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## GENTRY REVISITED: THE AGAVES OF THE PENINSULA OF BAJA CALIFORNIA, MÉXICO

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**Abstract:** In 1978, Howard Scott Gentry published his second monograph on the genus *Agave* focusing on the plants of the peninsula of Baja California, México, and the related species in the group Deserticolae in the US and Sonora. We revisit Gentry's work with an emphasis on revising the genus and its taxonomic arrangement and including several recently described species from this Mexican peninsula known for its high plant endemism. A total of 23 *Agave* taxa occur on the peninsula, 22 of which are endemic. We change Gentry's treatment of four groups into six sections formally defined to better segregate species based on shared inflorescence characteristics. We eliminate one variety, revert one variety to species status, change two species to subspecies or varieties, and reduce one subspecies to a variety. We present high spatial resolution maps of the distribution of these species as well and correct some of the previous identifications of herbarium specimens. Extensive field work suggests that taxonomic problems remain in the *Agave sobria* complex of the Sierra de la Giganta, where as many as three additional taxa could be described from the array of variation we observed. As well, the distributional overlap of *Agave avellanidens* and *Agave shawii* ssp. *goldmaniana* remains problematic owing to similar vegetative characteristics but greatly differing inflorescences.

**Keywords:** *Agave*, Agavaceae, Baja California, arid environment, endemic species

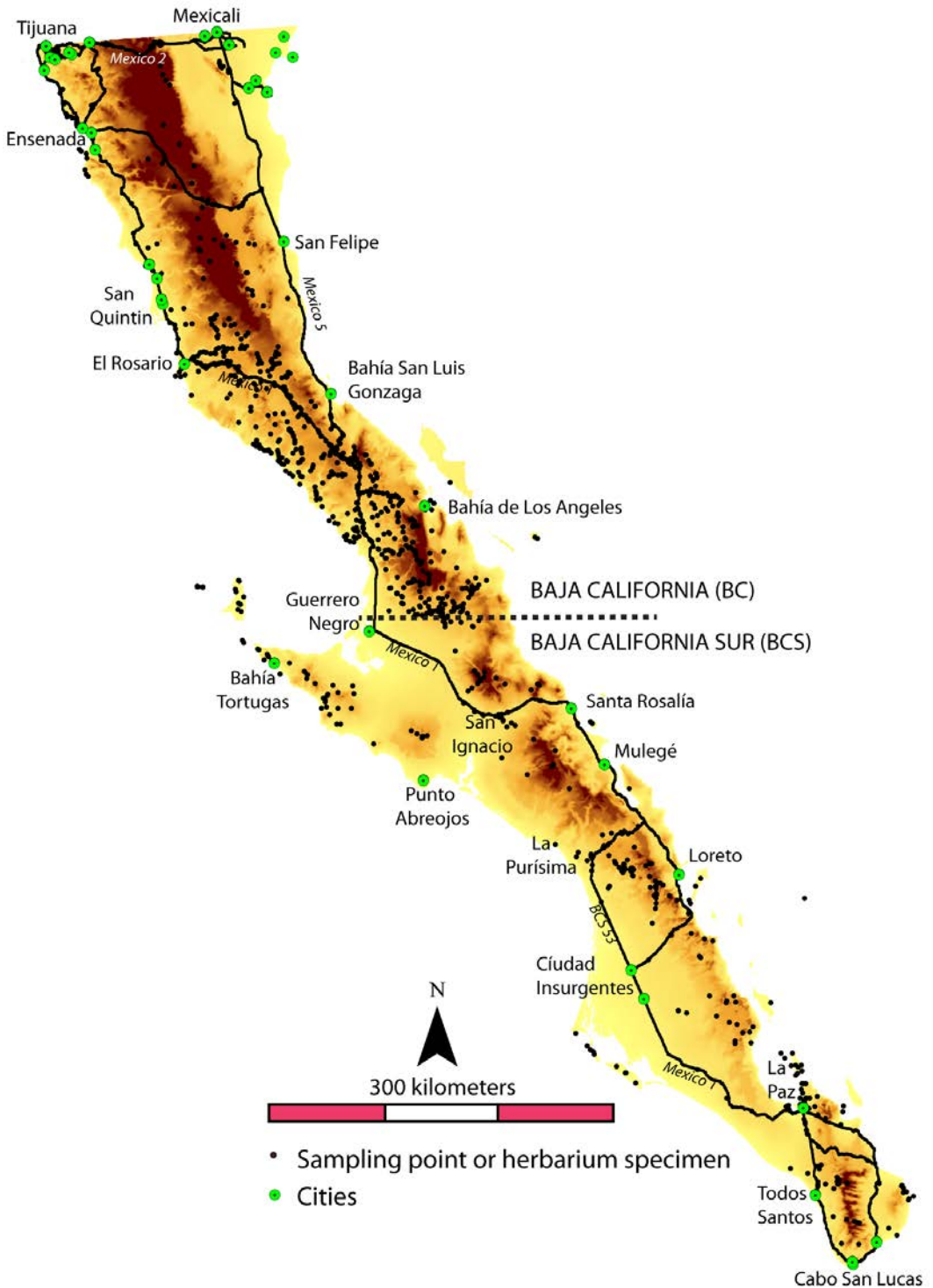
### INTRODUCTION

Members of the genus *Agave* Linnaeus are considered to be keystone species in arid and semiarid parts of North America (Good-Avila et al. 2006), particularly in the Sonoran and Chihuahuan Deserts of Mexico and the United States. The genus underwent rapid speciation between 8 and 6 million years ago and then again between 3 and 2.5 million years ago (Good-Avila et al. 2006). These speciation events bracket the widely accepted age of 5 million years ago for the opening of the Gulf of California (Lucchitta 2003), which separated the Baja California peninsula (Fig. 1) from mainland México. About ten percent of the known species of *Agave* occur on this peninsula, and most of them are endemics, which presumably evolved in the isolation of this long, narrow strip of land over the millennia.

Howard Scott Gentry devoted much of his long career to describing new species and organizing the genus *Agave* in the United States, México, and Central America. Following his first monograph on the *Agaves of Sonora* (Gentry 1972), Gentry (1978) published his classic monograph of the taxonomy, distribution, and ethnobiology of the genus *Agave* on the Baja California peninsula, nearby islands in the Pacific Ocean and the Gulf of California, and adjacent areas in California, Arizona, and Sonora. This work was incorporated mostly intact into his classic

book *The Agaves of North America* (Gentry 1982), which remains the only comprehensive treatment of this genus despite contemporary and later discussions, some of which also included non-native species (Wiggins 1980, Turner et al. 1995, Rebman and Roberts 2012). Here, we revisit Gentry's (1978) monograph on Baja California, adding recently described species and proposing a new intrageneric structure of the genus on the peninsula long known for its high endemism and biodiversity.

Gentry (1978) included 24 taxa in 4 groups from the Mexican states of Baja California (BC) and Baja California Sur (BCS), 23 of which are endemic to this peninsula or nearby islands (Gentry 1978, 1982). Primarily for completeness within the group Deserticolae, he combined these with several other species in adjacent areas of the US and Sonora. He discussed many problems with species fitting into these four groups, particularly within the Deserticolae group that Trelease (1911) originally established with even more species. Gentry (1978) also made an extensive collection of herbarium specimens that were distributed to many herbaria, particularly the Desert Botanical Gardens (DES), the University of Arizona (ARIZ), and the Mexican National University (MEXU), and he listed these with other specimens in his *exsiccatae* (Appendix 1). For more detailed species descriptions, including Gentry's (1978, 1982) use of the floral ideograms, readers are referred to his



**Figure 1.** Map of the Baja California peninsula showing sites where species lists have been made and the locations of herbarium specimens with geospatial data.

work and the original protologues; here, we emphasize similarities and differences among the species as well as their biogeography. The ideograms are a form of shorthand for floral measurements that allow for

quick species comparison. We felt that Gentry's in depth floral measurements and discussion were more than sufficient, and did not feel the need to duplicate his work.

Species	Distribution	State	Status	Reference
<b>Section Campaniflorae</b>				
<i>Agave aurea</i> Brandegees ssp. <i>aurea</i>	Widely distributed, west side of the Sierra de La Giganta to Cape Region	BCS	endemic	Gentry 1978
<i>Agave aurea</i> var. <i>capensis</i> (Gentry) Webb & Starr	Cape Region, Todos Santos, Baja California Sur	BCS	endemic	this study
<i>Agave aurea</i> ssp. <i>promontorii</i> (Trelease) Webb & Starr	Northern peaks, Sierra la Laguna	BCS	endemic	this study
<b>Section Conicae</b>				
<i>Agave avellanidens</i> Trellease	West and southwest of the Sierra la Libertad	BC	endemic	Gentry 1978
<i>Agave gigantensis</i> Gentry	Northern peaks, Sierra de La Giganta	BCS	endemic	Gentry 1978, Webb & Starr 2014a
<i>Agave moranii</i> Gentry	Southeast slopes and flats, Sierra San Pedro Mártir	BC	endemic	Gentry 1978
<i>Agave turneri</i> Webb & Salazar-Ceseña	Sierra Cucapá, Cerro el Mayor	BC	endemic	Webb & Salazar-Ceseña 2011
<b>Section Deserticolae</b>				
<i>Agave cerulata</i> (Trellease) Gentry ssp. <i>cerulata</i>	Widely distributed in central Baja California	BC	endemic	Gentry 1978
<i>Agave cerulata</i> ssp. <i>dentiens</i> (Trellease) Gentry	Isla San Esteban	SO	endemic	Gentry 1978
<i>Agave cerulata</i> Trellease var. <i>nelsonii</i> (Gentry) Webb & Starr	Northwest deserts, northern Sierra la Libertad	BC	endemic	this study
<i>Agave cerulata</i> ssp. <i>subcerulata</i> Gentry	Vicinity of San Ignacio, Calmallí	BCS, BC	endemic	Gentry 1978
<i>Agave deserti</i> Engelman ex Baker	East side of Sierra San Pedro Mártir to California	BC, CA		this study
<i>Agave margaritae</i> Brandegees	Isla Santa Margarita, Isla Magdalena, Pacific coast	BCS	endemic	Gentry 1978
<i>Agave pringlei</i> Engelman ex Baker	Sierra Juárez	BC	endemic	this study
<i>Agave sobria</i> Brandegees ssp. <i>frailensis</i> Gentry	Cabo Pulmo, Cabo Frailes, eastern Cape Region	BCS	endemic	Gentry 1978
<i>Agave sobria</i> Brandegees ssp. <i>Roseana</i> (Trellease) Gentry	Isla Espiritu Santo, north of La Paz	BCS	endemic	Gentry 1978
<i>Agave sobria</i> Brandegees ssp. <i>sobria</i> Gentry	Northern Sierra de la Giganta	BCS	endemic	Gentry 1978
<b>Section Intermediae</b>				
<i>Agave azurea</i> Webb & Starr	Picachos de Santa Clara, Vizcaino Peninsula	BCS	endemic	Webb & Starr 2014b
<i>Agave vizcainoensis</i> Gentry	Western Vizcaino Peninsula	BCS	endemic	Gentry 1978
<b>Section Rigidae</b>				
<i>Agave datylio</i> Simon ex Weber	La Paz region to La Puríssima	BCS	endemic	Gentry 1978
<b>Section Umbelliflorae</b>				
<i>Agave sebastiana</i> Greene	Isla Cedros, Islas San Benito, Isla Natividad	BCS	endemic	Gentry 1978
<i>Agave shawii</i> Engelman ssp. <i>goldmaniana</i> (Trellease) Gentry	Distributed from El Rosario to south of Punta Prieta	BC	endemic	Gentry 1978
<i>Agave shawii</i> Engelman ssp. <i>shawii</i> Gentry	Pacific coast, El Rosario to San Diego	BC, CA		Gentry 1978

**Table 1.** List of *Agave* species, subspecies, and varieties from the Mexican states of Baja California (BC) and Baja California Sur (BCS), Mexico, with overlap into California and Sonora (SON).

Organization within the genus *Agave* and its long-established subgenera is problematic because an array of different classification strategies was pro-

posed in the late 19<sup>th</sup> and early 20<sup>th</sup> century. Baker (1888) presented three subgenera – *Mangave*, *Littaea* and *Euagave* – based on inflorescences, and he estab-

1a. Leaves 10-20 times longer than wide, rosettes offsetting widely with elongate rhizomes, BCS and mainland México .....	Section Rigidiae
1b. Leaves only 2-10 times longer than wide; rosettes either solitary, with offsets close to the base, or with axillary branching.....	2
2a. Plants with elongate stems; branches of the panicle usually borne in large succulent bracts, the umbels broad and massive, and the inflorescence nearly as wide as tall; flowers large (70-100 mm long), tubes deep; Baja California and Pacific Islands west of the Vizcaino Peninsula, BC, BCS ..	Section Umbelliflorae
2b. Plants without stems or with short stems, branches of the panicle not borne in large succulent bracts, the umbels small- to medium-sized; flowers smaller (40-70 mm long), tubes shallow or broad and open, BC, BCS .....	3
3a. Plants generally green, solitary or offsetting by axillary branching; flowers red to purplish in bud, opening to light orange, campanulate with broad open tubes and curved tepals, BCS .....	Section Campaniflorae
3b. Plants light gray to green, offsetting or solitary, not branching from leaf axils; flowers greenish yellow to bright yellow, funnel-form with short tube and ascending or wide-spreading tepals .....	4
4a. Inflorescence narrow, cylindrical, and relatively tall with short lateral peduncles, plants relatively small and offsetting, BCS, BC, Arizona, Sonora.....	Section Deserticolae
4b. Inflorescence broader with significant lateral peduncles, typically tall and conical in outline .....	5
5a. Plants offsetting or solitary, dark gray-green to blue-green leaves, occasionally banded; inflorescence short pyramidal, Vizcaino Peninsula, BCS.....	Section Intermediae
5b. Plants generally solitary with large rosettes, green or gray-green leaves; inflorescence conical, BCS, BC .....	Section Conicae

**Table 2.** Key to the Sections (modified from Gentry 1978).

lished series and groups in subgenus *Euagave* based on vegetative characters. Trelease (1911) also used groups, albeit establishing more of them with different names. Berger (1915) used a subgenus-section classification within subgenus *Littaea* (Berger 1915) but inexplicably assigned Trelease’s (1911) groups into *reihe*, or series, within subgenus *Euagave* with no sections. Gentry (1978) reverted to the group names established by Trelease (1911) for Baja California, and Gentry (1982) changed the subgenus name to *Agave*. Gentry’s (1978) legacy for Baja California is four groups, two endemic to the peninsula, with three small ones and one large and problematic one (Deserticolae).

