



Astragalus comonduensis and *Calliandra pilocarpa* (Fabaceae), two new species from Baja California Sur, Mexico

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Abstract

Two new species of Fabaceae, *Astragalus comonduensis* from *A. sect. Inflati* and *Calliandra pilocarpa* from *C. sect. Androcallis* are described and illustrated. Both species are endemic to the state of Baja California Sur. Distribution, associated vegetation, rarity of observation, affinities to other related species, botanical illustrations, and various keys for identification of these plants in the region are also presented.

Keywords: Leguminosae, Lotoideae, Mimosoideae, plant morphology, taxonomy

Introduction

The flora of the Baja California peninsula and adjacent islands in both the Pacific Ocean and the Gulf of California, located in northwestern Mexico is documented to have 3,892 plant taxa, included in 3,551 species, 1,093 genera and 186 families (Rebman *et al.*, 2016). With respect to endemism, approximately 26% of the native flora of the region is endemic or near-endemic. This most recent study of the Baja California region's flora significantly increased the region's plant diversity through improved compilation of specimen vouchers and also by incorporating many plant taxa that were new and described since Wiggins (1980) publication on the entire flora. The three most diversified plant families reported for that region are Asteraceae, Fabaceae, and Poaceae. Regarding the family Fabaceae, it is represented in the Baja California region by 77 genera, 285 species, and 29 more infraspecific taxa, and in particular the genus *Astragalus* L. (1753: 755) is one of the most heavily represented in species (29), infraspecific taxa (38), and endemic taxa (20) (Rebman *et al.*, 2016). The diversity and rarity of the species belonging to this genus was observed and highlighted by Barneby (1964, 1976). Concerning *Calliandra*, this genus is represented in the Americas by 142 species (Sousa *et al.*, 2014), with almost 30 of them occurring in Mexico (Hernández, 2008). Only three species are currently recognized for the peninsula of Baja California, *C. californica* Benth. (1844a: 14) with a wide distribution along the peninsula, *C. peninsularis* Rose (1897: 135) restricted in distribution to the Cape region of southern Baja California Sur (Standley, 1922; Wiggins, 1980; Barneby, 1998; Rebman *et al.*, 2016), and *Calliandra eriophylla* Benth (1844b: 105), also with a wide, but scattered distribution along the peninsula (Rebman *et al.*, 2016).

Material and methods

As part of the ongoing project focused on the “Flora of Baja California” being conducted at the San Diego Natural History Museum by Rebman and others; at least 150 and 5 specimens of *Astragalus* and *Calliandra* respectively have been newly collected from various parts of the peninsula. Using an Olympus SZ61 stereo dissecting microscope, along with relevant literature for the genera and region (Barneby, 1964, 1976, 1998; Wiggins, 1980), two newly collected specimens of *Calliandra* and two newly collected specimens of *Astragalus* were reviewed in the San Diego

Natural History Museum (SD Herbarium). After meticulous morphological scrutiny, associated to the *Astragalus* and *Calliandra* species concept (Barneby, 1964; Barneby, 1998) found in the peninsula, the samples revealed that they did not coincide with any of the previously described species.

