its very short to absent peduncles, short pedicels, its long corollas usually with greatly elongated tubes.

The southernmost populations of *T. lanuginosa* in Puebla and Oaxaca are distinguished by having shorter corolla tubes and other characteristics that suggest introgression with *T. hypoleuca*. These latter plants are herein recognized as a variety of *T. lanuginosa* and thus the species consists of the following two taxa:

4a. TELOSIPHONIA LANUGINOSA (M. Martens & Galeotti) Henr. var. LANUGINOSA. Fig. 3 H–L

Echites lanuginosa M. Martens & Galeotti, Bull. Acad. Sci. Roy. Bruxelles 11(1): 357, 1844, (basionym). *Rhodocalyx lanuginosus* (M. Martens & Galeotti) Miers. Apocyn. S. Amer. 139, 1878; *Macrosiphon lanuginosa* (M. Martens & Galeotti) Hemsl. Biol.

Cent.-Amer. Bot. 2: 316, 1882. TYPE.—MEXICO. HIDALGO: Croît sur les versants calcaires et schisteux du gran ravin de Mex-titlan au NNE de México, 6000 ft, Sept. 18, *H. Galeotii* 1594 (holotype: BR).

Plants divariately branched shrubs with the new years growth developing from the older upper stems. Leaves highly variable in shape, size and thickness but tending to be oblong-ovate, oblong-obovate, oblong-ob lanceolate, narrowly elliptical to ovate, 15–30(–40) mm long, 7–16(–25) mm wide, acute to rounded-truncate, apiculate at the tip, often with strongly undulate, closely revolute margins. Flowers with corolla throats 14–22 mm long, the corolla tubes 50–80(–105) mm long, (2.6–)3–5(–6.5) times as long as the corolla throats.

The type variety can be distinguished on the basis its small shrub habit, often small, strongly undulate-margined leaves, thin, often reddish sepals and long corolla tubes. The taxon is highly variable in many of these features particularly in leaves with some specimens exhibiting thick, strongly undulate margined leaves and others having thin, entire leaves. Leaves of the plants from Hidalgo are often larger, more ovate-orbicular than those found in other areas.

The taxon is often difficult to distinguish from *T. macrosiphon* as they are very similar in leaf characteristics and flower structure. They usually can be distinguished on the basis of growth habit with *T. macrosiphon* having a more suffrutescent habit with new shoots of the season developing from a root crown or from lower branches of the previous year (sometimes from rhizomes), while *var. lanuginosa* has a divaricately branched small-shrub habit with new branches of the year developing further up the stems. It is considered that the desert-dwelling *T. macrosiphon* may die back completely during the dry season, regrowing each year from basal shoots, while *T. lanuginosa*, that occurs in scrub and grasslands mostly east of the deserts, is more of a true shrub either with perennial leaves or developing new shoots from its upper stems. The narrower, strongly undulate-margined leaves also serve to distinguish most specimens of *var. lanuginosa*, however undulate margins also occur in *T. macrosiphon*. A secondary feature for distinguishing the two taxa lies in the calyx. Calyx lobes of *var. lanuginosa* are typically shorter at anthesis and in dried specimens, are thinner, of a more uniform rusty-red color, which closely matches the color of the dried corolla tube. Calyx lobes of *T. macrosiphon*, in contrast, are larger, thicker and tend to be green-herbaceous, although most are reddish along the thickened, medial base and streaked with red towards the lower margins. Sepal length, however, tends to mirror vegetative size. Plants of *var. lanuginosa* showing strong vegetative growth have sepals 13–14 mm, approaching

those of *T. macrosiphon* in both size and texture (*Runyon* 2738, Hidalgo Co., TEX.). Likewise, some plants of *T. macrosiphon* that appear drought stressed with small leaves also have shorter calyx lobes, and sometimes shorter corollas (*LeSueur* 174, Chihuahua, TEX.).