Here, we categorize the species of Baja California into six sections under subgenus *Agave* to attempt to clarify the relationships among the diverse species on this peninsula (Table 1). All *Agave* species in Baja California belong to the subgenus *Agave* with no species from the *Littaea* being present, although there are members of *Littaea* across the Gulf of California in both Sonora and Sinaloa. Our use of sections suggests an organizational revision of the entire genus is necessary well beyond the confines of the agaves of the Baja California peninsula in order to clarify relationships among the several hundred species of this genus in North and South America as well as the islands of the Caribbean Sea.

As part of a larger project to map biodiversity of Baja California (Webb et al. 2014), we were drawn to Gentry’s work to help understand the biogeography of agaves. Gentry’s (1978, 1982) maps were important but also vague as to how widespread species were distributed and especially how species related to each other in the complex topography of this peninsula. The complex of *Agave deserti*, in particu-

lar, illustrates this problem, because later treatments changed subspecies created by Gentry (1978) into varieties (Hodgson 2001, Reveal & Hodgson 2002) on the basis of geographic proximity. To improve distribution maps, we used both direct observations from a large database begun by Turner et al. (1995) and continued at higher spatial resolution (Webb et al. 2014). We also include information from databases of herbarium specimens held in the United States and México that contained reliable geographical information and add two recently described endemic species (Webb et al. 2011, Webb & Starr 2014b).

## METHODS AND NOTES

This project is an outgrowth of a larger project on the biodiversity of perennial vegetation in the Sonoran Desert (Turner et al. 1995) that recently has been focused on the desert areas of the Baja California peninsula (Webb et al. 2014). The database of localities documented in Baja California contains 1,630 localities at which all perennial vegetation within a hypothetical 100-m radius is recorded (Fig. 1); the geometry of specific sites varies greatly, from alluvial plains with unrestricted access to steep canyons with limited access, but the search area remained about the same for all plots. *Agave* species were observed and recorded at 720 of these localities.

In addition, we used Gentry’s (1978) exsiccatae (Appendix 1) as a starting point for adding geospatial data on the distribution of agaves in Baja California. We searched the on-line resources for herbaria with holdings of *Agave* specimens identified as from Baja California and added to Gentry’s list, including specimens Gentry did not include as well as updating with more recently collected specimens (Appen-

dix 1). Using internet searches of herbaria holdings (accessed between 2012 and 2013), we obtained 540 herbarium records that either had accurate geospatial data (latitude-longitude data matched the reported locality) or sufficiently precise locality data to create geospatial data using Google Earth (<https://www.google.com/earth/>, accessed 27 September 2014). About 25 herbarium specimens with geospatial data from the original on-line listing plotted in either the Pacific Ocean or the Gulf of California, and we corrected these records using the specific locality information in Google Earth. About 100 other records did not have specific localities or geospatial data (e.g. “Lower California”) and were not included on our maps.

We examined the distribution maps and found many discrepancies between the names reported on herbarium specimens, their geospatial positions, and how that position fit among populations on the Baja California Peninsula. Some problems were obvious and could be easily corrected, such as a species known from the northern part of the peninsula reported from the south. Other locality problems were

more subtle, and we visited some of those localities to check the identifications (e.g. *Agave pringlei* versus *Agave moranii* in the Sierra Juarez). Webb & Starr (2014a) discuss problems with *Agave gigantensis* in this context; Webb & Starr (2014b) sorted out the distribution of three species on the Vizcaíno Peninsula and its nearby islands.

To attempt to clarify relationships among the species, we modify Gentry’s (1978, 1982) groups into sections within subgenus *Agave*. We retain Gentry’s (1982) modification of Trelease’s (1911) group names (e.g. Umbelliflorae) and separate the Deserticolae into three sections. This separation is based on the geometry of the inflorescence, which is a problem that Gentry noted in his treatment: the species he lumped together have narrow-cylindrical, medium-cylindrical, and conical (pyramidal) inflorescences, which provides a clear justification for separation. We also initiated a molecular study of the chloroplast DNA of the agaves of Baja California, which yielded no significant differences among the species on the basis of 1500 base pairs (A. Salywon, Desert Botanical Gardens, Phoenix, Arizona, pers. comm. 2014).

## DESCRIPTIONS AND DISTRIBUTIONS OF THE AGAVES OF BAJA CALIFORNIA

*Agave* LINNAEUS, *Species Plantarum* 1: 323. 1753.

Subgenus *Agave*: Type species of genus and subgenus: *Agave americana* Linnaeus. See Table 2.

### Section Campaniflorae

R.H. WEBB & G.D. STARR (stat. nova). Table 3

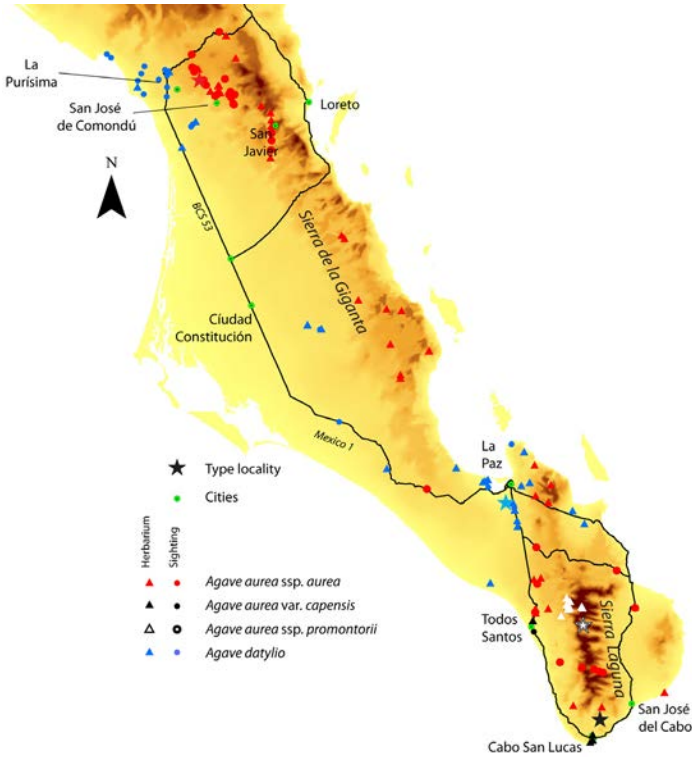
**TYPE SPECIES:** *Agave aurea* BRANDEGEE

Despite small differences in flower characteristics that others have used to justify species status for *Agave aurea*, *A. capensis*, and *A. promontorii* (Trelase 1911, Gentry 1978), we believe they are varieties or subspecies of one species because they are so similar in vegetative characteristics, differing primarily in size and propensity to offset or remain solitary. The three taxa in this monotypic section range widely in size with yellow-green, green to gray-green leaves that are flexible, long-lanceolate, reflexed downwards towards the tip and with numerous small marginal spines. The leaf surface in the Campaniflorae is moderately roughened and noticeably thickened, while the number of stomata per mm<sup>2</sup> ranges from 18 to 31 on the upper leaf surface, which is a relatively low density that sets this section apart from the Deserticolae and Umbelliflorae (Gentry and Sauck 1978). The inflorescences are large and open with small bracts on the upper part of the shaft, and the flowers are campanulate, red to purple on the outside, and yellow on the inside.

*Agave aurea*, the only species in section Campaniflorae, is primarily restricted to the west side of the Sierra de la Giganta, extending southward to the Sierra la Laguna and Cabo San Lucas (Fig. 2). The small, close-set spines on the leaf margins are a key characteristic, and Gentry (1978) reported that the flower proportions are unusually variable. The three infraspecific taxa of *A. aurea* occupy habitats with mostly summer rainfall, much of which is from tropical cyclones and hurricanes.

- |   |   |
|---|---|
| 1a. Rosettes smaller, up to 0.8 m tall and 1.2 m across, prolifically offsetting by axillary budding; leaves mostly 35-60 cm long; panicles relatively narrow; filaments with an apical gland at anther fixation. Cape District, BCS..... | <i>A. aurea</i> var. <i>capensis</i>    |
| 1b. Rosettes larger, 1-2 m tall and 1-2.5 m across, solitary; leaves 60-150 cm long; panicles broad; filaments without apical gland.....  | 2                                       |
| 2a. Rosettes generally 0.7-1 m tall; leaves smaller, more flexible, 60-110 cm long by 7-12 cm wide. Sierra de la Giganta and Cape District, BCS.....  | <i>A. aurea</i> ssp. <i>aurea</i>       |
| 2b. Rosettes 1-2.3 m tall; leaves larger, thicker, relatively rigid, 100-150 cm long by 11-17 cm wide. Sierra la Laguna, Cape District, BCS.....  | <i>A. aurea</i> ssp. <i>promontorii</i> |

**Table 3.** Key to the Campaniflorae (modified from Gentry 1978).



**Figure 2.** The distribution of *Agave aurea* ssp. *aurea*, *A. aurea* var. *capensis*, *A. aurea* ssp. *promontorii*, and *Agave datylio* in Baja California Sur.

***Agave aurea* BRANDEGEE ssp. *aurea***

(Fig. 3)

*Agave aurea* BRANDEGEE, *Proc. Cal. Acad. Sci. ser. 2.* 2: 207. 1889.

**TYPE LOCALITY:** La Purísima, BCS, 13 February 1889 (Brandege s.n., UC) (Fig. 2).

This subspecies has a short stem with solitary rosettes 100-120 cm tall and 100-200 cm wide with gracefully arching yellow-green to green leaves. The leaves are 60-110 cm long and 7-12 cm wide with straight to undulate margins and regularly spaced, dark-to-light brown marginal spines 4-7 mm long and 12 mm apart. The terminal spine is 2.5-3.5 cm long, dark brown or grayish red, and shortly decurrent or decurrent as a dark corneous margin. The inflorescence is 2.5-5 m tall and relatively wide with lateral peduncles bearing congested umbels of flowers red to purplish in bud and yellow to orange-yellow when open; the flowers are 43-70 mm long and campanulate.

*Agave aurea* ssp. *aurea* is the most abundant taxon in section *Campaniflorae*, extending from the west slopes of the Sierra de la Giganta to the Sierra la Laguna in the Cape Region. It is easily recognized by the long, narrow green leaves arching out to

form an open, spreading rosette and by the reddish panicles and bright yellow flowers. It can be abundant on the reddish-black basalt of the western slopes of the Sierra de la Giganta, creating a scenic landscape of yellow-green rosettes against the dark background (Fig. 3). *Agave aurea* ssp. *aurea* typically does not occur in the sandy soils of the Llano de Magdalena, suggesting a preference for rocky substrate. Plants have been observed on all sides and within the Sierra la Laguna (Fig. 2), and the plants tend to be larger and darker colored than those at and near the type locality.

On the rolling hills north of Todos Santos (Fig. 2), an extensive population of *A. aurea* ssp. *aurea* shows forms similar to both *A. aurea* ssp. *promontorii* and *A. aurea* var. *capensis* in the color and form of their leaves. Gentry (1978) discussed this site and suggested that *A. aurea* ssp. *aurea* was a recent arrival from the north in geologic time. An unusually large form of *Agave aurea* ssp. *aurea* that we found south of La Paz (Fig. 4) appears to bridge the gap with *A. aurea* ssp. *promontorii*. In contrast to Gentry's (1978) explanations, we believe these two sites, and the similarity between *A. aurea* ssp. *aurea* and *A. aurea* ssp. *promontorii*, warrant reduction of the latter to subspecies status. This reduction is further warranted by *A. aurea* ssp. *aurea* populations at lower elevations in the Sierra la Laguna that are very similar in form to the *A. aurea* ssp. *promontorii* populations at higher elevations.



**Figure 3.** *Agave aurea* ssp. *aurea* near the type locality south of San Jose de Comodú, Baja California Sur. Bob Webb (right) and Ray Turner (left) frame the plant.



**Figure 4.** A specimen of *Agave aurea* ssp. *aurea* south of La Paz, Baja California Sur with an unusually tall inflorescence (about 7 m). This inflorescence resembles the one in the photograph of flowering agaves in Balboa Park, San Diego, California that Gentry (1978) used to illustrate *Agave promontorii*.

*Agave aurea* BRANDEGEE var. *capensis* (GENTRY)  
R.H.WEBB & G.D.STARR comb. nov. (Fig. 5)

**BASIONYM:** *Agave capensis* GENTRY, *Occas. Pap. Calif. Acad. Sci.* No. 130: 72. 1978.

**TYPE LOCALITY:** Cabo San Lucas and vicinity, BCS, July 1964 (Gentry & Fox 11247, US) (Fig. 2).

This variety differs from other members of the Campaniflorae primarily because it prolifically offsets by axillary budding, which creates large clusters of short-stemmed rosettes 60-80 cm tall and 80-120 cm wide. The gray-green, lanceolate leaves with a light glaucous covering are mostly 30-60 cm long by 4-7 cm wide and can be straight to arching with an undulate margin. The reddish brown to grayish marginal spines are 4-5 mm long, spaced about 1-2 cm apart on short mammillate bases, and the terminal spine is dark brown, 1.5-3 cm long, and decurrent for 1-2 cm on the leaves. The inflorescence typically is 2.5-3.5 m tall with 15-24 lateral branches that are up to 30 cm long and ascending, and the umbels are



**Figure 5.** *Agave aurea* var. *capensis* north of Todos Santos, Baja California Sur.

small and consist of flowers 50-65 mm long that are reddish brown or purplish in bud and yellow when mature, opening yellow inside.