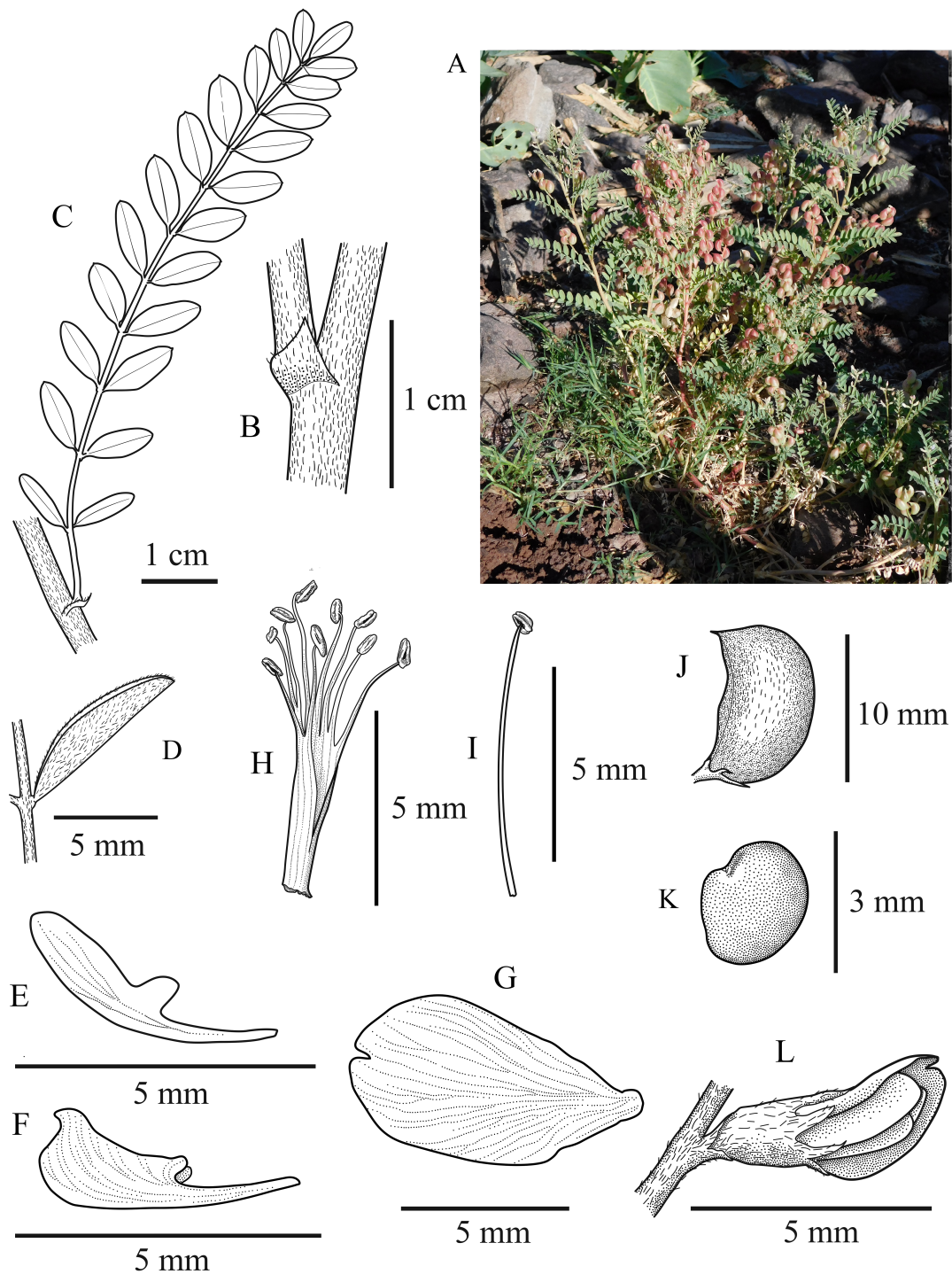


FIGURE 1. *Astragalus comonduensis*, A) Picture of the whole plant. B) Stipule. C) Leaf. D) Leaflet. E) Wing petal. F) Keel petal. G) Banner petal. H) Androecium with nine filaments united. I) Vexilar stamen. J) Fruit. K) Seed. L) Complete flower. Illustration by Callie Mack.

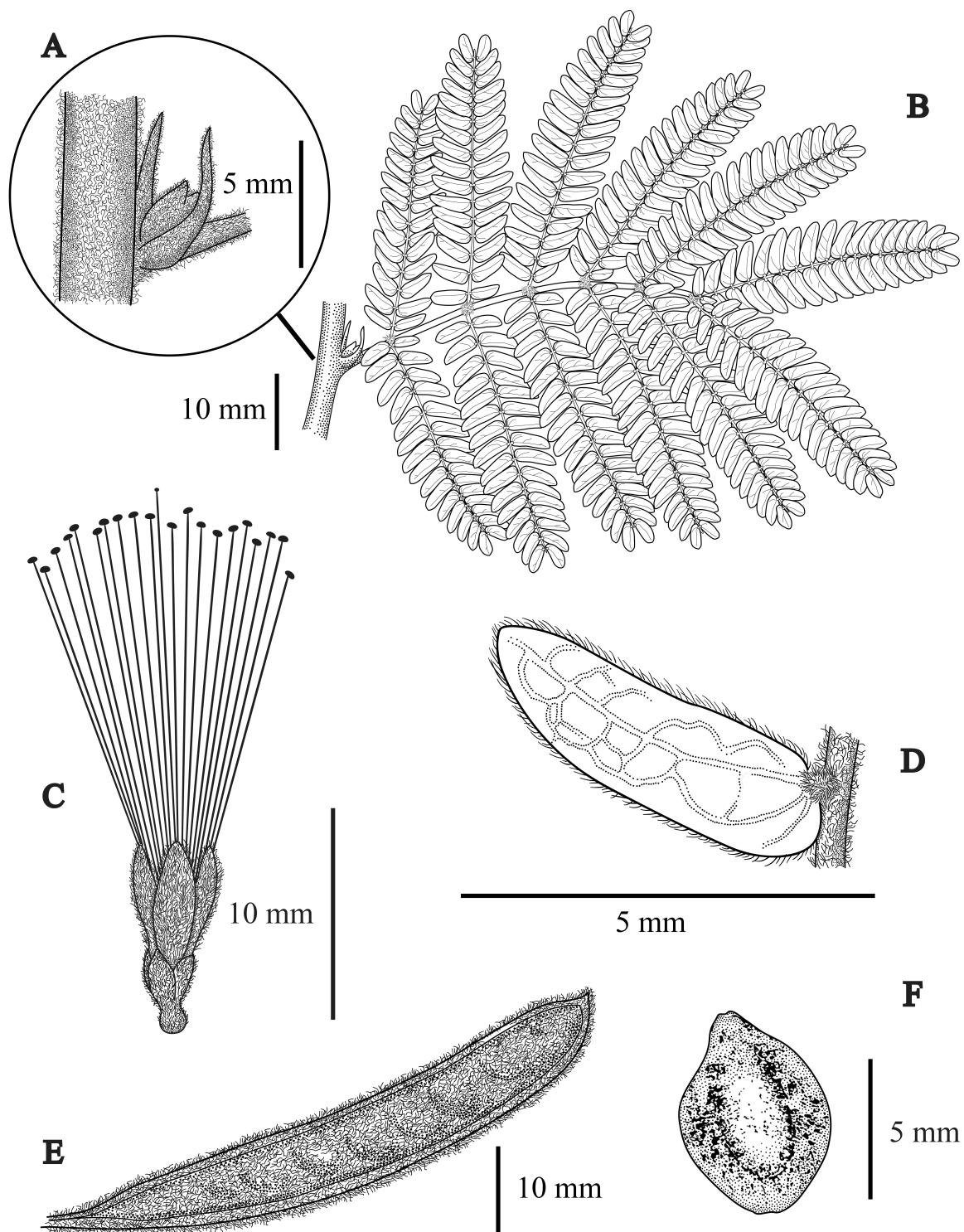


FIGURE 2. *Calliandra pilocarpa*, A) Stipules and pubescence. B) leaf. C) Complete flower showing calyx, corolla, stamens and style, note the characteristic dense pubescence in both, calyx and corolla. D) leaflet and venation. E) Fruit. F) Seed. Illustration by Callie Mack.