In its short peduncles-pedicels, membranous sepals, and divaricate shrub habitat *T. lanuginosa* also is similar to *T. nacapulensis* and *T. hesperia*. *Telosiphonia nacapulensis*, however, can be distinguished by its larger shrub habit, reduced leaf vestiture, smaller corolla lobes, and its unusually close sepal vestiture; while *T. hesperia* can be distinguished by its dense leaf vestiture and by its tendency to have more orbicular, broadly ovate leaves and herbaceous sepals. However, as noted previously, populations of *var. lanuginosa* from Hidalgo may also have broadly ovate-orbicular leaves. The subshrubby, short corolla-tubed, green-leaved *T. brachysiphon* is easily distinguishable from this taxon as is the oblong-leaved *T. hypoleuca*. However, the southernmost populations of *T. lanuginosa*, described as a new variety below, have characteristics intermediate between the *var. lanuginosa* and *T. hypoleuca*. Woodson (1933) considered *T. lanuginosa* to be intermediate in morphology and distribution between *T. hypoleuca* and *T. macrosiphon* and suggested a hybrid origin of *T. languinosa*. In its narrower leaves, that are less strongly vestitured on the upper surface, and the much smaller, reddish calyx lobes, *T. lanuginosa* does indeed approach *T. hypoleuca*. It does not, however, exhibit the longer peduncles and shorter corolla tubes characteristic of *T. hypoleuca*.

The variety occurs on rocky limestone, caliche, sandstone, shale slopes and flats, mostly in openings and grasslands in Tamaulipan thorn scrub and Mesquite scrub in southern Texas in Jim Hogg, Hidalgo, Starr, Webb, Zapata counties and in México in Tamaulipas, Nuevo León, eastern Coahuila, San Luis Potosí and Hidalgo from 6–1500 m elevation (Fig. 5). Flowers are recorded from April through September, primarily after rains.

Representative specimens.—U.S.A. TEXAS. Webb Co.: 16.9 mi S of Miranda City, 27°13'N, 98°56'W, 800 ft, 19 Jul 1972, *Wendt* 1984 (TEX). Zapata Co.: E side of Zapata, 12 Jun 1963, *Correll & Watschausen* 27700 (LL). Jim Hogg Co. 10 mi N of Petroleum, 28 Jun 1963, *Correll & Johnston* 25641 (LL). Starr Co.: 6 mi N of Rio Grande City, 31 Dec 1933, *Clover* 1605 (MICH). Hidalgo Co.: Samfordyce, 300 ft, 18 Jul 1926, *Runyon* 74 (TEX-2, US).—MEXICO. TAMAULIPAS: 20 mi E of San Fernando—Santander Jimenez, 11 mi W of Loreto, 15 Sep 1960, *Johnston & Crutchfield* 5534 (MICH, TEX); 13 mi S of Cd. Victoria, 2 Jul 1940, *Hitchcock & Stanford* 6891 (GH); Puerto de la Angostura, km 658–60, hwy between Victoria and Cd. Mante, 29 Jun 1948, *Moore & Wood* 3631 (NY, TEX); Jaumave, Sierra de San Luis, 1932, *van Rozynski* 699 (MICH).—NUEVO LEÓN: 32 mi NNE of Sabinas Hidalgo, 23 May 1972, *Powell & Turner* 2344 (TEX); Mamulique Pass, 62 km N Monterrey, 1900 ft, 14 Oct 1972, *Fryxell & Bates* 2052 (LL, NY); hills near Monterrey, 31 Aug 1903, *Pringle* 11838 (GH, LL, MICH, TEX).—COA-

HUILA: Mts W of Saltillo, Aug 1880, *Palmer 807* (GH, NY).—SAN LUIS POTOSÍ: Minas de San Rafael, May 1911, *Purpus 5206* (GH, NY-2); 2 km E of Núñez, km 84 carretera San Luis–Antiguo Morelos, 1600 m, 22 Aug 1955, *Rzedowski 6255* (MICH, TEX).—HIDALGO: 13 km SE of Metztlán, carretera a Pachuca, 1300 m, 11 Jul 1976, *Rzedowski 34210* (MICH); Sierra de la Mesa, Ixmiquilpan, Jul–Sep 1905, *Purpus 1378* (GH, NY).

4b. *TELOSIPHONIA LANUGINOSA* (M. Martins & Galeotii)
Henr. var. *oaxacensis* Henr. var. nov.