*Agave aurea* var. *capensis* can be found growing side-by-side with *A. aurea* ssp. *aurea* in the Cape Region, but is easily recognized by its prolific offsetting habit and the smaller, narrower leaves with marginal spines, sometimes set on prominent teats. Gentry (1978) believed that the connective gland located on the stamen where the anther is affixed to the filament is a structure unique within the Campaniflorae and is well developed in *A. aurea* var. *capensis*, and although we believe this one floral character to be important enough to segregate the taxon at a varietal level, it is insufficiently important to justify maintaining this as a unique species.

*Agave aurea* BRANDEGEE SSP. *promontorii*  
(TRELEASE) R.H.WEBB & G.D.STARR comb. nov.  
(Fig. 6)

**BASIONYM:** *Agave promontorii* Trelease, *Missouri Bot. Gard. Report* 22: 50. 1911.

**TYPE LOCALITY:** Sierra de la Laguna, BCS, 21 January 1906 (Nelson & Goldman 7437, US) (Fig. 2).

This subspecies has large, solitary rosettes that are up to 100-200 cm tall and 200-250 cm wide. The green, lanceolate leaves are 100-150 cm long and 11-17 cm wide, generally gracefully arching, and have straight margins with curved marginal spines that are mostly 4-8 mm long, 5-10 mm apart, and reddish brown. The terminal spine is 3-5 cm long, dark brown, and has a short-decurrent margin on the leaf. The inflorescence is 5-9 m tall with a stout shaft bearing conspicuous deltoid bracts and a broad panicle with 25-30 umbels. Flower buds are red to purplish, and the flowers are campanulate and 60-75 mm long.





**Figure 6.** *Agave aurea* ssp. *promontorii* in the Sierra de la Laguna east of Rancho Burrea, a site Gentry (1978) discusses in reference to this species.

*Agave aurea* ssp. *promontorii* is a large plant that has obvious affinities to *A. aurea* ssp. *aurea*, and we have a difficult time distinguishing the two subspecies other than the obvious differences in size. Trelease (1911) described *A. promontorii* as distinct from *A. aurea* based on its more glaucous leaves with a heavier, more awl-pointed spine, but he probably was unaware that the distribution of *A. aurea* ssp. *aurea* surrounds that of *Agave aurea* ssp. *promontorii* (Fig. 2), and the difference is primarily one of elevation: *A. aurea* ssp. *promontorii* only occurs in the northern Sierra de la Laguna at elevations of 900-1800 m. Gentry (1978, 1982) gives what we believe is misleading information on the size of *A. aurea* ssp. *promontorii* using photographs of the plant in cultivation in San Diego; we visited the Rancho Burrea locality he discussed and found plants with rosettes only slightly larger than those of *A. aurea* ssp. *aurea*.

If taken out of habitat, and despite the misleading photographs in Gentry (1978), *A. aurea* ssp. *promontorii* would be difficult to distinguish from the other members of the Campaniflorae. The large size of both the rosette and the leaves distinguishes it somewhat from *A. aurea* ssp. *aurea*, particularly the form of that subspecies from its type locality near Comondú, and *A. aurea* var. *capensis* is much smaller and prolifically offsets. Gentry (1978) discussed the *A. aurea* population north of Todos Santos and remarked on the similarity of plants to *A. aurea* ssp. *promontorii*, but observed no individuals of the latter at this locality. A population of *A. aurea* south of La Paz (Fig. 4) has average sized plants with abnormally large flower stalks and an unusual inflorescence structure that resemble those pictured on page 83 in Gentry (1978) and indicates that *A. aurea* ssp. *promontorii* warrants subspecies status, and not species status.

### Section Conicae

R.H.WEBB & G.D.STARR (sect. nova). Table 4.

**TYPE SPECIES:** *Agave avellanidens* TRELEASE

This proposed section separates plants with conical-shaped inflorescences from those with narrow, spike-like inflorescence of section Deserticolae. Gentry (1982) recognized this enigma and suggested that *Agave moranii*, *A. avellanidens*, and *A. gigantensis* were aligned phylogenetically and distinct from other members of the Deserticolae. With the description of *Agave turneri* Webb & Salazar-Ceseña, a fourth member can be included in this new section. Based on extensive field work, we believe that combining these four species in a new section on the basis of shared inflorescence characteristics helps to clarify the relationship of these species to others on the Baja California peninsula. In addition, they share the characteristic of a solitary habit, which makes this section unique among the ones we discuss in Baja California and clearly separates them from other members of the Deserticolae.

*Agave avellanidens* TRELEASE  
(Figs. 7, 8)

*Agave avellanidens* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 60. 1911.

**TYPE LOCALITY:** Rancho Paraíso, Sierra la Libertad, BC, 1 May 1889 (Brandegee s.n., UC) (Fig. 9).

This species has solitary to sparsely offsetting rosettes 0.6-1.2 m tall and 1-1.5 m wide; Gentry

(1978) reports plants with stems 50 cm long. The leaves are yellow-green, green or blue-green, 40-70 cm long by 9-14 cm wide, and broadly linear-lanceolate to ovate with a straight or undulate margin. The gray to brown marginal spines are 5-15 mm long and regularly spaced 1-3 cm apart, set on small to large teats and they vary from straight to curved. The gray-brown terminal spine is conical and 2.5-4.5 cm long and decurrent on much of the leaf margin. The inflorescence is conical in shape and 4-6 m tall with

- 1a. Leaves blue-gray, rarely gray-green, often conspicuously cross-banded, long oblanceolate with small marginal spines not on prominent teats, long acuminate at the tip; flower stalk 2-4 m tall, the inflorescence short and broadly conical to nearly pyramidal; Sierra Cucupá, BC. . . . . *A. turneri*
- 1b. Leaves green to glaucous green, lacking cross-banding or lightly cross-banded, triangular long-lanceolate with small marginal spines not on prominent teats or broadly obovate with large teeth set on prominent teats, flower stalk 4-6 m tall, the inflorescence narrowly long conical; eastern foothills of the Sierra San Pedro Mártir, on and around the Sierra la Libertad, or extreme northern end of the Sierra de la Giganta, BCS. . . . . 2
- 2a Leaves typically light green to glaucous gray-green, 70-120 cm long, long triangular-lanceolate, leaf margin nearly straight with small marginal spines; terminal spine decurrent to about mid-blade; south and east slopes of the Sierra San Pedro Mártir, northern BC . . . . . *A. moranii*
- 2b. Leaves green, 40-75 cm long, broadly obovate to oblanceolate, not long triangular-lanceolate, leaf margin straight to undulate with large marginal spines, southern BC and BCS . . . . . 3
- 3a. Leaves green, broadly linear-lanceolate, not or scarcely narrowed towards the base; panicle generally occupying one-half the shaft with 25-35 laterals; flowers yellow to orange, southern BC. *A. avellanidensis*
- 3b. Leaves green to occasionally glaucous gray-green, broadly obovate, narrower at the base, broadest at or above the middle; inflorescence in upper one-third of shaft with 18-25 laterals; flower buds whitish or pale green, opening pale yellow; Higher elevations in the Sierra de la Giganta, BCS. . . . *A. gigantensis*

Table 4. Key to section Conicae.



Figure 7. *Agave avellanidensis* southeast of Rancho el Mesquit in Baja California Sur.

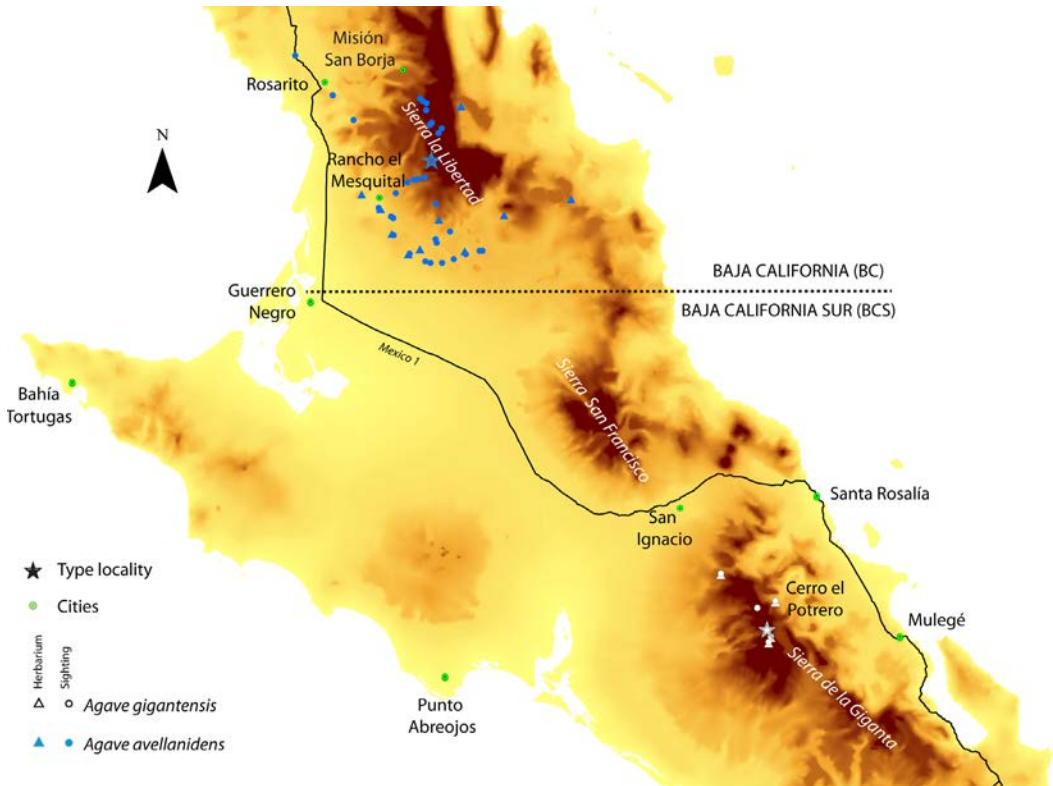
25-35 lateral branches of dense umbels. The greenish yellow flowers, which dry to an orange-yellow color, are 40-70 mm long and slender.

*Agave avellanidensis* occurs in and around the Sierra la Libertad – primarily on its western side – in the state of Baja California; its distribution appears to end at about the border with Baja California Sur (Fig. 9). The type locality, Rancho Paraíso, is perhaps 20 km south of Misión San Borja on the eastern side of the Sierra la Libertad, and this remote rancho, probably abandoned, is difficult to precisely locate. *Agave cerulata* var. *nelsonii* occurs north and east of Misión San Borja, and *A. cerulata* ssp. *cerulata* occurs at Calmallí near the southeastern limits of *A. avellanidensis*. Although we have not seen these two species together in this remote region, the two should be easily distinguished because *A. cerulata* prolifically offsets and has glaucous-gray leaves.

Vegetatively, *Agave avellanidensis* sufficiently resembles *A. shawii* ssp. *goldmaniana* that the two can



Figure 8. *Agave avellanidensis* 8.6 miles east of Villa Jesus Maria near Rancho el Mesquit, Baja California Sur.



**Figure 9.** The distribution of *Agave avellanidens* and *A. gigantensis* in Baja California and Baja California Sur.

be confused where they share distributional limits in the coastal hills southeast of Punta Prieta and in the vicinity of Rosarito. *Agave avellanidens* is distinguished by its conical inflorescence, either in flower or long after the plant has died, easily separating it from *A. shawii* ssp. *goldmaniana* of the Umbelliflorae with its short and broad inflorescence. Although Gentry (1978) reports that *A. shawii* ssp. *goldmaniana* occurs just north of Rancho Mesquital, we believe the southern range limit of this species, except for some possible interspecific hybrids and occasional individuals, is actually north of Rosarito. Gentry (1978) speculated that *A. shawii* ssp. *goldmaniana* intergraded with *A. avellanidens* in their zone of co-occurrence, and we have observed an unusually large *Agave* in the area southeast of Rosarito that could be such an interspecific hybrid.

*Agave gigantensis* GENTRY  
(Fig. 10)

*Agave gigantensis* GENTRY, *Occas. Pap. Calif. Acad. Sci.* No. 130: 63. 1978.

**TYPE LOCALITY:** Sierra de las Palmas, BCS, 20 June 1973 (Gentry & McGill 23320, US) (Fig. 9).

*Agave gigantensis* has solitary rosettes 0.5-1 m tall and 0.8-1.2 m wide. The green to glaucous-green leaves, which turn red to purplish-red when the plant flowers, are 40-75 cm long by 11-16 cm wide, broadly lanceolate without a well-developed gutter,



**Figure 10.** *Agave gigantensis* on Cerro Potrero in the northern Sierra de la Giganta, Baja California Sur.

and with a prominently mammillate and undulate margin. The gray-to-brown marginal spines are mostly 10-20 mm long and spaced 6-8 cm apart, and

variously flexed and curved; Gentry (1978) referred to them as rarely “grotesque” and “bizarre.” The terminal spine is gray, 3-6 cm long, straight or sinuous, and decurrent well along the leaf margin. The inflorescence is 4-5 m tall with a stout stalk and 15 to 25 lateral branches. The pale-yellow flowers are 48-60 mm long and slender.