Taxonomy

Astragalus comonduensis A. E. Estrada, Rebman & Villarreal, *sp. nov.* (Fig. 1. A–L)

Morphologically similar to *Astragalus aridus* A. Gray (1864: 223), but differs in its erect habit, strigulose pubescence, mucronate and adaxially glabrate leaflets, shorter and narrower calyx with both white and black intermixed trichomes, color of flowers, degree of pod inflation, consistency and pubescence type on fruit surfaces, ovule number, and seed size.

Type:—MEXICO. Baja California Sur (Municipio Comondú): Llano La Laguna: Sierra de la Giganta Region, north of San José de Comondú near Rancho Palo Fierro; southern portion of the llano, 26°08'19.9"N, 111°46.1'19.6"W, alt. 505 m, 9 March 2016, *J. Rebman 31220* with *R. Domínguez Cadena & F. Pio León* (Holotype SD 255900!; isotype HCIB).

Plant annual, caulescent. **Stems** erect, up to 45 cm long, striate, green or green-reddish, turning purple when dry, strigulose, the trichomes 0.2–0.4(–0.5) mm long, white, straight, appressed; stipules free or some amplexicaul by half to three-quarters of stem's circumference, straight or basally oblique, 2–3 × 1–2 mm, ovate, gradually to abruptly acute at the apex to triangular-lanceolate, brown-yellow, green or reddish-tinted, strigulose abaxially, the trichomes 0.2–0.5 mm long, white with some black ones intermixed, glabrate adaxially, margins ciliate, straight or reflexed with age. **Leaves** (2–)4.2–7.3(–7.9) cm long, short petioled, the petiole 3–10 mm long; leaflets (13–)14–17(–21), (3.2–)4.2–9.5(–17) × 1.4–4 mm, elliptic to elliptic-obovate, petiolulate, petiolule 0.3–0.7 mm long, orange to reddish, glabrate to sparsely strigulose, base acute, apex mucronate, mucro 0.1–0.3 mm long, glabrate adaxially, strigulose abaxially with mainly white trichomes, leaf rachis strigulose to densely strigulose on young leaves, trichomes white or white with a few black ones intermixed. **Inflorescences** in axillary racemes, (6.4–)6.5–8.9 cm long, peduncles 3.8–4.9 cm long, erect, ascending, 10°–20° angled from stem, sparsely strigulose, with both white and black trichomes; floriferous axis 1.6–4.4 cm long, 4–9 flowered; flowers mostly ascending, and remaining so in fruit, rarely spreading; bracts 1.1–1.5 mm long, lanceolate to triangular-lanceolate, green, sparsely strigulose, with white and black trichomes intermixed abaxially, glabrous adaxially; pedicels 1–2 mm long, slightly thickened in fruit, sparsely strigulose similar to bracts, persistent after fruit falls, bractlets 0. **Flowers** 5–5.5 mm long; calyx 2–2.8 × 1–1.2 mm, campanulate, the tube 2–2.8 mm long, slightly inequilateral, more deeply recessed behind the banner, strigulose, with white and black trichomes, the teeth 0.8–1.2 mm long, lanceolate to triangular-lanceolate, green, green-reddish to reddish, sparsely strigulose as the tube; petals purple-lavender, some flowers becoming bluish with age, the banner sessile, 4.5–5 × 2.1–2.2 mm, elliptic to elliptic-obovate, sometimes longitudinally inequilateral, a side wider than the other, folded near the middle, and margins folded again backward, slightly bent backward from the keel, distally recurved 25°–50° from the vertical, apically retuse, the notch 0.2–0.3 mm deep; wings 4.2–4.6 mm long, the claw 2–2.1 mm long, the blade 2.3–2 × 1.3–1.4 mm, oblong, oblique, half-obovate, unguiculate, and auriculate, the apex rounded; the keel 3.9–4 mm long, the claw 1.8–1.9 mm long, the blade 1.9–2 × 1.2–1.3 mm, strongly incurved, half obovate, apically triangular, the beak curved slightly backwards, unguiculate and auriculate. Stamens 10-merous, diadelphous, 9 fused by their filaments into a white, slightly striped sheath 2.9–3.1 mm long, the free portion 0.8–1 mm long, enfolding the ovary, the vexilar stamen 3.8–3.9 mm long, standing free; anthers spherical or almost so, 0.3–0.4 mm diameter, yellow to yellow-orange. Ovary unilocular, 0.9–1.2 mm long, sessile, densely strigulose, trichomes white, style 0.9–1.2 mm long, incurved, glabrate, stigma terminal, minute, glabrate, ovules 7–9. **Pod** ascending when young and remaining so, sessile, oblique-ovoid, subglobose, bladderly-inflated, 10–14 × 6–10 mm, basally somewhat cuneate, distally abruptly contracted in a triangular, slightly laterally compressed, 2–3 mm long beak, ventrally shallow sulcate by the filiform suture and it less convex than the also filiform dorsal suture, the valves little flattened dorsoventrally, sparsely and minute strigulose, the trichomes 0.1–0.3 mm long, tan to reddish, becoming purple when dry, subdiaphanous to opaque; seeds 2.1–2.5 mm long, opaque, smooth, light-brown to brown.