A *Telosiphinae lanuginosae* var. *lanuginosae* differt tubo corollae 33–45 mm longo [non 50–80(–105) mm longo] fauce corollae 18–26 mm longo (non 14–22 mm longo).

TYPE.—MEXICO. PUEBLA: Tlacuilaltepec & Trés Mogotes, Aug 1909, *Purpus 3989* (holotype: GH!; isotype: NY!).

Plants low, weak-stemmed subshrubs, sometimes developing from rhizomes. Leaves oblong-ovate, oblong-elliptical to oblong, (2.2–)2.5–3.5(–4.5) cm long, 8–12(–17) mm wide, tapering-acute at the tips, entire to closely undulate at the margins. Flowers with corolla throats 18–26 mm long, the corolla tubes 33–45 mm long, 1.6–2.3 times as long as the corolla throats.

The new variety can be distinguished from var. *lanuginosa* solely by its shorter corolla tubes. In addition most specimens are low, weak-stemmed subshrubs with trailing stems and some specimens have rhizomes. The leaves are slightly larger than in the type variety, are more oblong-ovate to oblong-elliptic, bicolored, and moderately thin. They taper to an acute tip and are closely rounded to slightly cordate at the base. In their oblong shape the leaves are somewhat reminiscent of those of *T. hypoleuca* and most specimens of this taxon have been identified as *T. hypoleuca* by collectors.

In corolla tube length the taxon is intermediate between *T. hypoleuca* and var. *lanuginosa* with var. *oaxacensis* having corolla tubes 33–45 mm long, 1.6–3.2 times as long as the corolla throats, while those of *T. hypoleuca* are 8–30 mm long, only 0.4–1.5 times as long as the adjacent corolla throats, and those of var. *lanuginosa* are 50–80(–105) mm long, (2.6–)3–5(–6.5) times as long as the corolla throats.

In all characteristics var. *oaxacensis* appears intermediate between *T. hypoleuca* and var. *lanuginosa* leading one to suggest that these disjunct populations, south of the Sierra Madre del Sur, may have both taxa in their origin. The collections available are quite uniform vegetatively and have leaves very similar to a collection of var. *lanuginosa* from San Luis Potosí (*Purpus 5206*), which caused me to consider *oaxacensis* a variety of *T. lanuginosa* rather than a variety of *T. hypoleuca*. It, of course, could be considered a distinct species, but I consider it adequately treated as a variety of *T. lanuginosa*.

All specimens observed of var. *oaxacensis* have flowers solitary at the stem tips with moderately short pedicels and no or highly reduced peduncles as in var. *lanuginosa*. In contrast, var. *T. hypoleuca* typically has well developed peduncles, mostly 10–22, rarely to 36 mm long, and occasional specimens have 2, rarely 3, flowers at the stem tips. But occasional specimens of *T. hypoleuca* have highly reduced peduncles and most specimens do have solitary flowers.

The new variety is known only from Puebla and Oaxaca where it occurs in deciduous woodlands with *Quercus*, *Rhus*, *Arctostaphylos*, *Lysiloma*, *Bursera*, *Portlandia* etc. from 1740 to 1950 m elevation. Flowering specimens were collected in July and August.

Representative specimens.—MEXICO. PUEBLA: 15 km SE of Izúcar de Matamoros, carretera a Tehuiztzingo, *Medina 598 y Valiente* (MEXU); 45 km SE de Acatlán de Osorio, entre Chila y Yucunduche, 1740 m, 28 Jul 1983, *Torres 3312 y Hernández* (MEXU).—OAXACA: 8 km E de Chilapa de Díaz, carretera a Tamazulapan, 1950 m, 3 Jul 1977, *Rzedowski 32831* (MEXU); 20 km N Santiago Miltepec, carretera a Tehuacán, 2 Aug 1985, *Salinas & Dorado F-2714* (MEXU).

5. *TELOSIPHONIA hesperia* (I. M. Johnst.) Henr., comb. nov. Fig. 4 A–D

Macrosiphonia hesperia I. M. Johnst. Proc. Calif. Acad. Sci. ser. 4. 12: 1125, 1924, (basionym). TYPE.—MEXICO, BAJA CALIFORNIA DEL SUR, Cliffs back of Puerto Ballandra, Carmen Island, Gulf of California, 21 May 1921, *I. M. Johnston 3807* (holotype: CAS; isotype: US!).