*Agave gigantensis* occurs on the higher elevation mesas and cliffs of the northern Sierra de la Giganta (Webb & Starr 2014a, Fig. 9). Although he described this species, Gentry (1978, 1982) offered conflicting information and photographs that caused confusion concerning identification of this distinctive species. It has a rather large, solitary rosette bearing broad, green leaves with mammillate margins and distinctive and large marginal spines. Although Gentry (1978) reports that this species occurs along the road to Misión San Javier above Loreto, we only found many leaf variations of *A. sobria* in this area (Fig. 32), as well as *A. aurea* ssp. *aurea*. *Agave gigantensis* is only known with certainty from its type locality in the Sierra de las Palmillas (Sierra de las Palmillas) and northwards on Cerro el Potrero, which are rugged mesas in the northern Sierra de la Giganta (Webb & Starr 2014a).

***Agave moranii* GENTRY**  
(Figs. 11, 12)

***Agave moranii* GENTRY**, *Occas. Pap. Calif. Acad. Sci.* No. 130: 58. 1978.

**TYPE LOCALITY:** 3-5 km southeast of Rancho Agua Caliente, Sierra San Pedro Mártir, BC, 13 June 1973 (*Gentry & McGill 23287*, US) (Fig. 13).

*Agave moranii* is a large, solitary species with rosettes 1-1.5 m tall and 2 m wide. The light green to glaucous gray-green leaves have a white margin and are triangular long-lanceolate, 70-120 cm long by 8-12 cm wide, rigid, and deeply guttered. The gray marginal spines are 6-12 mm long and regularly spaced at 2-4 cm in the middle of the leaf but are smaller and spaced farther apart towards the terminal spine. The terminal spine is 4-6 cm long, grayish white, and decurrent to the middle of the leaf. The inflorescence is 4-5 m tall with a stout shaft and closely spaced bracts below the 20-30 lateral branches subtended by more bracts. The bright yellow flowers are 50-70 mm long and highly congested on the panicles. This species initiates flowering in the late summer and fall, arrests that flowering during the winter, and completes it in the spring.

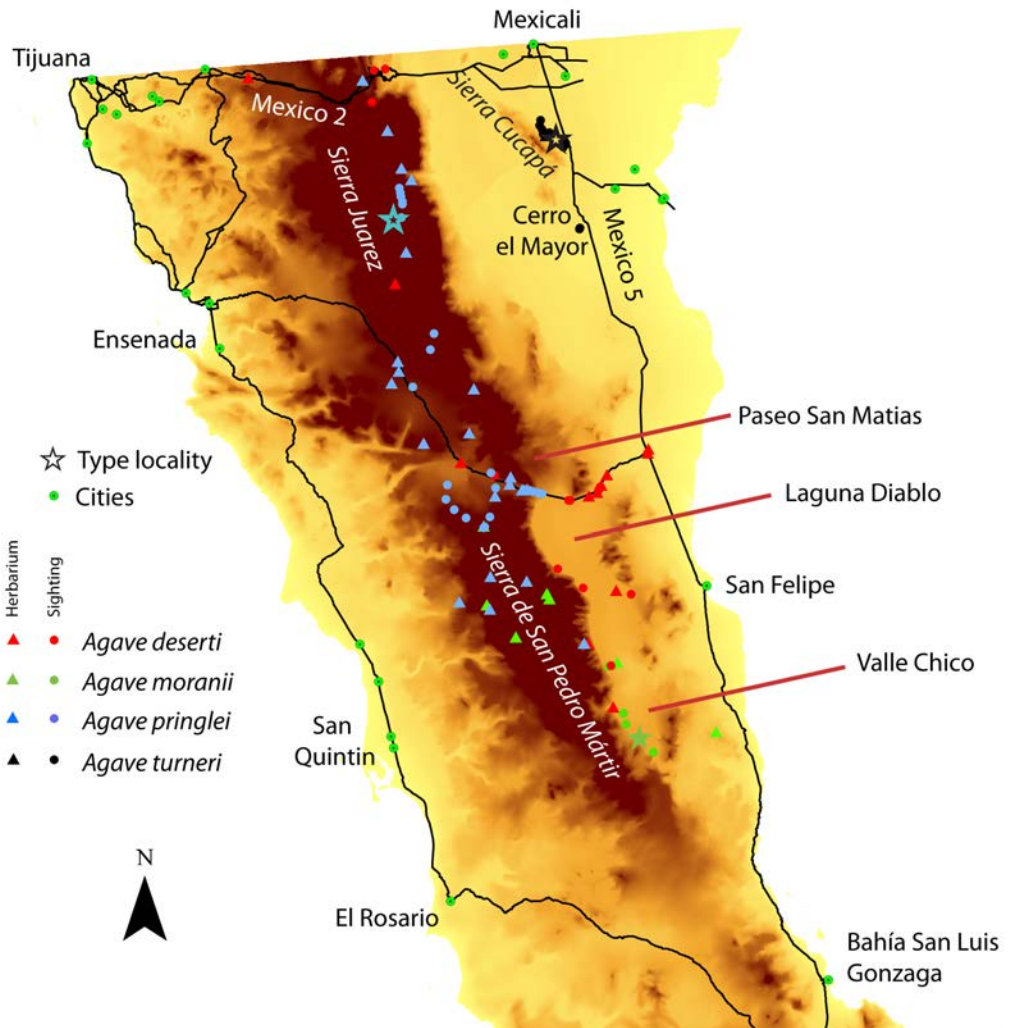
*Agave moranii* is distinguished from other species in section Conicae by its large rosettes of long, rigid leaves with white margins; the large bracts on the inflorescence shaft, and its relatively congested panicles. *A. pringlei* is the only other species in the same region that can be confused with *A. moranii*, especially from leaf specimens alone, but the inflorescences of the two species are quite different reflecting their respective sections. Gentry (1978) thought these two species hybridize; however, we found no evidence of



**Figure 11.** Greg Starr stands next to *Agave moranii* in Valle Chico with the southern Sierra de San Pedro Mártir in the background.



**Figure 12.** *Agave moranii* in Valle Chico west of San Felipe, Baja California.



**Figure 13.** The distribution of *Agave deserti*, *A. moranii*, *A. pringlei*, and *A. turneri*. The type locality of *A. deserti* is in southern California; the type locality of *A. pringlei* is an unspecified place in the Sierra Juarez.

this in the field. Their habitats have little overlap: *A. moranii* occurs in the desert valleys on the east side of the Sierra San Pedro Martir, whereas *A. pringlei* grows at higher elevations in the mountains to the north. *Agave moranii* occurs with *A. cerulata* var. *nelsonii* near its type locality on the southeastern end of the Sierra San Pedro Martir (Fig. 13), and we found no evidence that the two species hybridize.

***Agave turneri*** R.H.WEBB & J.M.SALAZAR-CESEÑA (Figs. 14, 15)

*Agave turneri* R.H.WEBB & J.M.SALAZAR-CESEÑA, *Brittonia* 63: 2 203-210. 2011.

**TYPE LOCALITY:** Sierra Cucapá, BC, 6 March 2009 (M. Salazar 3740, MEXU) (Fig. 13).

This recently described species is solitary with a rosette 0.4–1.2 m tall and 0.8–1.9 m wide. The leaves are gray-green to blue-glaucous green, lan-

ceolate, with 10–40 per rosette; they are 40–90 cm long by 6–13 cm wide, have prominent leaf-margin impressions on both surfaces, and have some darker cross-banding. The leaf margin is straight, purple (aging to white), and is about 1–2 mm wide with easily detached marginal spines 0.5–0.7 mm long and regularly spaced at 15 mm intervals. The terminal spine is purplish brown when young aging to gray and typically 5–6 cm long. The inflorescence is 2–4 m tall and bearing triangular bracts and 5-10 lateral branches concentrated in the upper one-fourth of the stalk and densely packed with yellow-green to yellow flowers 37-56 mm long. Like *A. moranii*, flowering is initiated in the late summer and fall in response to rainfall, is arrested during the winter months, and is completed in early spring, resulting in the bracts being congested below the fertile inflorescence.

*Agave turneri* is narrowly endemic to the hyper-arid Sierra Cucapá and Cerro Mayor south of Mexicali



Figure 14. *Agave turneri* on Cerro el Mayor, Baja California.

(Webb & Salazar-Ceseña 2011, Fig. 13). Only 8 localities of *Agave turneri* are known in these mountain ranges, and all of them are on the eastern side in monzogranite, an unusual type of granitic rock high in potassium and white in color. With its semi-compact inflorescence and gray leaves, *A. turneri* superficially resembles both *A. azurea* and *A. vizcainoensis* of the Intermediae, yet the floral characteristics are more closely associated with *A. avellanidens*, *A. gigantensis* and *A. moranii* of the Conicae, presenting a taxonomic challenge. *A. turneri* seemingly bridges the gap between those two sections, however the distribution of *A. turneri* is an extension of the south-north pattern exhibited by the Conicae, while the two members of the Intermediae are restricted to the Vizcaino Peninsula and far removed from the distant *A. turneri*. The sub-compact inflorescence can be explained by two factors. First, the harsh, hyper-arid environment results in a short time when conditions are conducive for flowering and seed set prior to potential summer rains. Second, the nature of the flower stalk being initiated in late summer or fall, resting through winter and resuming in spring also leaves a short time period of ideal conditions for full elongation and flowering. This type of flowering is not unprecedented in the genus as *Agave montana* of the Salmianae does the same, which results in a much shorter inflorescence than its nearest relatives. The large, solitary rosettes and inflorescence readily distinguishes *Agave turneri* from *A. deserti*, the geographically nearest species to the Sierra Cucapá.



Figure 15. *Agave turneri* in flower in the Sierra Cucapá, Baja California.

## Section Deserticolae

R.H.WEBB & G.D.STARR (stat. nova). Table 5

**TYPE SPECIES:** *Agave deserti* ENGELMANN.

The species in this section, which we have reduced in number from both Trelease (1911) and Gentry (1978), generally produce small- to medium-sized, offsetting rosettes. The leaves are glaucous gray to greenish-yellow, rigid, and linear, narrowly lanceolate, long triangular-lanceolate, broadly lanceolate, broadly triangular, ovate or obovate and with weak, easily detached marginal spines. The inflorescence is narrow with very short lateral branches and small flower clusters, and the flowers are small and yellow or green. We reserve section Deserticolae for species with very short lateral peduncles on a tall inflorescence, moving several species formerly within this group to our proposed new sections Conicae and Intermediae. Species in section Deserticolae grow in both states of Baja California, Sonora, Arizona, and California, but here we only discuss the taxa of the Baja California peninsula.

The leaf surface in the Deserticolae is generally light colored, glaucous gray or yellowish or light green, with 30 to 50 stomata per mm<sup>2</sup> on the upper leaf surface (Gentry and Sauck 1978). The flower structure is relatively uniform in section Deserticolae (Gentry 1978), and variability in the floral characters are less important for distinguishing species than in other sections. Gentry (1978) reported variation in flower structure

1a. Leaves short and broad, length-to-width ratio less than 2.5:1, green to yellow-green, ovate to oblanceolate, Islas Margaritae and Magdalena, BCS . . . . .	<i>A. margaritae</i>
1b. Leaves long and narrow, length-to-width ration greater than 3:1, yellow green, green, bluish, gray or white, with a glaucous coating or if green without the glaucous coating, the shape being long triangular, peninsula or islands . . . . .	2
2a. Plants of the northern part of the Baja California peninsula and the northwestern Sonoran Desert; plants dense, leaves glaucous blue or glaucous gray and the inflorescence dense, with short laterals and congested in the upper 1/4–1/5 of the stalk, or leaves green and the inflorescence more open with longer laterals spaced out in the upper 1/3 of the stalk. . . . .	3
2b. Plants of the central and southern parts of the Baja California peninsula; plants open, leaves pale green or yellow green to glaucous gray or glaucous bluish, the inflorescence open and narrow with short laterals, the stalk thin and sometimes arching or plants dense, leaves green to glaucous green, the inflorescence open and moderately broad with longer laterals, the stalk stout . . . . .	4
3a. Leaves mostly 25–40 cm long by 6–8 cm wide, length-to-width ratio 5:1; marginal spines lacking basal brown ring; terminal spine decurrent for several cm and confluent with uppermost marginal spines; floral tube 3–5 mm deep; foothills of the Sierras San Pedro Mártir, Juarez, and their eastern alluvial fans, BCN north to California . . . . .	<i>A. deserti</i>
3b. Leaves mostly 40–70 cm long by 5–7 cm wide, length-to-width ratio 8:1–10:1; marginal spines frequently with a basal brown ring; spine conspicuously decurrent in a corneous margin frequently to the mid-blade or even below; floral tube 5–8 mm deep; higher elevations in the Sierras San Pedro Mártir and Juarez, BCN . . . . .	<i>A. pringlei</i>
4a. Leaves yellowish green, pale green or light glaucous gray, rarely white, narrowly lanceolate to triangular–lanceolate, long–acuminate, the margins nearly straight to mildly undulate; marginal spines with an encircling brown ring; central and southern BC to northern Mulegé . . . . .	5
4b. Leaves glaucous green, glaucous gray or glaucous blue, linear, linear–lanceolate or obovate, margins nearly straight to deeply mammillate; marginal spines lacking encircling brown ring, BCS south of Mulegé to La Paz . . . . .	8
5a. Rosettes 30–50 cm in diameter at maturity, leaves upright and arching to recurved, broadly triangular, widest from base to near the middle, long taper to tip, concave above, margins deeply undulate with large, rounded teats, only known from BCS . . . . .	<i>A. cerulata</i> ssp. <i>subcerulata</i>
5b. Rosettes 50–150 cm in diameter at maturity, leaves upright and straight, not arching or recurved to flat, narrowly lanceolate to long triangular–lanceolate, widest at base with a long, gradual taper to tip, or broadly lanceolate, widest from base to above the middle with a short taper to tip, plane above, margins straight or undulate with square teats, mostly mid- to southern BC, rarely in northern BCS. . . . .	6
6a. Rosettes 80–150 cm in diameter at maturity, leaves 40–70 cm long by 4–7 cm wide at widest point, length-to-width ratio 10:1, Isla San Esteban and reportedly Isla de Ángel de la Guarda or on the peninsula near Bahía de los Angeles . . . . .	<i>A. cerulata</i> ssp. <i>dentiens</i>
6b. Rosettes 50–75 cm in diameter at maturity, leaves, 20–50 cm long by 4–8 cm wide at widest point, length-to-width ratio 3:1–7:1, mid- to southern BC . . . . .	7
7a. Lower leaves spreading, broadly linear-triangular or broadly ovate, widest from base to above middle with a short taper to the tip, flower stalk stout, inflorescence with 15–20 laterals . . . . .	<i>A. cerulata</i> var. <i>nelsonii</i>
7b. Lower leaves ascending, narrowly long–triangular, widest at base with a gradual taper to the tip, flower stalk thin, inflorescence with 6–12 laterals . . . . .	<i>A. cerulata</i> ssp. <i>cerulata</i>
8a. Leaves broadly linear to lanceolate, narrowly ovate to narrowly obovate, length-to-width ratio 8:1–9:1, sometimes wider; margin straight to shallowly undulate, Sierra de la Giganta and its foothills, Gulf islands, BCS . . . . .	<i>A. sobria</i> ssp. <i>sobria</i>
8b. Leaves broadly lanceolate, ovate to obovate, length-to-width ratio 3.3:1–5:1, margin prominently mammillate, vicinity of La Paz and Cabo Frailes, BCS	9
9a. Leaves 20–35 cm long by 6–8 cm wide, length-to-width ratio 3.3:1–4.4:1, Cabo Frailes, BCS . . . . .	<i>A. sobria</i> ssp. <i>frailensis</i>
9b. Leaves 35–50 cm long by 7–10 cm wide, length-to-width ratio 5:1, vicinity of La Paz and Gulf Islands, BCS . . . . .	<i>A. sobria</i> ssp. <i>roseana</i>