Distribution and habitat:—As currently known, there are only two specimens of *Astragalus comonduensis*, both collected at Llano La Laguna located in the Sierra La Giganta region, north of San José de Comondú in Baja California Sur (Fig. 4). Based on the collection descriptions, this species grows with vegetation dominated by *Datura wrightii* Regel (1859: 193), *Heliotropium procumbens* Miller (1768: 10), *Ambrosia confertiflora* DC. (1836: 526), *Prosopis articulata* S. Watson (1889: 48), *Parkinsonia aculeata* L. (1753: 375), *Eclipta prostrata* L. (1771: 286), and *Nicotiana glauca* Graham (1828: 2837), in wet muddy soil near the water's edge along the banks of ephemeral lakes. One of the specimens (*Rebman 31220*), was very large and loaded with fruits and only portion of it was collected for herbarium specimen. The other specimen (*Domínguez 3140*) collected in 2002, we don't know how many individuals were there at that time.

Etymology:—The name of the species refers to the municipality of Comondú, where the plant is only known to occur.

Phenology:—With only two specimens of *Astragalus comonduensis* currently known, phenological information is rather limited. However, based on the phenological conditions of these specimens, flowering apparently occurs from February to March, and fruiting is likely from March to June. Samples of *Astragalus aridus*, *A. insularis* Kellogg (1884: 6), and *A. idriotorum* Barneby (1964: 703) distributed in adjacent or near areas to the type locality were examined in other herbaria (BCMEX, CAS, CFNL, NYBG and SD), in order to ensure the correct determination and discrimination of these with the new species (Appendix I).



FIGURE 3. Holotype (SD 141639) of *Calliandra pilocarpa* (previously determined as *Calliandra peninsularis*).

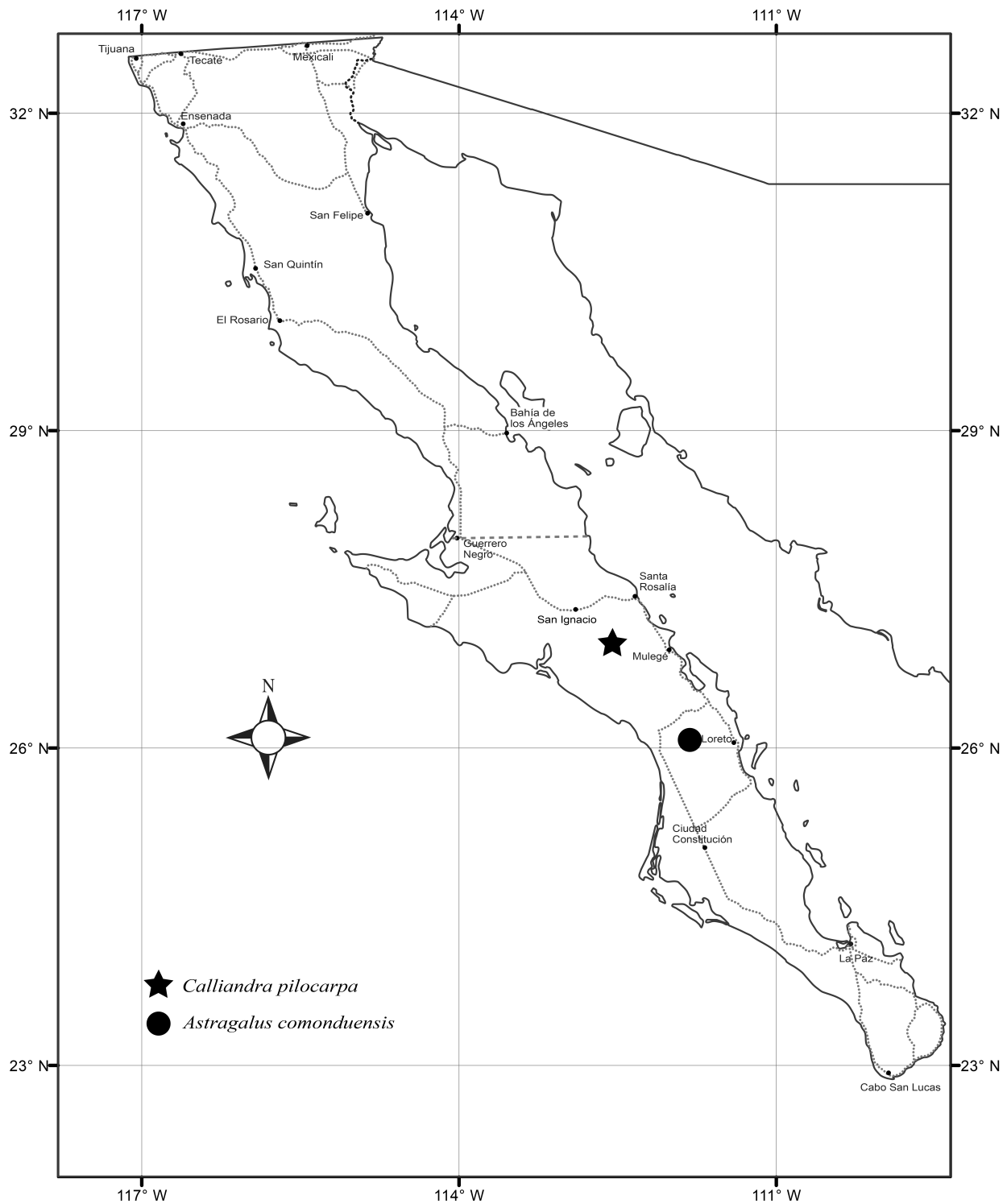


FIGURE 4. Distribution of *Astragalus comonduensis* and *Calliandra pilocarpa* in Baja California Sur, Mexico.