Much to weakly branched, deciduous, spreading shrubs (5–)10–20 dm tall, often wider than tall; young stems yellowish green, soon turning reddish maroon; internodes (5–)20–45(–57) mm long, initially densely villous with short, tightly curled hairs to 0.1 mm long and with longer straighter-curved hairs to 0.3 mm long, tardily glabrescent. Leaves opposite; leaf-blades broadly ovate, orbicular, sometimes reniform, 15–30(–56) mm long, 11–30(–56) mm wide, mostly shorter than the subtended internodes, rounded to acuminate, always apiculate at the tip, rounded to cordate at the base, entire to very slightly, coarsely undulate at the margins, bicolored, the upper surfaces green to olive-green, moderately to densely velutinous with erect hairs 0.3–0.5 mm long, the lower surfaces densely white tomentose with dense, curled hairs 0.3–0.8 mm long with the midvein and secondary veins yellowish; petioles 2–6 mm long, yellowish, densely tomentose with curled hairs. Flowers terminal, solitary at tips of new-growth stems, overtopped by 1–2 lateral branches; peduncles 0.2–1 mm long; bracts sepallike, lanceolate, acute, 6–9 mm long; pedicels 2–5(–9) mm long, thick, yellowish, tomentose; sepals 5(–6), oblong-lanceolate, (7–)9–12.5 mm long, 2–3.5 mm wide, acute, green, sometimes herbaceous distally when young, more yellowish below, villous-tomentose with