Table 5. Key to the Deserticolae (modified from Gentry 1978).

was as high within local populations as it was within the entire species distribution. The populations of *Agave deserti*, *A. pringlei*, and *A. cerulata*, in particular, are mostly distinguished by geography, less by leaf and overall inflorescence characters, and scarcely by flower characters. All of these species offset prolifically.

*Agave cerulata* TRELEASE ssp. *cerulata*  
(Fig. 16)

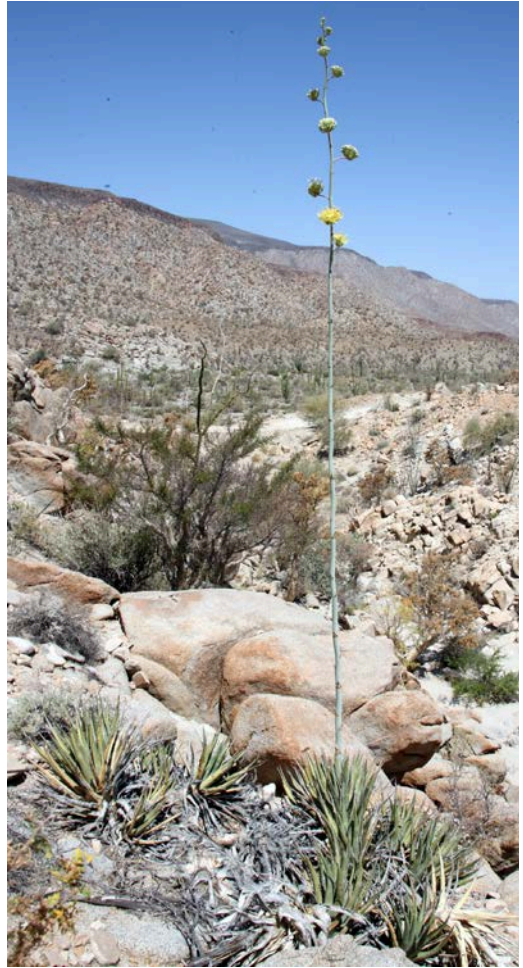
*Agave cerulata* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 55. 1911.

**TYPE LOCALITY:** Calmallí, BC, 29 September 1905 (Nelson & Goldman 7180, US) (Fig. 17).

This prolifically offsetting species has rosettes 25-50 cm tall and 40-75 cm wide, with the rosettes in a dense cluster of clones. The leaves are yellow-green, pale green, to glaucous gray-green with some cross-banding; they mostly are 25-50 cm long by 4-7 cm wide, narrowly lanceolate to triangular-lanceolate, long acuminate, with typically straight margins and grayish brown marginal spines that are 1-4 mm long and irregularly spaced or missing from much of the leaf margin. A key character is the brown ring around the weakly attached marginal spines. The terminal spine is light-to-dark gray, 3-6 cm long, and decurrent to at most the first marginal spines. The inflorescence is 2-3.5 m tall with typically 6-12 short lateral branches and bearing small triangular bracts. The flowers are mostly 45-60 mm long, waxy white in bud, and pale yellow when open.

This species occurs on both sides of the peninsula as well as on the peninsular divide over a wide area of central Baja California and Isla Ángel de la Guarda (Fig. 17). *Agave cerulata* ssp. *cerulata* seldom is found as a solitary individual, and Gentry (1978) believed that *A. cerulata* was one of the most numerous agaves in North America, after *A. lechuguilla* of the Chihuahuan Desert. As previously discussed, *A. cerulata* could be confused with *A. deserti*, but geographic separation and the brown ring around marginal spines clearly distinguish *A. cerulata* from its more northerly cousin. *Agave cerulata* is also distinguished from *A. sobria*, despite Johnston's (1924) assertions, because the latter is clearly separated geographically in the Sierra de la Giganta, does not offset as prolifically, has more flexible inflorescences, and lacks the brown ring around marginal spines.

*Agave cerulata* is vegetatively similar to *A. deserti*, although typical *A. cerulata* ssp. *cerulata* has long-triangular, yellow-green leaves compared to the linear-lanceolate leaves of *A. deserti*. Using genetic data, Navarro-Quezada et al. (2003) concluded that *A. cerulata* phylogenetically clustered separately from *A. deserti*. Johnston (1924; and continued by Shreve & Wiggins 1964), considered *A. nelsonii* to be conspecific with *A. deserti*. However, the inflorescence of *A. cerulata* var. *nelsonii* has more widely separated side branches with longer peduncles, more broadly linear-triangular leaves with characteristic brown rings at



**Figure 16.** *Agave cerulata* ssp. *cerulata* south of Bahía San Luis Gonzaga in Baja California.

the base of the marginal spines, and a more southerly distribution as is discussed below. Gentry (1978, 1982) discussed the polymorphic nature of *A. cerulata*, and given the amount of variation at the type locality, it would be difficult to justify separating this into more taxa than is currently accepted, except on the basis of geographic separation. Burgess (1988) found that the leaf size of *A. cerulata* ssp. *cerulata* decreases with increasing aridity, providing abiotic reasons for the polymorphic leaves that Gentry (1978) discussed.

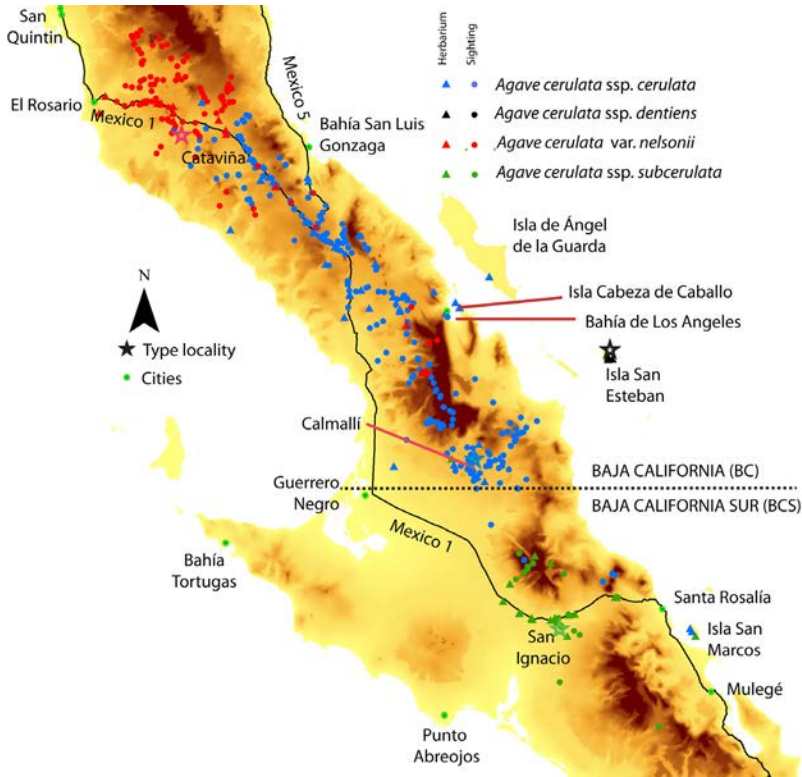
*Agave cerulata* TRELEASE ssp. *dentiens* (TRELEASE)  
GENTRY  
(Fig. 18)

*Agave dentiens* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 51. 1911.

**TYPE LOCALITY:** Isla San Esteban, Sonora, 12 April 1911 (Rose 16819, MO) (Fig. 17).

This subspecies of *A. cerulata* has prolifically offsetting rosettes 50-70 cm tall and 80-150 cm wide.





**Figure 17.** The distribution of *Agave cerulata* and its subspecies in Baja California and Baja California Sur.

The green to light-glaucous gray leaves are 40-70 cm long and 4-7 cm wide, triangular lanceolate, faintly to prominently banded, with straight margins with either no marginal spines or small ones 1-2 mm long surrounded with brown circles. The terminal spine is 3-5 cm long, brown to gray, and decurrent a short distance along the leaf margin. The panicle is 3-4 m tall with 8-18 lateral branches, and the flowers are pale yellow and 49-53 mm long.

*Agave cerulata* ssp. *dentiens* is endemic to Isla San Esteban, a small island across the Gulf of California in the state of Sonora (Wilder et al. 2008, Felger and Wilder 2012). Although three species of *Agave* occur in the island chain off the Sonoran coast (Wilder et al. 2008), which includes Isla Tiburón, the largest island in the gulf, *A. cerulata* ssp. *dentiens* is the only species on Isla San Esteban. Some reports have this subspecies growing on Isla Ángel de la Guarda (Fig. 17) or on the mainland of Baja California in the vicinity of Bahía de los Angeles. Gentry (1978) reported a specimen (Gentry & Fox 11953) collected between Punta Prieta and Bahía

de Los Angeles, and other unusual plants with affinity to *A. cerulata* were found in the mountains southeast of Bahía San Luis Gonzaga (M. Salazar-Ceseña, pers. comm. 2012). Although the mainland plants could fit within an extremely variable interpretation of the *A. cerulata* complex, the offshore populations appear to warrant subspecies status. Alternatively,



**Figure 18.** *Agave cerulata* ssp. *dentiens* from the vicinity of Arroyo Limantour on Isla San Esteban, Sonora (photograph by Benjamin T. Wilder).

Navarro-Quezada et al. (2003) found that genetic variation of *A. cerulata* ssp. *dentiens* was not significantly different from *A. cerulata* on the peninsula. However, given its relatively wide inflorescence, *A. cerulata* ssp. *dentiens* appears to be a viable subspecies and could represent a bridge between sections *Deserticolae* and *Conicae*.

***Agave cerulata* TRELEASE var. *nelsonii* (GENTRY)**  
R.H.WEBB & G.D.STARR comb. nova  
(Fig. 19)

**BASIONYM:** *Agave nelsonii* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 61. 1911.

**TYPE LOCALITY:** Misión San Fernando, Sierra San Miguel, BC, 4 September 1905 (Nelson & Goldman 7111, US) (Fig. 17).

This prolifically offsetting variety of *Agave cerulata* has short-stemmed, compact rosettes that are 50-75 cm in diameter at maturity. The leaves are gray-green and mostly 20-35 cm by 6-8 cm, lanceolate to triangular-lanceolate, with a thick gray to bluish glaucous coating. The grayish brown marginal spines are 3-9 mm long with a brownish ring around the base, are regularly spaced about 1-2 cm apart, and may be on small teats. The terminal spine is 2-4 cm long, grayish brown, and decurrent to the first or second set of marginal spines. The inflorescence is stout, 2.5-4 m tall, and has 15-20 ascending to arching lateral branches. The umbels are compact and globose, and the slender, light yellow flowers are 45-55 mm long.

We change these plants from subspecies to variety because we found substantial overlap in distribution with *Agave cerulata* ssp. *cerulata* at the southern end of the distribution for *A. cerulata* var. *nelsonii*. (Fig. 17). For example, we found both taxa east of El Rosario, at Laguna Chapala, and at Agua de Higuera. Gentry (1978) discussed variability in the forms of *A. cerulata* found at the type locality of Calmallí, and one or more of those could be fit into variety *nelsonii*. This variety is the dominant taxa in the northernmost distribution of the *A. cerulata* complex (Fig. 17), being found on both sides of the southern Sierra de San Pedro Mártir. Between El Rosario and the southwestern flank of the Sierra de San Pedro Mártir, the distribution overlaps with *A. shawii* ssp. *goldmaniana* and, because of its large clusters of dense rosettes with broadly linear-triangular or broadly ovate leaves and frequently long, reclining trunks, can be mistaken for small forms of that taxa when not in flower. The vegetative similarities and overlap in distribution leads us to speculate whether *A. cerulata* var. *nelsonii* is probably the result of some long ago hybridization between *A. cerulata* and *A. shawii* ssp. *goldmaniana*, which has stabilized over the millennia. However, the tall, narrow inflorescence is definitely more like *A. cerulata* and section *Deserticolae* than it is like *A. shawii* ssp. *goldmaniana* and section *Umbelliflorae*. *Agave cerulata* var. *nelsonii* can be considered the higher-elevation form of *A. cerulata* as it occurs in the Sierra la Libertad north and east Misión San



**Figure 19.** *Agave cerulata* var. *nelsonii* east of Cataviña, Baja California.



**Figure 20.** *Agave cerulata* ssp. *subcerulata* at the type locality south of San Ignacio, Baja California Sur.

Borja and generally occurs upslope of subspecies *cerulata* in the north.