Additional specimens examined (paratypes):—MEXICO. Baja California Sur (Municipio Comondú): La Laguna, al norte de San José de Comondú, 26°06'48.2"N, 111°46'38.2"W, alt. 443 m, 14 March 2002, *M. Domínguez L.* 3140 (SD 157777, HCIB 16970).

Notes:—The morphological characteristics of this species, such as free stipules and inflated unilocular fruit, make it part of *Astragalus* sect. *Inflatii* A. Gray (1864: 213). It also has several morphological characteristics that place it in *Astragalus* subsect. *Aridi* M.E. Jones (1923: 92). These include: annual habit, leaflets 7–21, racemes with 2–10 flowers, small purple flowers, 7–22 ovules, and persistent, sessile, erect and unilocular pod. Within *Astragalus* subsect.

Aridi, the annual species *Astragalus aridus* A. Gray (1864: 223) is the only other species characterized by having erect fruits and few (3–7) ovules while the rest of the species in the group show extended or declined fruits, and a greater number of ovules. *Astragalus comonduensis* characteristically exhibits erect fruits and few ovules (7–9). However, there are several differences between these two annual species. 1. *Astragalus comonduensis* reaches up to 42 cm high and the stems are erect, not eventually decumbent and trailing as in *A. aridus*; 2. The pubescence of *A. comonduensis* is strigulose with 0.2–0.4(–0.5) mm long, straight, white, appressed trichomes, not silky or satiny-canescenscent, with ascending 0.6–1.1 mm long trichomes as in *A. aridus*; 3. The leaflets of *Astragalus comonduensis* are mucronate and glabrate adaxially, not equally pubescent on both leaf surfaces and never mucronate as in *A. aridus*. 4. In respect to the perianth, the calyx of *A. comonduensis* is shorter (2–2.8 mm long) and narrower than that of *A. aridus* (3.2–4.4 mm long), plus it exhibits both white and black intermixed trichomes unlike the uniformly white trichomes of *A. aridus*. 5. Both species have small flowers, but *A. comonduensis* has purple-lavender petals, while *A. aridus* has been reported to have whitish, pink-lilac or flesh colored petals. 6. Also, the keel of the new species has a very distinctive small curved backward beak which is absent in *A. aridus*. 7. In addition to these features, there are marked differences regarding the pods, with those of *A. comonduensis* being completely inflated, bladdery, proportionally wider, shiny, and not laterally compressed (not even minutely), opaque to sub-diaphanous, and minutely-strigulose, while the pods of *A. aridus* are little inflated, but not bladdery, laterally compressed at both ends, and strongly so at the apex, with the valves being densely white canescent to strigulose-pilose, papery, and opaque. 8. Furthermore, *A. comonduensis* has a greater number of ovules (7–9) per ovary and smaller seeds (2.1–2.5 mm long) that are smooth and light brown, while *A. aridus* usually contains 3–7 ovules per ovary and 9. *A. aridus* has larger seeds (2.7–3.7 cm long). *Astragalus insularis* and *A. idrietorum* are also found on the Baja California peninsula, and are physiognomically somewhat similar to *A. comonduensis*, but these two species can easily be distinguished by their much longer perianth parts. *Astragalus insularis* also has reddish-purple flowers that turn violet when dry, and fruits that are spreading or reflexed with age. *Astragalus idrietorum* has a perennial versus annual habit, and racemes with (8)10–20 flowers versus only 4–9 flowers found in *A. comonduensis*. Although both *Astragalus comonduensis* and *A. idrietorum* have ascending pedicels, *A. idrietorum* is easily differentiated by its larger calyx size (5–5.2 mm long), flower color (pink-purple, drying violet with age) and larger petal sizes (banner 6.5–9 mm long, wings 5.7–7.9 mm long, and keel 5.7–7.4 mm long). Table 1 show the most significant morphological differences between *Astragalus aridus* and *A. comonduensis*.

TABLE 1. Comparison of the most significant morphological differences between *Astragalus aridus* and *A. comonduensis*.

| | <i>A. aridus</i> | <i>A. comonduensis</i> |
|---------------------------|---|--|
| Stems size and habit | Up to 30 cm, decumbent and trailing | Up to 42 cm, erect |
| Pubescence | Silky or satiny-canescenscent, trichomes 0.6–1.1 mm long, ascending | Strigulose, trichomes 0.2–0.4(–0.5) mm long, straight, white, appressed |
| Leaflets | Never mucronate, equally pubescent on both leaf surfaces | Mucronate and glabrate adaxially |
| Calyx size and pubescence | 3.2–4.4 mm long, with white and black intermixed trichomes | 2–2.8 mm long, trichomes uniformly white |
| Petals color | Whitish, pink-lilac or flesh | Purple-lavender |
| Keel tip | Incurved beak | Small curved backward beak |
| Pod | Little inflated, but not bladdery, laterally compressed at both ends, and strongly so at the apex, the valves densely white canescent to strigulose-pilose and opaque | Completely inflated, bladdery, shiny, not laterally compressed (not even a little), the valves minutely-strigulose, opaque to sub-diaphanous |
| Ovules number | 3–7 | 7–9 |

Identification key to segregate *A. comonduensis* from related species in Mexico.