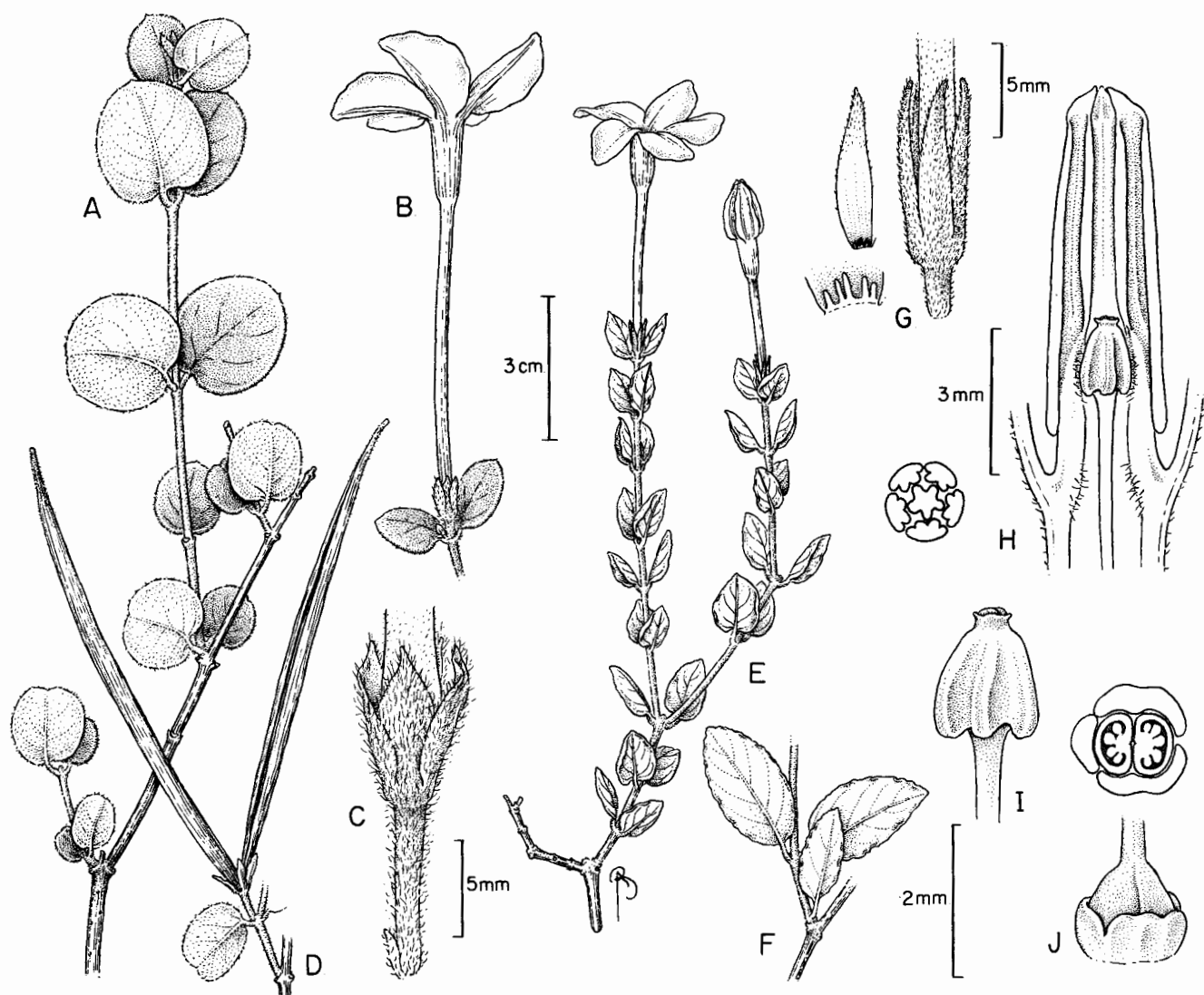


Fig. 4. *Telosiphonia hesperia* and *T. nacapulensis*.—A–D. *T. hesperia*.—A. Stem showing characteristic orbicular leaf blades, divaricate branching (Palmer 841 GH).—B. Flower showing subtending leaves and calyx (Carter & Moran 5495 TEX).—C. Calyx and pedicel: sepals are large and leafy; peduncles are very reduced (Carter 5101 TEX).—D. Mature fruit with subtending sepals (Palmer 841 GH).—E–J. *T. nacapulensis*.—E. Stem showing small leaves with somewhat undulate, recurved margins and terminal flowers (Felger & Dimmitt 85–869 TEX).—F. Leaf variation; some collections have larger, thinner leaves (Felger & Dimmitt 85–830 TEX).—G. Calyx with narrow sepals. Figures to left show inner sepal surface with basal squamellae, expanded below (Carter 5101 TEX).—H. Gynostegium showing anthers and style head at junction of corolla tube-throat; the anther sacs occur above the style head; cross sectional drawing shows orientation of style-head ribs opposite the anther sacs.—I. style head showing five ribs.—J. ovary and surrounding nectary, section shows cross section of ovaries with surrounding nectaries.—H–J from preserved material from Arizona-Sonora Desert Museum, Tucson, Ariz. (Henrickson 22222 CSLA). (Magnifications as indicated, for A–B, D–F follow 3 cm scale).

curled hairs to 1 mm long outside and near medial tip inside; corollas white or lavender externally in bud, opening mornings to late afternoon (Carter & Moran 5495), 6.5–11.5 cm long, the tubes 42–63 mm long, the throats 11–12 mm long, tubular to conical, the lobes strongly oblique, 18–24 mm long, 13–18 mm wide; anthers 8.5–9 mm long; filaments ca 1.5 mm long. Paired fruit (5.2–)10–19.5 cm long, 3–4 mm wide, closely vestitured with tightly coiled hairs; seeds 8–10 mm long, rusty brown; seed coma 15–18 mm long, whitish.

The species is characterized by its large-shrub growth habit, its long flowers with tubes much exceeding the length of the throat, by the orbicular to broadly ovate leaves, by tendency for the young sepals to have green herbaceous tips that eventually fade and become membranous after anthesis, and its distribution in southern Baja California, México. The leaves are distinctly bicolored, green and densely velutinous with erect, straight hairs on the upper surface, white, densely canescent with curled hairs and the veins are white, not reddish beneath. Insufficient specimens are avail-



Fig. 5. Distribution of species of *Telosiphonia* in southwest United States and Mexico based on collections of A-GH, ARIZ, F, RM, RSA-POM, TEX-LL, US.

able to determine the typical flowering period, but the species appears to be drought deciduous, producing leaves and flowers in the late summer-fall with flowers appearing on the new growth of the season typically from September to October.