*Agave cerulata* TRELEASE ssp. *subcerulata*  
 GENTRY  
 (Fig. 20, 21)

*Agave cerulata* TRELEASE ssp. *subcerulata* Gentry,  
*Occas. Pap. Calif. Acad. Sci.* No. 130: 44. 1978.

**TYPE LOCALITY:** San Ignacio, BCS, 3 April 1951  
 (Gentry 10330, US) (Fig. 17).

This distinctive subspecies has offsetting rosettes 15-30 cm tall and 30-50 cm in diameter. The leaves are glaucous green to blue-green, 15-30 cm long by 2.5-7 cm wide, and lanceolate to triangular lanceolate in shape. The leaf margins are crenate with prominent teats and well-developed, grayish-brown marginal spines that are 3-8 mm long, spaced at 1-3 cm intervals, variously flexed, and weakly attached. The gray-brown terminal spine is 2-4 cm long and usually sinuous. The inflorescence is 2-3 m tall, typically with 8-10 short lateral branches bearing light-yellow flowers 44-55 mm long.

*Agave cerulata* ssp. *subcerulata* occurs mostly in Baja California Sur, but has a distribution that extends into the state of Baja California just south of the type locality for *A. cerulata* at Calmallí (Fig. 17). The relatively broad, short leaves with prominent teats are distinctive in this subspecies in habitat, and it is relatively easy to differentiate from other species in Baja California. Subspecies *subcerulata* resembles *A. subsimplex*, another member of the Deserticolae from Sonora, and because it is the most southerly in-



**Figure 21.** *Agave cerulata* ssp. *subcerulata* at Cerro las Mulas west of San Ignacio, Baja California Sur.

fraspecific taxon of *A. cerulata*, it may form a genetic connection to some strains of *A. sobria*. To emphasize this, we found one locality on the western side of the Sierra de la Giganta south of San Ignacio (Fig. 17). Johnston (1924) and Gentry (1978, 1982) reported what they called “depauperate forms” growing in gypsum soils on Isla San Marcos, in the Gulf of California near Santa Rosalía (Fig. 1), and the size of rosettes depends upon slope aspect. Polymorphism in this subspecies likely is dependent upon substrate and aspect on the mainland as well, with populations near the type locality of San Ignacio (Fig. 20) having smaller rosettes with more crenate leaves than plants growing at the Cuesta del Diablo east of Volcán de Tres Virgines.

*Agave deserti* ENGELMANN  
 (Fig. 22)

*Agave deserti* ENGELMANN, *Trans. Acad. Sci. St. Louis*  
 3: 310, 370. 1875

**SYNONYM:** *Agave consociata* TRELEASE,  
*Missouri Bot. Gard. Rep.* 22: 53. 1911.

**TYPE LOCALITY:** Rancho San Felipe, San Diego County, California, based on collections made by Emory in 1846 and Hitchcock and Palmer in 1875.

*Agave deserti* has prolifically offsetting rosettes that are 30-50 cm tall and 40-60 cm wide. The leaves are variable in size, shape, and color but typically are 25-40 cm long by 6-8 cm wide, lanceolate to linear-lanceolate, gray to blue-gray glaucous green and commonly banded, and bearing slender-cusped, fragile marginal spines 2-3 mm long or rarely much longer. The stout terminal spine generally is 2-4 cm long, light brown to gray in color, and decurrent to the first or second marginal spine. The inflorescence generally is 2.5-4 m tall on a slender shaft with small triangular bracts and 6 to 15 short laterals congested in the upper one-sixth of the stalk. The flowers are yellow and 40-60 mm long

*Agave deserti* is at the center of a large variable species complex, the limits of which are difficult to assess owing to its wide distribution in the US and Mexico. Johnston (1924) lumped several of the taxa proposed by Trelease (1911) under *A. deserti*, includ-



**Figure 22.** *Agave deserti* on the northeast side of Valle Santa Clara, Baja California. The Sierra de San Pedro Mártir and Laguna Diablo appear in the background.

ing. *A. pringlei*, *A. nelsonii*, *A. consociata*, and *A. dentiens*. Gentry (1978) accepted some of this synonymy, but created *A. deserti* ssp. *deserti* and ssp. *pringlei* (with ssp. *simplex* in Arizona), and he proposed that populations in Paseo San Matias, which separates the Sierra San Pedro Mártir from the Sierra Juarez (Fig. 1), were a hybrid swarm and justified the reduction of *A. pringlei* to subspecies. Genetically, Navarro-Quezada et al. (2003) found more dissimilarity among *A. deserti* populations than those of *A. cerulata* or *A. subsimplex* from Sonora and suggested that this finding could indicate an increased tendency towards hybridization in *A. deserti*.

Hodgson (2001) reduced *Agave pringlei* to a variety of *A. deserti* because of the close proximity of *A. pringlei* and *A. deserti* in Paseo San Matias. We examined this population and found a clear separation of *A. deserti* and *A. pringlei* in this area with little evidence of a hybrid swarm. *A. deserti* can generally be separated from *A. pringlei* on the basis of leaf color (glaucous gray versus green), the presence of a brown ring around marginal spines in *A. pringlei* (suggesting a higher affinity to *A. cerulata*), and the height of inflorescence (taller in *A. deserti*). We do not reject Gentry's (1978) assertion that hybridization occurs; for example, Cave (1964) has reported a polyploid individual from Baja California with  $n = 59$  gametic chromosomes (*Hutchinson 710*) (most agaves are  $n = 30$ ); we did not find apparent hybrids that are as numerous as Gentry (1978) reports and insufficient overlap and similarity among the plants to justify re-



**Figure 23.** *Agave margaritae* on Isla Magdalena, Baja California Sur.

duction of *A. pringlei* to either a subspecies or variety of *A. deserti*.

*Agave margaritae* BRANDEGEE  
(Fig. 23)

*Agave margaritae* BRANDEGEE, *Proc. Calif. Acad. Sci. series. 2. 2*: 206. 1889.

**SYNONYM:** *Agave connochaetodon*

TRELEASE, *Missouri Bot. Gard. Rep.* 22: 58. 1911.

**TYPE LOCALITY:** Isla Magdalena, BCS, 14 January 1889 (Brandegge s.n., UC) (Fig. 24).

This prolifically offsetting species has rosettes that generally are 25-30 cm tall and 50-75 cm wide bearing 40-50 leaves. The leaves are yellow-green to glaucous blue and 12-25 cm long by 7-10 cm wide, ovate to broadly lanceolate with a crenate margin and, in some forms, prominent teats. The marginal spines are reddish-brown to gray; curved and (or) flexed; are typically 4-5 mm long, but, in some forms, are 8-15 mm long; and spaced about 1-1.5 cm apart. The terminal spine is 2-3 cm long and decurrent for a short distance along the leaf margin. The inflorescence is 2-3.5 m tall with 6 to 12 short lateral branches. The flowers are a light yellow color and 45-50 mm long.

This species is only known from the two islands that form the barrier to create Bahía Magdalena on the west coast of Baja California Sur (Figs. 1, 24). Although several forms are thought to occur, the variability of this species is high, not unlike other species on the Baja California peninsula. *Agave margaritae* cannot be confused with any other species, in part because of its location on two islands with no other agaves nearby. Although glaucous blue-green forms are known (and may have been the inspiration for *A. connochaetodon*), we only observed the yellow-green rosettes on Isla Magdalena.

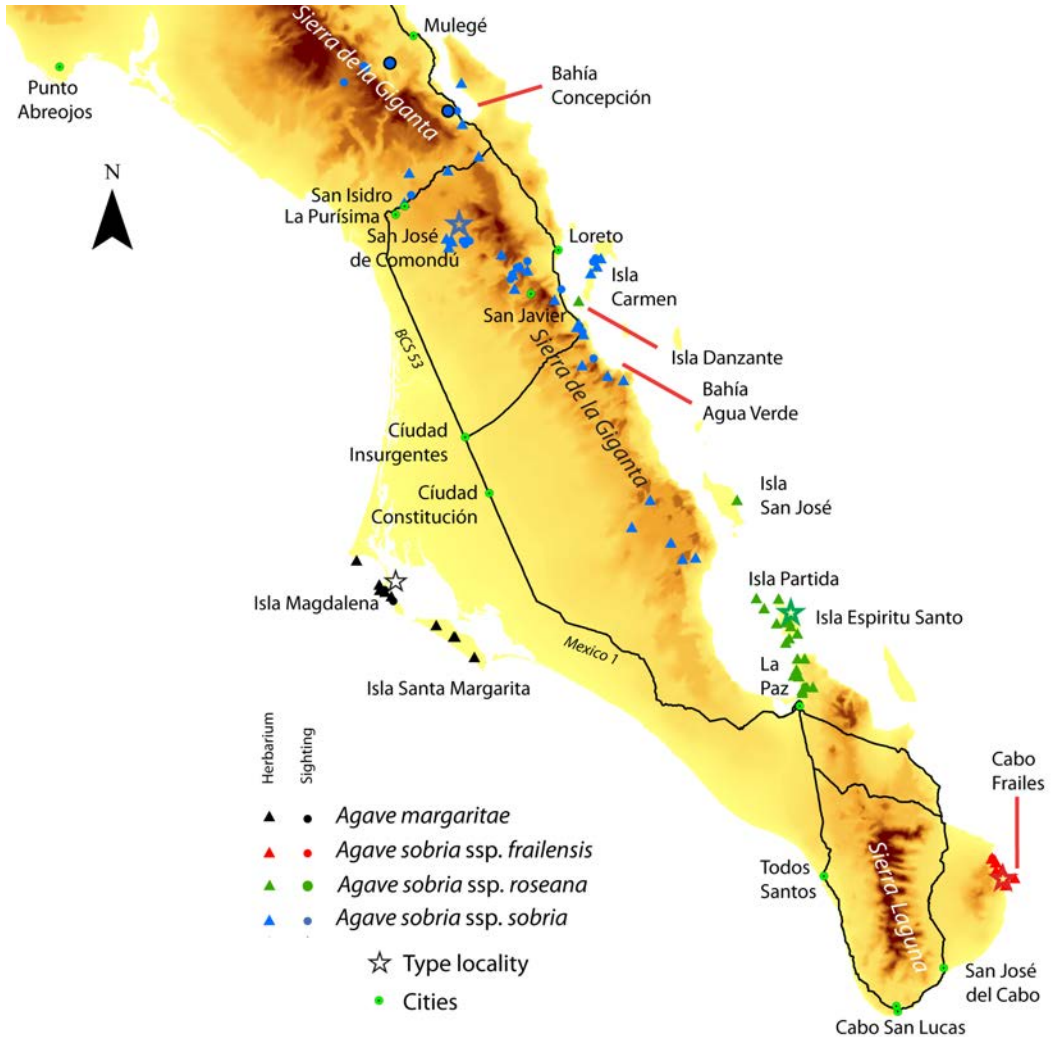


Figure 24. The distribution of *Agave margaritae*, *Agave sobria*, and its subspecies.

*Agave pringlei* ENGELMANN ex BAKER (Fig. 25)

*Agave pringlei* ENGELMANN ex BAKER, *Handbook Amarillid.* 182. 1888.

**SYNONYM:** *Agave deserti* ENGELMANN ssp. *pringlei* (ENGELMANN ex BAKER) GENTRY, *Occas. Pap. Calif. Acad. Sci.* No. 130: 20. 1978.

**SYNONYM:** *Agave deserti* ENGELMANN var. *pringlei* (GENTRY), HODGSON. *Novon* 11: 410. 2001.

**TYPE LOCALITY:** Not specified. Gentry (1978) reports that Orcutt probably collected a specimen from the Sierra Juarez in 1882 (Fig. 13).

*Agave pringlei* has offsetting rosettes that are 40-70 cm tall and 50-80 cm wide. The leaves are green to glaucous green, triangular lanceolate, long acuminate, and mostly 40-70 cm long by 5-7 cm

wide. The marginal spines are regularly spaced 1-2 cm apart, have a distinctive encircling brown ring, and are typically 5-10 mm long. The terminal spine is 3-4 cm long, reddish brown to light gray, and decurrent to mid-leaf. The inflorescence is typically about 3 m tall, up to 6 m tall at higher elevations, with 10-15 lateral branches, and the yellow flowers are 40-60 mm long.

As discussed under *A. deserti*, we propose reversion to *A. pringlei* Engelmann based on the green, long triangular-lanceolate leaves with the conspicuous brown ring around the marginal spines, as well as the shorter inflorescences. Gentry (1978, 1982) reported that the brown ring around the base of the marginal spines was distinctive for *Agave cerulata*, and the occurrence of this trait in *A. pringlei* suggests a closer link to *A. cerulata* than to *A. deserti*. Navarro-Quezada et al. (2003), however, found considerable genetic similarity between close-proximity populations of *A. deserti* and *A. pringlei*, but not all populations of *A. deserti* showed this similarity; their



**Figure 25.** *Agave pringlei* with its distinctive green-leaved rosettes southwest of Paseo San Matias in the Sierra de San Pedro Mártir, Baja California. *Agave deserti*, flowering from its gray-leaved rosettes, appears in the background.

analyses may have been influenced by the proposed hybrid swarm that Gentry postulated in the Paseo San Matias region. Northwest of Lazaro Cardenas in the northern Sierra San Pedro Mártir, Moran collected a specimen (*SD 100610*) he identified as *A. cerulata*; we found *A. pringlei* during our visit to this area. We found what appeared to be isolated hybrids between *A. pringlei* and *A. deserti* at several sites in the northern Sierra Juarez south of Rumerosa.