1. Perennial; racemes 10-more flowered; pod ascending; calyx 5–5.2 mm long; central part of the state of Baja California *A. idrietorum*
- Annual or biennial; racemes 3–9 flowered; pod ascending or spreading; calyx less 5 mm long; Baja California and Baja California Sur 2
2. Pod spreading or reflexed, not ascending; flowers purple-reddish, dark-purple, magenta to blue-violet; ovules 12–14; widely distributed on the peninsula (26°20'–31°02'N) and on a few adjacent islands *A. insularis*
- Pod ascending; flowers white, rose, lavender, purple-lavender or bluish when dry; ovules 3–9; Baja California or Baja California Sur 3

3. Herbage densely white silky-canescens; leaflets not mucronate, equally pubescent in both adaxial and abaxial leaf surfaces; calyx 3.2–4.4 × 1.5–2.4 mm; apex of the keel straight, without a backward beak; ovules 3–7; pod scarcely inflated, not evidently bladderly, but laterally compressed at both ends and strongly so at the apex, the valves papery, opaque, densely white canescens to strigulose-pilose; extreme northeastern Baja California (31°59'–32°30'N) and northwestern Sonora..... *A. aridus*
- Herbage green-strigulose, not densely pubescent; leaflets mucronate and glabrate adaxially, not equally pubescent on both leaf surfaces; calyx 2–2.8 × 1–1.2 mm; apex of the keel with a small slightly backwardly curved beak; ovules 7–9; pod inflated, bladderly, not laterally compressed, shiny, sub-diaphanous, minutely-strigulose; Baja California Sur, near Comondú (26°06'N, 111°46'W)..... *A. comondensis*

Calliandra pilocarpa A. E. Estrada, Rebman & Villarreal, *sp. nov.* (Fig. 2 (A–F) & Fig. 3)

Morphologically similar to *C. peninsularis*, but differs in stem pubescence, persistence of stipules, peduncle size, number of flowers per capitulum, bract size, calyx and corolla pubescence, corolla shape, pod suture width, and seed size.

Type:—MEXICO. Baja California Sur (Municipio Mulegé): Sierra Guadalupe: West of Mulegé: Cañada El Guano, just west of Rancho San Sebastian, 27°00'13"N, 112°25'48"W, alt. ca. 900 m, 26 October 1997, *J. Rebman 4553*, with *B. Hollingsworth* (holotype SD 141639!; isotypes BCMEX 9220, HCIB 11711, UCR 109221).

Plant shrubby up to 1.2 m tall. **Stems** woody, light brown, grooved, densely arachnoid-pubescent, the trichomes white (as in all structures), straight, sinuous and curly, 0.2–1.3 mm long, the shorter ones the denser, mixed with slightly curved or almost straight longer ones, all of them entangled. **Stipules** 6–7 mm long, linear-lanceolate, densely white-pubescent abaxially, glabrate adaxially, persistent. **Leaves** bipinnate-paripinnate, pinnae (2–)5–6 pairs, similar in size, sometimes, the middle ones longer; petiole 6–11.5 mm long, pilose-pubescent, leaf rachis 2.2–5 cm long, pilose-pubescent, pinna rachis 1.9–4.9 cm long, pilose-pubescent; leaflets petioluled, petiolule 0.2–0.3 mm long, light-green, (13–)18–20 pairs per pinna, 6–11.5 × 1–1.7 mm, the longest ones in the middle of the pinna rachis and gradually shorter in size to both ends, oblong, inequilateral-cordate and, wider at base to narrowly ovate, lance-ovate, acute at apex, with a small mucro, 0.01 mm long, lead color and glabrous or sparsely pilose with 0.4–0.7 mm long, curly or sinuous trichomes or olive green, covered with a waxy-lead color veil adaxially, pilose or densely pilose-pubescent, remaining so and with no waxy-lead color veil abaxially, venation palmate-pinnate, the midvein little displaced forwardly, charged to one side more than another, and dividing the blade in a 1:2 ratio, slightly prominent adaxially, more prominent and raised abaxially. **Inflorescences**, peduncles 3.8–6 cm long; capitulae 2–8 flowered; bracts 1–1.6 mm long, lanceolate, glabrous and reddish adaxially, sparsely-pilose abaxially; pedicels 1–1.5 × 0.5–0.8 mm, glabrous, sometimes hidden by the dried persistent corolla; perianth pentamerous, flowers actinomorphic; calyx 2–2.2 × 1.2–1.4 mm, campanulate, the tube 1–1.2 mm long, the teeth 1–1.3 × 0.8–1 mm, triangular, densely pilose-pubescent, persistent to fruit maturity, and breaks due to the widening of pedicel and fruit during development; corolla gamopetalous, campanulate, funnel-shaped, 6.1–6.5 × 2–3.5 mm, the tube 2.5–3.8 mm long, the teeth 1.2–1.6 mm, triangular, all densely pilose-pubescent as in stems; androecium 18–24-merous, the sheath 5.5–7 mm long, the free portion 14–23 mm long, red; ovary elliptic. **Pod** 1–2 per capitulum, erect, 5.8–7.5 × 0.7–0.9 cm, oblong, gradually narrow basally and abruptly so at the apex, the sutural keels 1–1.3 mm wide, the valves light-brown, opaque, linear, cross nerved, shallowly reticulated and most evident near sutures, densely and permanently pilose-arachnoid or densely-pilose, the trichomes entangled overall, raised over the seeds, slightly constricted at interseminal spaces; seeds 7–8 × 5–6.5 mm, rhombic-elliptic to rhombic-obovoid, base cuneate but somewhat rounded, apex abruptly or gradually acute, plumpy-inflated, the testa hard, dull, tan, speckled with black, pleurogram black stained, linear-filiform.

Distribution and habitat:—As far as we know, *Calliandra pilocarpa* occurs only in a restricted part of northern Baja California Sur in the Sierra Guadalupe (Fig. 4), associated with vegetation dominated by *Prosopis palmeri* S. Watson (1889: 48), *Aralia scopulorum* Brandegee (1889: 165), *Prunus ilicifolia* (Nutt. ex Hook. & Arn.) D. Dietr. (1842: 43), *Bernardia viridis* Millsp. (1889: 223), *Acalypha comondiana* Millsp. (1889: 222), *Euphorbia xanti* Engelm. ex Boiss. (1862: 62), and *Nolina palmeri* var. *brandegeei* Trel. (1912: 50), inhabiting slopes and canyons with volcanic substrate.