The species is known from rocky igneous slopes along the eastern edge of southern Baja California del Sur from south of Santa Rosalia to well south of Lo-

reto and on several islands in the Gulf of California (Islas San Marcos, del Carmen, Catalina, Santa Cruz, Espiritu Santo, Cerralbo (Johnston 1924) from 50 to 1200 m elevation (Fig. 5). Common associates include species of *Lysiloma*, *Prosopis*, *Erythea*, *Bursera*, *Jatropha*, *Fouquieria*, *Karwinskia*, *Sapium*, *Pachycereus*, etc. A common name given with Carter specimens is "Jasmín de la Sierra."

Representative specimens.—MEXICO. BAJA CALIFORNIA DEL SUR: Arroyo de los Chivos, NE side of San Marcos Island, 50 m, 27 Mar 1962, *Moran 8998* (MICH); head of Concepcion Bay, 6 Apr 1911, *Rose 16700* (NY); Carmen Island, 1–7 Nov 1890, *Palmer 841* (GH); Sierra de la Giganta, head of Cañón de Ultima Agua, 25°49.5'N, 111°23'W, 900–1075 m, 4 Oct 1970, *Carter & Moran 5495* (ARIZ, NY); Sierra de la Giganta, Arroyo Santo Domingo, 10 km SSW San Javier, 25°45'N, 111°35'W, 2500 ft, 14 Oct 1964, *Carter 4734* (GH, MICH); Sierra de la Giganta, Rancho Tasajera, 3.5 km NE San José de Agua Verde, 25°30'N, 111°09.75'W, 350–500 m, 22 Oct 1964, *Carter 4838* (MICH); Sierra de la Giganta, NW of Portezuelo de Cuesta de los Dolores, 25°07'N, 110°57–58'W, 660 m, 19 Oct 1964, *Carter 4803* (NY); E side of Punta San Lorenzo, 25 mi E of La Paz, 26 Nov 1959, *Wiggins 15632* (RM).

6. *Telosiphonia nacapulensis* Felger & Henr., sp. nov. Fig. 4 E–J

A *Telosiphonia hesperia* differt foliis minoribus ovatoribus (non orbicularibus) vestimento multo minus denso et sepalis minoribus tenuioribus typice rubescentibus (non latis herbaceis).

TYPE.—MEXICO. SONORA: Cañón Nacapules, ca 4 km N of Bahía San Carlos, deep riparian canyon, 28°01'N, 111°03'W, 125 m, 11 Aug 1985, *R.S. Felger & M.A. Dimmitt 85–830* (holotype: ARIZ!; isotypes: GH, NY, TEX, MEXU!).

Strongly, divaricately branched, rounded shrubs 8–15 dm tall and often as wide; stem branched at 30–65 degrees from the central stem; young stems yellow-green, turning dull or reddish maroon; internodes 6–30(–60) mm long, with both short, tightly curled hairs to 0.1 mm long and with longer curved to erect hairs to 0.2 mm long. Leaves opposite; leaf-blades ovate, broadly ovate, sometimes obovate, 12–22(–30) mm long, 7–15(–17) mm wide, obtuse-rounded, often notably acuminate, always apiculate at the tip, rounded to cordate at the base, entire, sometimes revolute or undulate at the margins, slightly to strongly bicolored, the upper surfaces green, pubescent to hirtellous with tightly curled or erect-curved hairs to 0.1(–0.2) mm long, often red speckled with the veins impressed or not, the lower surfaces gray-green to white, sparsely velutinous to densely white canescent-tomentose with strongly or slightly curled to curved hairs 0.2–0.3(–0.5) mm long, the veins whitish or reddish, raised; petioles (2–)3–5.5 mm long, hairy as the midrib. Flowers 1–2 at the tip of new-growth stems, overtopped by lateral leafy branches or not; peduncles 0.3–1.5(–2.5) mm long; bracts linear, rarely lanceolate, 2.5–6(–10) mm long, 0.4–1.2(–2.8) mm wide, membranous or green; pedicels (1–)6–9(–11) mm long, hairy as the young stems; sepals 5, linear, rarely lanceolate, 5–9 mm long, 1–1.2(–2.4) mm long, mostly reddish membranous, rarely leafy, pubescent with a mix of short curled hairs and some larger, more spreading hairs to 0.3 mm long; corollas white, tinged with red outside in bud, opening in late afternoon (*Felger 85–869*), 7.0–10.2 cm long, the tube (36–)45–55(–60) mm long, the throat tubular