Some collections in the northern Sierra San Pedro Mártir have been confused with *Agave moranii*, which differs substantially (we place that species in section *Conicae*). The confusion presumably occurs because *A. pringlei* has long, narrow green leaves, as does *A. moranii*, but the inflorescence of *A. moranii* is much wider, the rosettes do not offset, and the leaves are more rigid and guttered. Gentry (1978) notes that *A. pringlei* has a deeper tube with a deeper insertion of filaments that helps to distinguish it from *A. deserti* and *A. moranii*, but he did not believe that this characteristic was consistent or distinctive enough to separate it from *A. deserti*. Near Rancho San Pedro Mártir south of Paseo San Matias, Reid Moran collected one specimen (*SD 68088*) that he believed was a hybrid between *A. pringlei* and *A. moranii*; we visited this locality and we believe only *A. pringlei* occur there, albeit a slightly larger form than those that occur at Paseo San Matias.



**Figure 26.** *Agave sobria* ssp. *sobria* at the type locality above San Pedro de Comondú, Baja California Sur.



**Figure 27.** *Agave sobria* ssp. *sobria* along the road to Misión Guadalupe in the northern Sierra de la Giganta west of Mulegé, Baja California Sur.

*Agave sobria* BRANDEGEE ssp. *sobria*  
(Fig. 26)

*Agave sobria* BRANDEGEE, *Proc. Calif. Acad. Sci. series* 2. 2: 207. 1889.

**SYNONYM:** *Agave affinis* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 56. 1911.

**SYNONYM:** *Agave carminis* TRELEASE, *Missouri Bot. Gard. Rep.* 22: 25. 1911.

**SYNONYM:** *Agave sleviniana*  
I.M. JOHNSTON, *Proc. Calif. Acad. Sci. series* 4. 12: 1000. 1924.

**TYPE LOCALITY:** Mesas north of Comondú, 28 March 1889 (Brandegee s.n., UC) (Fig. 24).

*Agave sobria* is perhaps the most variable species in Baja California on the basis of its current conception. This solitary or offsetting species has rosettes 50-150 cm in height and 50-150 cm in diameter with few to many leaves; at the type locality, the



**Figure 28.** A clump of *Agave sobria* ssp. *sobria* east of San Isidro and La Purísima, Baja California Sur. These plants have an affinity to *A. cerulata*, which occurs more than 100 km to the north of this site.

plants have 12-20 leaves. The leaves are 10-80 cm long by 5-45 cm wide and are typically linear to lanceolate, long-acuminate, and banded. The leaf margin undulate to mammillate, with gray-red marginal spines on small to large teats spaced 3-4 cm apart and 5-10 mm long; the amount of flexure varies tremendously among the various populations. The terminal spine typically is 3-6 cm long and sharp. The inflorescence is 2.5-4 m tall with a slender shaft that is upright but more commonly arching under the weight of the 12-20 short lateral branches. The flowers are slender, pale yellow, and 45-55 mm long.

*Agave sobria* represents a complex of different forms, some of which were previously described as species (e.g. *A. carminis* and *A. affinis*) and some of which have been mistaken for *A. gigantensis* (Webb & Starr 2014a). *Agave sobria* is distinguished by its slender flowers with long narrow tepals; its light-glaucous, lanceolate leaves with widely spaced marginal spines; and its presence on both sides of the length of the Sierra de la Giganta. Without regard to the numerous forms of *A. sobria* in this mountain range and on islands in the Gulf of California, the only other species that occurs with it is *A. gigantensis*, a solitary species of mesa tops that is much larger with green leaves and a more robust inflorescence (Webb & Starr 2014a). *A. sobria* most commonly occurs on rocky slopes in canyons, such as at the type locality below the volcanic rim rocks and on the talus slope above Comondú (Fig. 26).

*Agave sobria* is highly polymorphic with different forms throughout its range, excluding the subspe-



**Figure 29.** *Agave sobria* ssp. *sobria* with thin, long leaves on cliffs above México Highway 1 and El Coyote on the west side of the head of Bahía Concepción, Baja California Sur.



**Figure 30.** *Agave sobria* ssp. *sobria* from Isla Carmen that Trelease (1911) described as *Agave carminis*.



**Figure 31.** *Agave sobria* ssp. *sobria* on cliffs near sea level along México Highway 1 south of Loreto, Baja California Sur.



**Figure 32.** *Agave sobria* ssp. *sobria* on Cuesta las Parras southwest of Loreto and northeast of Misión San Javier. We believe these plants have been mistaken for *Agave gigantensis*.



**Figure 33.** *Agave sobria* ssp. *sobria* near Mesa Siquito along the road west of Bahía Agua Verde, Baja California Sur.

cies that Gentry (1978) described from the Cape Region. The plants at the type locality only appear to represent the most northerly forms in the mountains between La Purísima and Mulegé (Fig. 27). Northeast of San Isidro (near La Purísima, Fig. 24), a prolifically offsetting type occurs that has obvious



**Figure 34.** *Agave sobria* ssp. *frailensis* on Cerro las Lisas near Punta los Mangles in Baja California Sur.

affinities to *A. cerulata* but without the brown ring around marginal spines (Fig. 28); somewhat similar types occur on the other side of the peninsula along Bahía Concepción south of Mulegé (Fig. 29). In the southern part of the Sierra de la Giganta and on adjacent islands, many strongly divergent forms occur; the plants once described as *Agave carminis* (Fig. 30) are considerably different from those found along México Highway 1 south of Loreto (Fig. 31). Webb and Starr (2014a) believe one form of *Agave sobria* northeast of Misión San Javier has been mistaken for *A. gigantensis* (Fig. 32); another large form with relatively wide and numerous leaves occurs on Mesa Siquito west of Bahía Agua Verde (Fig. 33). Considerable additional field work, in addition to molecular data, would be required to determine the nature and distribution of *Agave sobria* and especially whether other species, subspecies, or varieties are warranted to separate the extremely divergent forms known within its range.

*Agave sobria* BRANDEGEE  
ssp. *frailensis* GENTRY  
(Fig. 34)

*Agave sobria* BRANDEGEE ssp. *frailensis* GENTRY,  
*Occas. Pap. Calif. Acad. Sci.* No. 130: 67. 1978

**TYPE LOCALITY:** about 6 km north of Punta Frailes, BCS, 7 October 1951 (Gentry & Cech 11264, US) (Fig. 24).

This subspecies has compact, sometimes urn-olate (urn-like) rosettes to about 20-35 cm tall by 50-75 cm across that offset sparingly. The leaves are glaucous green to blue-gray in color and are mostly 20-35 cm long by 6-8 cm wide, lanceolate, and banded. The leaf margin is strongly mammillate with numerous gray, flexuous marginal spines that mostly are 6-10 mm long. The terminal spine is 3-4 cm long, typically sinuous or contorted, and decurrent to the first marginal spines. The inflorescence is slender, 3-4 m tall, and bearing triangular bracts subtending 10-15 short lateral branches. The yellow





**Figure 35.** *Agave sobria* ssp. *roseana* along México Highway 11 north of La Paz, Baja California Sur.

flowers are 45-63 mm long and slender.

*Agave sobria* ssp. *frailensis* occurs at only a few localities along the Gulf of California between Cabo Frailles and Punta los Mangles (Fig. 24) growing on small granite hillslopes. It has smaller rosettes than subspecies *roseana* with more leaves and marginal spines. The compact urceolate rosettes, in particular, make these very distinctive plants, and no other agaves grow with it in Baja California Sur. *Agave aurea* ssp. *aurea* is the geographically closest species, and it occurs 20 km or more to the west (compare Figs. 2, 34).

*Agave sobria* BRANDEGEE  
ssp. *roseana* (TRELEASE) GENTRY  
(Fig. 35)

*Agave sobria* BRANDEGEE ssp. *roseana* (TRELEASE)  
GENTRY, *Occas. Pap. Calif. Acad. Sci.* No. 130: 54.  
1978.

**SYNONYM:** *Agave roseana* TRELEASE,  
*Missouri Bot. Gard. Rep.* 22: 59. 1911.

**SYNONYM:** *Agave sobria* BRANDEGEE var.  
*roseana* I.M Johnston, *Proc. Calif. Acad. Sci.*  
*series 4.* 12: 1002. 1924.

**TYPE LOCALITY:** Isla Espiritu Santo, BCS, 18 April 1911 (Rose 16854, US) (Fig. 24).

This subspecies has small, offsetting rosettes with few yellow-green leaves. The leaves are 35-50 cm long by 7-10 cm wide, broadly lanceolate, and frequently twisted. The leaf margin is prominently mammillate with teats 1-1.5 mm long bearing large, flexuous marginal spines that may be bicuspid and 10-25 mm long. The gray terminal spine is 5-7 cm long and can be sinuous to contorted. The inflorescence is 2.5-3.5 m tall, slender, with 8 to 12 compact, globose umbels with light yellow flowers 45-65 mm long.

*Agave sobria* ssp. *roseana* occurs on the coast north and east of La Paz and on islands just offshore, particularly Isla Espiritu Santo and adjacent islands (Fig. 24). One collection reports it on Isla San Jose south-east of Loreto (Fig. 24), and the relationship between *A. sobria* ssp. *roseana* and the plants previously described by Trelease (1912) as *A. carminis* have not been sufficiently evaluated. Collections suggest its distribution may extend into the southern Sierra de la Giganta, but we have not evaluated these plants and suspect that they may be part of the extreme polymorphism of the typical species. Subspecies *roseana* is distinguished from the typical *A. sobria* by its sparsely offsetting rosettes with few, broad leaves bearing prominent mammillate margins and large, irregularly flexed marginal spines. Gentry (1978) believed that typical *A. sobria* occurred with subspecies *roseana* on the peninsula north of La Paz, but we reject this assertion and restrict the distribution of typical *A. sobria* to the Sierra de la Giganta until further investigation suggests otherwise. He also reported that some offshore populations had solitary individuals, whereas others in Isla Espiritu Santo and the La Paz peninsula prolifically offset.

## Section Intermediae

R.H.WEBB & G.D.STARR (sect. nova). Table 6

**TYPE SPECIES:** *Agave vizcainoensis* GENTRY.

We propose section Intermediae to include two species that would not fit well into section Deserticolae. As discussed under section Conicae, the Deserticolae group created by Trelease (1911) and continued by Gentry (1978) became problematic with the inclusion of Gentry's *Agave vizcainoensis* because the shape of its inflorescence was so much different than other species in the section and because of its deep flower tube that differs from other members of the Deserticolae; he included it there for lack of a better option. *Agave deserti*, the type for section Deserticolae, has a tall inflorescence with a narrow, cylindrical shape and short lateral branches. The species in section Intermediae have similar vegetative characteristics to those within Deserticolae except they have shorter, cylindrical, and relatively broad inflorescences and that deep flower tube. With the addition of the recently described *A. azurea* (Webb & Starr 2014b), we found it necessary to create section Intermediae to set apart these two species, which in our opinion form a bridge between the Deserticolae and the Umbelliflorae (Webb & Starr 2014b). The name Intermediae was chosen to reflect that intermediate position.

1a. Plants in the Picachos de Santa Clara, Vizcaíno Peninsula, mostly solitary, leaves glaucous blue-green and 55-76 cm long, obovate to oblanceolate, margin straight with small to large marginal spines, flowers 79-85 mm long, flower stalk with moderately enlarged bracts below the fertile section, BCS . . . . .	<i>A. azurea</i>
1b. Plants on the western Vizcaíno Peninsula, solitary or offsetting, leaves dark blue green and 25-40 cm long, lanceolate, the margin nearly straight to undulate, with shorter, more flattened marginal spines, flowers 65-75 mm long, flower stalk with small bracts below the fertile section, BCS . . . . .	<i>A. vizcainoensis</i>

Table 6. Key to the Intermediae.

*Agave azurea* R.H.WEBB & G.D.STARR (Figs. 36, 38)

*Agave azurea* R.H.WEBB & G.D.STARR, *Haseltonia* 19: 89-96. 2014.

**TYPE LOCALITY:** Picachos de Santa Clara, BCS, April 2013 (Webb-Starr 20130418, HCIB) (Fig. 37)

This species is generally solitary with rosettes of 13–17 leaves that typically are 80–90 cm tall and 100–153 cm wide. The glaucous blue-green leaves are obovate to oblanceolate and 55–76 cm long by 14–22 cm wide with light bud printing, faint to moderate banding, and a straight to rarely undulate margin. The marginal spines can develop on small teats or no teats; are deflexed towards the stem; are orange-yellow, reddish purple or brownish red, aging to whitish gray; and are 10–15 mm long spaced about 40–50 mm apart. The terminal spine is 40–70 mm long and decurrent to the first marginal spines. The inflorescence is 2–4.5 m tall with triangular bracts on the shaft and 6–9 lateral branches each bearing 6–8 flower-bearing peduncles. The yellow-orange flowers are 79–85 mm long.



Figure 36. *Agave azurea* at the type locality in the Picachos de Santa Clara in Baja California Sur.