Etymology:—The epithet of this new species refers to the pilose vestiture of the fruits as they have white, dense and entangled pubescence remaining evident on the fruit valves even after maturing and opening.

Phenology:—Based only on a few known specimens, flowering presumably occurs from August to November and in April, and fruiting from September to November and possibly in May.

Additional specimens examined (paratypes):—MEXICO. Baja California Sur (Municipio Mulegé): Sierra de Guadalupe: El Barco: bajada al Cañón de San Pedro, 26°53'24"N, 112°26'47"W, alt. 980 m., 28 November 2002, *M. Domínguez L. 3214* (SD 160093!, HCIB 18096). Sierra Guadalupe: West of Mulegé: Cumbra de San Pedro between Ex-mission Guadalupe and San Juan de las Pilas, 26°53'50"N, 112°26'08"W, alt. ca. 1280 m, 29 April 1998, *J. Rebman 5214*, with *J.L. Zuniga* (SD 142316).

Notes:—The inflorescences of *Calliandra pilocarpa* are lateral and developed along its primary leaf-axis, below the foliage apex which put this new species in the *C.* sect. *Androcallis* (Barneby 1998: 21). This is reinforced by its distichous phyllotaxy, bipinnate leaves with minute leaflets, and non-spinescent stipules. Of the 35 species of *Calliandra* distributed from the southern United States, Mexico and Central America, only three that are currently recognized are recorded from the peninsula of Baja California, *C. eriophylla*, *C. peninsularis*, and *C. californica*. *Calliandra eriophylla* is distinguished from the other two species by its obviously bicolored (pink and white) androecium. Morphologically, the other two species can be distinguished by the number of pairs of pinnae (5–7 in *C. peninsularis*, 2–4 in *C. californica*) and by the number of pairs of leaflets (16–21 pairs in *C. peninsularis* and 5–12 or rarely more in *C. californica*) per pinna. Ecologically, these two species generally inhabit different types of vegetation and different elevations. *Calliandra peninsularis* is most commonly associated with oak or oak-pine forest at relatively high elevations, ranging from 1000–1800 m, with a restricted distribution between 22°–24°N, while *C. californica* typically inhabits more arid sites at lower elevations ranging 5–550 m and is widely distributed throughout most of the peninsula and on various adjacent islands. The new species is morphologically closer to *Calliandra peninsularis* as both share similarities in leaf size, pinna rachis size, size and shape of leaflets, and stamen number. However, these species have significant differences in several morphological characters (Table 2).

TABLE 2. Comparison of morphological characters between *Calliandra peninsularis* and *C. pilocarpa*.

| | <i>C. peninsularis</i> | <i>C. pilocarpa</i> |
|----------------------------|--|---|
| Stem pubescence | Puberulent | Arachnoid pilose-pubescent |
| Stipules | Caducous | Persistent or late caducous |
| Peduncle size | 1.2–2.3 cm long | 3.8–6 cm long |
| Flowers per capitulum | 8–12 | 2–8 |
| Bract size | ±1 mm long | 1–1.6 mm long |
| Pedicel size (long × wide) | 0.5–0.7 × 0.3–0.4 mm | 1–1.5 × 0.5–0.8 mm |
| Calyx size (long × wide) | 1.6–2 × 1.1–1.2 mm | 2–2.2 × 1.2–1.4 mm |
| Calyx pubescence | Puberulent only around orifice | Densely white pilose throughout |
| Calyx teeth size | 0.25–0.35 mm long | 1–1.3 mm long |
| Corolla shape | Subtubular, slightly dilated apically | Campanulate, widely dilated apically |
| Corolla pubescence | Thinly strigulose | Densely pilose |
| Ovary | Glabrous or thinly granular | Apparently densely white pilose (densely pubescent after fertilization) |
| Pods per capitulum | 1–4 | 1–2 |
| Pod size (length x width) | 6–11 × 0.7–1.7 cm | 5.8–7.5 × 0.7–0.9 cm |
| Pod sutural margins | 1.4–2 mm wide | 1–1.3 mm wide |
| Valves | Translucent, reddish-brown, puberulent overall | Opaque, light-brown, densely pilose-arachnoid |
| Seeds size (long-wide) | 6.5–7 × 4.7–5.2 mm, microscopically speckled | 7–8 × 6.5 mm, evidently speckled |

The substantial differences in the peduncles, bracts, pedicels, calyx, calyx teeth, pod, and seeds, in addition to the different number of flowers per capitulum, and corolla shape, show clear and obvious differences between this new species and *Calliandra peninsularis*. *Calliandra pilocarpa* is easily distinguished by its persistent stipules, white canescent-pilose foliage, campanulate corollas, and its white densely pilose-canescant, opaque pods. The calyx and corolla of *Calliandra pilocarpa* are completely densely white pilose-pubescent with entangled trichomes. In *Calliandra peninsularis* the calyx is puberulent, but the trichomes are mostly restricted around the orifice and the corolla is minutely strigulose. In *Calliandra californica* the calyx is pilosulous overall or glabrescent on the lower half or completely glabrous, and the corolla is glabrous, narrow campanulate to evidently cylindrical, minutely strigulose, or rarely more densely pilosulous (Barneby, 1998).

Identification key for *Calliandra* species from Baja California peninsula (adapted from Barneby, 1998).