to somewhat amplify, 12–20(–25) mm long, 5–9 mm wide, the lobes strongly oblique, 1.5–2.2 mm long, to 12–18 mm wide; anthers 8.2–8.5 mm long, 1.2 mm wide; free filaments 1.5 mm long. Paired fruit 10–11 cm long, 3–5 mm wide, closely vestitured with tightly coiled hairs; seeds rusty-brown, 6.7–8.5 mm long; coma whitish, 13–15 mm long.

The species is characterized by its deciduous, divaricately branched shrub habit, by the ovate leaves that tend to have distinct, rather long acuminate tips and either entire or undulate, sometimes revolute margins, by the moderately short, mostly thin sepals with a characteristic short vestiture, and by the very long corolla tubes and relatively short corolla lobes. The specimens vary greatly vegetatively. Some plants show evidence of vigorous growth with long internodes, large, flat, green, rather sparsely vestitured leaves, other specimens have reduced new growth with crowded nodes, crooked stems, thick, often revolute or cupped, hairy leaves. Lower leaf vestiture also varies, even on fast-growing plants, with some plants having white, canescent-tomentose lower surfaces with other plants having a much less dense vestiture.

The new species appears closely related to *T. brachysiphon* having similar sepals and leaves, but it differs in its larger, woody shrub habit, much longer corolla tubes, and often somewhat thicker leaves with dense abaxial vestiture. Of note the southernmost collections of *T. brachysiphon* also tend to be more shrubby, as in the type of *Macrosiphon woodsoniana*, but these plants lack the greatly elongated corolla tubes characteristic of *T. nacapulensis*. In its shrubby habit, leaf shape and vestiture, and sepals the new species also resembles *T. lanuginosa*, however the corolla diameter of *T. nacapulensis* (measured lobe tip to tip in pressed flowers) ranges from 3 to 4 cm, while the flowers of *T. lanuginosa* are much larger, typically 5–8 cm in total limb diameter.

The new species is known from the dry reddish and yellowish rhyolitic Sierra El Agua (part of the larger Sierra el Aguaje), north of Bahía San Carlos, and the Sierra Libre, between Hermosillo and Guaymas (Fig. 5), where it occurs in scattered populations on steep, dry, rocky canyon sides with *Acacia willardiana*, *Bursera microphylla*, *Haematoxylon brasiletto*, *Jatropha cuneata*, *Macroptilium atropurpureum* and various cacti. The species is cultivated in Tucson. Flowering occurs in following rains in August–October with flowers terminating new growth of the season. The flowers opening in the late afternoon and fail during the following morning.

Representative specimens.—MEXICO. SONORA: Sierra Libre, Microondas Avispas, 28°29'N, 111°01'40"W, 500 m, 11 Aug 1985, *Felger 85–820* (ARIZ); Bahía San Pedro, 28°01'N, 111°02'W, 10 m, 1 Oct 1975, *Turner et al. 79–262* (ARIZ); Cañón Babiso, near San

Carlos, 27°58'N, 111°04'W, 16 Jan 1978, *Vandevender & Urry s.n.* (ARIZ); 2 mi NW of San Carlos Bay on old road to Rancho La Manga, 27°58'N, 111°04'W, 100 m, 3 Sep 1989, *Sanders et al.* 9186 (ARIZ).

ACKNOWLEDGMENTS

The author thanks the curators at A-GH, ARIZ, F, NY, RM, RSA-POM, TEX-LL, US for loans of specimens, Justin Williams (TEX), Bruce Hansen (FLAS) for comments on the manuscript, Richard Felger and Mark Dimmitt (ARIZ) for specimens and information regarding *T. nacapulensis*, Fernando Chiang (MEXU) for information on the new taxon from Puebla and Oaxaca, Bobbi Angell (NY) for the line drawings, Guy Nesom for the Latin translations, and the Plant Resources Center at the University of Texas, Austin for use of facilities. Richard Felger thanks the Wallace Genetic Foundation, Washington D.C., for support of his fieldwork.

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