1. Androecium bicolored, white proximally, pink distally *C. eriophylla*
- Androecium red overall 2
2. Pinnae of most leaves 2–4 pairs; leaflets 5–12 pairs in most pinnae; rachis of longer pinnae, 3 cm or shorter, widely distributed on the Baja California peninsula (23°–32° N) *C. californica*
- Pinnae of most leaves (3–)5–6 pairs; leaflets (13–)16–21 pairs in most pinna; rachis of longer pinnae 2–5 cm long; Baja California Sur 3
3. Pubescence puberulent; stipules caducous; peduncles 1.2–2.3 cm long; pedicel 0.5–0.7 mm long; calyx 1.6–2 × 1.1–1.2 mm; corolla subtubular, slightly dilated apically; pod translucent, reddish-brown, puberulent overall *C. peninsularis*
- Pubescence pilose-pubescent, entangled; stipules persistent or late caducous; peduncles...3.8–6 cm long; pedicel 1–1.5 mm long; calyx 2–2.2 × 1.2–1.4 mm; corolla campanulate, widely dilated apically; pod opaque, light-brown, densely and permanently pilose-arachnoid *C. pilocarpa*

Acknowledgments

This work was supported in part by funds from the National Geographic Society (Grant # 6022-97) and from Sven Lindblad and Special Expeditions who funded the 1997 Lindblad Binational, Multidisciplinary Expedition to the Sierra Guadalupe region organized by the San Diego Natural History Museum. Our gratitude is extended to the SD Herbarium staff and volunteers for their continued assistance with floristic research projects. A special thanks to Callie Mack for supplying the wonderful botanical illustrations for both new species. The second author is always indebted to the many people who have joined and helped him with field work on the flora of Baja California especially Dr. José Luís León de la Luz at HCIB and Dr. José Delgadillo at BCMEX, both invaluable friends and colleagues. A special thanks to the appropriate Mexican authorities for granting permits and to Dr. Exequiel Ezcurra and Patricia Beller for their efforts in obtaining the papers and permits needed to conduct field research and collection of plant species in the region.

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APPENDIX I

Specimens examined: *Astragalus aridus*:—MEXICO. Sonora: Mesa near La Grulla, 31 June 1904, *D. T. McDougal*, no collection number (NYBG 1267538); 31 miles south-east of San Luis Rio Colorado, 26 February 1958, *P. H. Raven 11642* (CAS 538688; NYBG 1267537). Baja California Norte: Lomas El Carrizo, 55 miles due SE of El Rosario, alt 75 m, 3 January 1988, *M. A. Franklin 5825* (JEPS 177768); Sandy desert wash, about 14 miles west of Mexicali, 16 March 1960, *I.L. Wiggins & D. B. Wiggins 15743* (CAS 506777; US 2520674).

Astragalus insularis:—MEXICO. Baja California Sur: Flat Sandy valley floor, Arroyo San José, 26°29'N, 112°45'W, alt. 40 m, 14 February 1977, *R. Moran 20132* (SD 92310); N of El Arco; N of Calmalli, along road between Rancho Esperanza and Rancho Miramar, with *Yucca valida*, *Opuntia cholla*, and *Pachycereus pringlei*, 28°11'00"N, 113°33'51"W, alt. 300 m, 11 March 1998, *J. Rebman 4687* with N. Roberts (SD 144758); 10 miles north of San Borja, 28°53'N, 113°50'W, alt 550 m, 20 March 1960 *R. Moran 7960* (SD 59942); NW of Cedros village, on road to the spring, 28°07'N, 115°11'W, alt. 400 m, 15 April 1963, *R. Moran 10619* (SD 52956); Isla San Lorenzo (southern Island), 28°35.5'N, 112°50'W, 24 march 1962, *I.L. Wiggins 17274* (CAS 566475); Arroyo, 3 miles SE of San Andrés, 27°14'N, 114°22'W, alt. 65 m, 5 February 1972, *R. Moran 19798* (NYBG 1267979); Vizcaino Desert, south of mesa Punta de Auras, 5 miles N of Bahía Asunción on the road to San José del Castro, *Prosopis*, *Atriplex*, *Viguiera*, *Trixis*, alt. 50 m, 24 April 1989, *S. Boyd 3480*, *T. Ross & L. Arnseth* (NYBG 1267985).

Astragalus idrietorum:—MEXICO. Baja California Norte: C. 2 miles NW of San Agustin, 29°57'N, 115°00'W, alt. 500 m, 27 march 1991, *G.L. Webster 28605* (SD 230829); boulders and sandy flats in palm canyon, 1 mile N of San Roque, 29°48'N, 114°48'W, alt. 500 m, *G.L. Webster 18094 & S. Lynch* (SD 95994); Cataviña boulder fields, ca. 5 miles N of Cataviña and 5.7 miles W of highway 1 along the road to Faro San José. *Viscainoa geniculata*, *Ocotillo*, *Cirio*, and *Pachycormus*, 29°42'37"N, 114°48'37"W, alt. 490 m, 3 April 1998, *J. Rebman 5009* (SD 144655); 7.5 miles south of El Crucero, *Idria*, 29°10'N, 114°11'W, alt. 450 m, 1 February 1973, *R. Moran 19627 & J.L. Reveal* (SD 92373); Arroyo Alfredo, NW of ex-mission Santa María, 29°46'N, 114°36'W, alt. 700 m, 31 May 1965, *R. Moran 12180* (SD 60788); San Agustín, 29°56'N, 114°56'W, alt. 670 m, 25 September 1965, *B.F. Howe n.n.* (SD 62076); 2 miles N of Cataviña, 22 March 1951, *Brattstrom n.n.* (SD 44243).