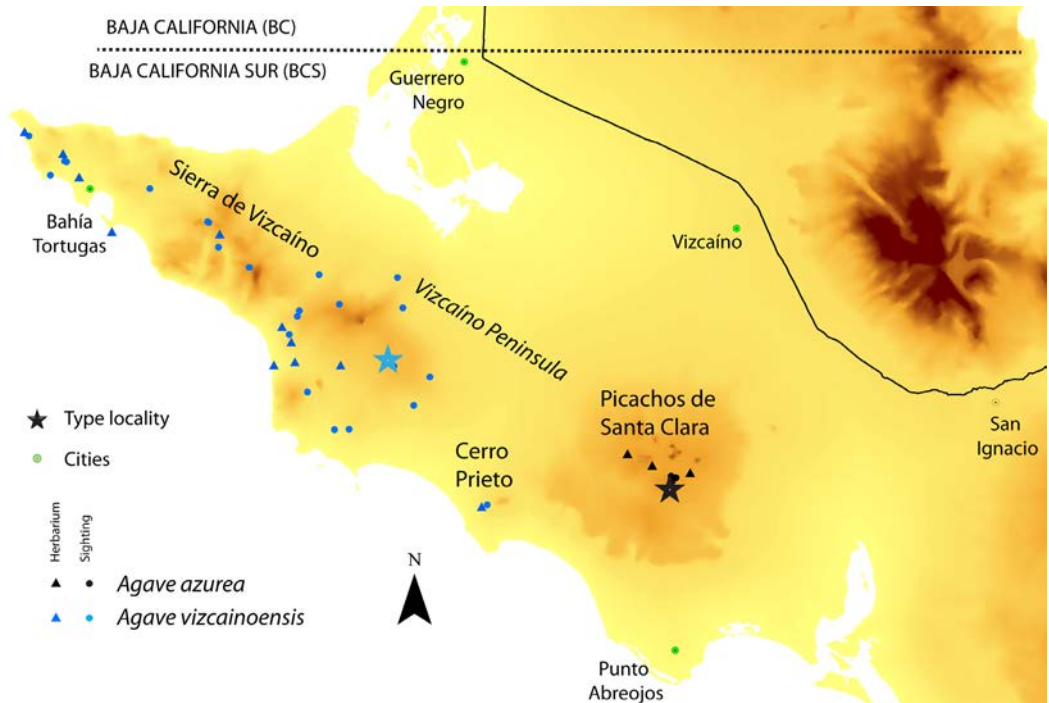


Figure 37. The distribution of *Agave vizcainoensis* and *A. azurea*.



**Figure 38.** *Agave azurea* in flower at its type locality in the Picachos de Santa Clara, Vizcaino Peninsula, Baja California Sur.

*Agave azurea* appears to be restricted to rocky colluvial hillslopes and alluvial fans in the Picachos de Santa Clara on the Vizcaino Peninsula (Figs. 36, 38). It can be mistaken for its close relative *A. vizcainoensis*, which we did not find in the central part of these mountains. Webb and Starr (2014b) report that the two species differ in many ways, including the mostly solitary form of *A. azurea*, the leaf shape, flower dimensions, and capsules and seeds. The shorter, wider, and more congested inflorescence of *A. azurea*,



**Figure 39.** *Agave vizcainoensis* in the Sierra Vizcaino on the Vizcaino Peninsula, Baja California Sur.

as well as its flower length, places it between those of the Umbelliflorae and those of the Deserticolae (Webb & Starr 2014b). Because of their glaucous, blue-green leaves, plants of this species have been confused with *A. sebastiana*, which only occurs on islands northwest of the Vizcaino Peninsula (Webb & Starr 2014b) and has far more leaves that are more ovate; moreover, *Agave azurea* vegetatively resembles *A. turneri*, a species narrowly endemic to a mountain range near the US – Mexico border (Fig. 13) with a different type of inflorescence (see section Conicae). Gentry's collections of this species (Gentry 7693, 7713) from the Picachos de Santa Clara are listed under both *A. gigantensis* and *A. vizcainoensis* (Appendix 1). *Agave gigantensis* grows at higher elevations in the northern Sierra de la Giganta, has green leaves and a taller, narrower inflorescence with widely spaced laterals.

***Agave vizcainoensis* GENTRY**  
(Fig. 39)

*Agave vizcainoensis* GENTRY, *Occas. Pap. Calif. Acad. Sci.* No. 130: 67. 1978.

**TYPE LOCALITY:** Cerro Tordillo, Sierra Vizcaino, BCS, 12-13 March 1947 (Gentry 7469, UC) (Fig. 37).

This species has offsetting to solitary rosettes that have few leaves and generally are 30-50 cm tall and 50-90 cm wide. The glaucous gray-green leaves, which can become reddish or dark, are lanceolate, 25-40 cm long by 6-10 cm wide with an undulate margin. The grayish to brown marginal spines are 5-10 mm long and spaced at 1-3 cm intervals, slender or broadly flattened, and straight or curved. The terminal spine is 2.5-4 cm long, gray to brown in color, and decurrent well into the leaf margin. The inflorescence is 2-5 m tall with 8 -15 spreading lateral branches, and the yellow-green flowers are 65-75 mm long.

*Agave vizcainoensis* occurs in the mountains and alluvial fans on the western Vizcaino Peninsula (Fig. 37) and does not occur in the deep sandy soils of the eastern part of the peninsula. The description of this species does not adequately represent the



**Figure 40.** *Agave vizcainoensis* from Cerro Prieto, southwest of the Picachos de Santa Clara and northwest of Punta Abreojos on the Vizcaíno Peninsula, Baja California Sur. Plants at this site have been mistakenly identified as *Agave sebastiana*, but the inflorescences on these plants are narrow and characteristic of *A. vizcainoensis*.

large variation within and among populations. The typical plants have few leaves that broadly spread, which Gentry refers to as “an open rosette.” However, plants confused with *A. sebastiana* have numer-

ous leaves in a closed rosette, and their inflorescences clearly anchor them within the concept of *A. vizcainoensis*. For example, Reid Moran collected specimens from Cerro Prieto (Moran 5263-25269, SD), southwest of the Picachos de Santa Clara (Fig. 37), and identified them as *A. sebastiana*. We visited this population and found plants with closed rosettes and marginal spines on large teats (Fig. 40). As discussed in Webb and Starr (2014b), other specimens identified as *A. sebastiana* were collected in the vicinity of Bahía Tortugas north to Punta Eugenia; our field investigations in this area yielded highly variable, many-leaf forms of *A. vizcainoensis* and no *A. sebastiana*. Turner et al. (1995) identified *A. vizcainoensis* in this area as *A. sebastiana*, which we corrected after revisiting those localities.

Aside from its close relationship with *Agave azurea*, *A. vizcainoensis* generally is distinct from other agaves of the Baja California peninsula and offshore islands. The deep flower tubes of *A. vizcainoensis* suggests that this species is related to *A. margaritae*, which grows on offshore islands 100 km to the south (Fig. 24). *A. margaritae* has small, prolifically offsetting rosettes bearing short, broad leaves and a narrow inflorescence that is more appropriate for section *Deserticolae*.

## Section *Rigidae*

R.H.WEBB & G.D.STARR (stat. nova). Table 7

**TYPE SPECIES:** *Agave angustifolia* HAW.

Gentry (1978) followed Trelease (1911) and used the monotypic group *Datyliones*, but later, Gentry (1982), included *A. datylio* with his new group *Rigidae*. The one species in this group is significantly different from others on the Baja California peninsula.

*Agave datylio* SIMON ex WEBER  
(Figs. 41, 42)

*Agave datylio* SIMON ex WEBER var. *vexans* (TRELEASE) I.M.JOHNSTON *Proc. Calif. Acad. Sci. series 4* 12: 1003. 1924.

**SYNONYM:** *Agave vexans* TRELEASE,  
*Missouri Bot. Gard. Rep.* 22: 62. 1911.

**TYPE LOCALITY:** Not explicitly known, but described from near La Paz in Baja California Sur (Fig. 2).

*Agave datylio* has rosettes typically 60-100 cm tall and 50-100 cm wide. The yellow-green leaves are linear (sword shaped) and 50-80 cm long, 3-4 cm wide, deeply grooved above and rounded below, and rigid, which is typical for this section. While the spines are typically 3-5 mm long and somewhat blunt, the terminal spine is large (2.5-4 cm long) and sharp. The inflorescence is 3-5 m tall with 8 to 15 branches of small umbels in its upper half; the flowers are greenish-yellow and 40-55 mm long.

This species is widely distributed at low elevations and in sandy soils in Baja California Sur. It is readily seen along BCS 53 in the vicinity of La Purísima and outside of the La Paz metropolitan area (Fig. 2). *Agave datylio* has no close relatives on the penin-



**Figure 41.** *Agave datylio* south of La Paz, Baja California Sur.

sula, but is related to *A. aktites*, which grows along the mainland Sonoran-Sinaloan coast. Because of its thin, dagger-like, yellow-green leaves, as well as its habitat on low-elevation sandy plains, *A. datylio* is unlikely to be confused with any other species in Baja California. Trelease (1912) described *A. vexans*



**Figure 42.** A large colony of *Agave datylio* growing near La Purísima, Baja California Sur. These plants have previously been classified as variety *vexans* but likely are diminished owing to harsh climatic and edaphic conditions in this area.

(Fig. 42) and Johnston (1924) reduced it to variety status based on stamen length, a characteristic that Gentry (1978, 1982) dismisses, indicating instead that it differed from typical *A. datylio* by its smaller rosettes and leaves. He also observed that variety *vexans* appeared to be a xerophytic ecotype of the species, but we believe that the smaller size is primarily due to edaphic conditions in the vicinity of La Purísima and Comondú, where this variety occurred. We therefore include variety *vexans* as a synonym of *Agave datylio* and eliminate it from the taxa of the Baja California peninsula.

**Section Umbelliflorae**

R.H.WEBB & G.D.STARR (stat. nova). Table 7

**TYPE SPECIES:** *Agave shawii* ENGELMANN

Members of Section Umbelliflorae are generally offsetting plants with medium-to-large rosettes bearing numerous broad leaves colored blue-gray, gray-green, or various shades of green. Plants may branch from leaf axils and seemingly creep along the ground, forming clonal groups. This section was named for its umbel-like inflorescences that are stout, nearly as wide as tall, and bear many flowered panicles frequently subtended by large, greenish purple bracts. The flowers are large and fleshy with wide tubes and strongly divergent stamens. The number of stomata on the upper leaf surface ranges from 40 to 47 per mm<sup>2</sup> (Gentry & Sauck 1978). This section mostly occurs in the state of Baja California, but extends into southern California and occurs in the island group off the Vizcaíno Peninsula of Baja California Sur.

The closest section to the Umbelliflorae appears to be Intermediae, which we view as a transition between this section and the Deserticolae. Further discussion of the relationship between members of the Intermediae, the Deserticolae, and the Umbelliflorae can be found above regarding section Intermediae. Members of the Umbelliflorae are mostly in the winter-rainfall regime of the western coast of Baja California. The arid climate of this region is strongly influenced by fog, which provides condensate for additional moisture and reduces air temperature, particularly in the summer.

1a. Panicle taller than wide, laterals mostly 20 to 30; leaves longer, generally 40-60 cm, long-acuminate, length-to-width ratio 4:1. Generally the Valle de Calamajué area, BC . . . . .	<i>A. shawii</i> ssp. <i>goldmaniana</i>
1b. Panicle about as broad as tall, laterals number 8 to 15; leaves short, generally only 20-40 cm long, short-acuminate, length-to-width ratio 2.5:1 to 3.5:1 . . . . .	2
2a. Panicle with a rounded crown, the subtending bracts large, succulent, red to purple; leaves bright green. Coastal areas in BC to the vicinity of San Diego, California . . . . .	<i>A. shawii</i> ssp. <i>shawii</i>
2b. Panicle with a flat crown, subtending bracts small, scarious, pink to yellow; leaves glaucous gray to green. Isla Cedros, Isla la Trinidad, Isla San Benito, BCS . . . . .	<i>A. sebastiana</i>

**Table 7.** Key to the Umbelliflorae (after Gentry 1978).

***Agave sebastiana*** GREENE  
(Fig. 43)

***Agave sebastiana*** GREENE. *Bull. Calif. Acad. Sci.* 1: 214. 1885.

**TYPE LOCALITY:** Isla Cedros, BCS, 1 May 1885 (Greene s.n., CAS). (Fig. 44).

*Agave sebastiana* typically offsets prolifically but can have solitary rosettes that are 60-90 cm tall and 75-100 cm wide. It has numerous, seemingly imbricated leaves that are silvery blue, blue-gray or glau-

cous blue-green and 25-45 cm long by 8-24 cm wide, broadly linear, broadly linear-lanceolate, broadly linear-ovate or ovate and short-acuminate at the tip, and bud-printed. The leaf margin typically is thick and dark brown with slender, reddish-brown marginal spines 5-10 mm long and reflexed towards the base. The terminal spine is stout, gray to black in color and 2-3 cm long. The wide-spreading inflorescence is 2-3 m tall and rounded to nearly flat on the top with a stout shaft subtended with appressed triangular bracts and bearing 8 to 12 large umbels of yellow flowers that typically are 70-90 mm long.

Gentry (1978) noted that *Agave sebastiana* is closely related to *A. shawii* based on leaf and flower morphology, and at least one collection purports to document *A. shawii* on Isla Cedros (Appendix 1). However, *A. sebastiana* has silvery blue to glaucous blue-green leaves with more slender, black marginal spines and more conspicuous bud printing, and the inflorescence is broader and flatter with smaller subtending bracts. *A. sebastiana* can have rosettes that are solitary or clustering and forming large clones with new rosettes starting from the bases of old stems. This species occurs on the small archipelago off the northwest coast of the Vizcaíno Peninsula and unambiguous individuals have not been found on the mainland despite several herbarium specimens bearing the name of *A. sebastiana* collected from near Bahía de los Tortugas (Fig. 37) and elsewhere (Webb & Starr 2014b). No other agaves are known from these islands.



Figure 43. *Agave sebastiana* on Isla Cedros, Baja California Sur.

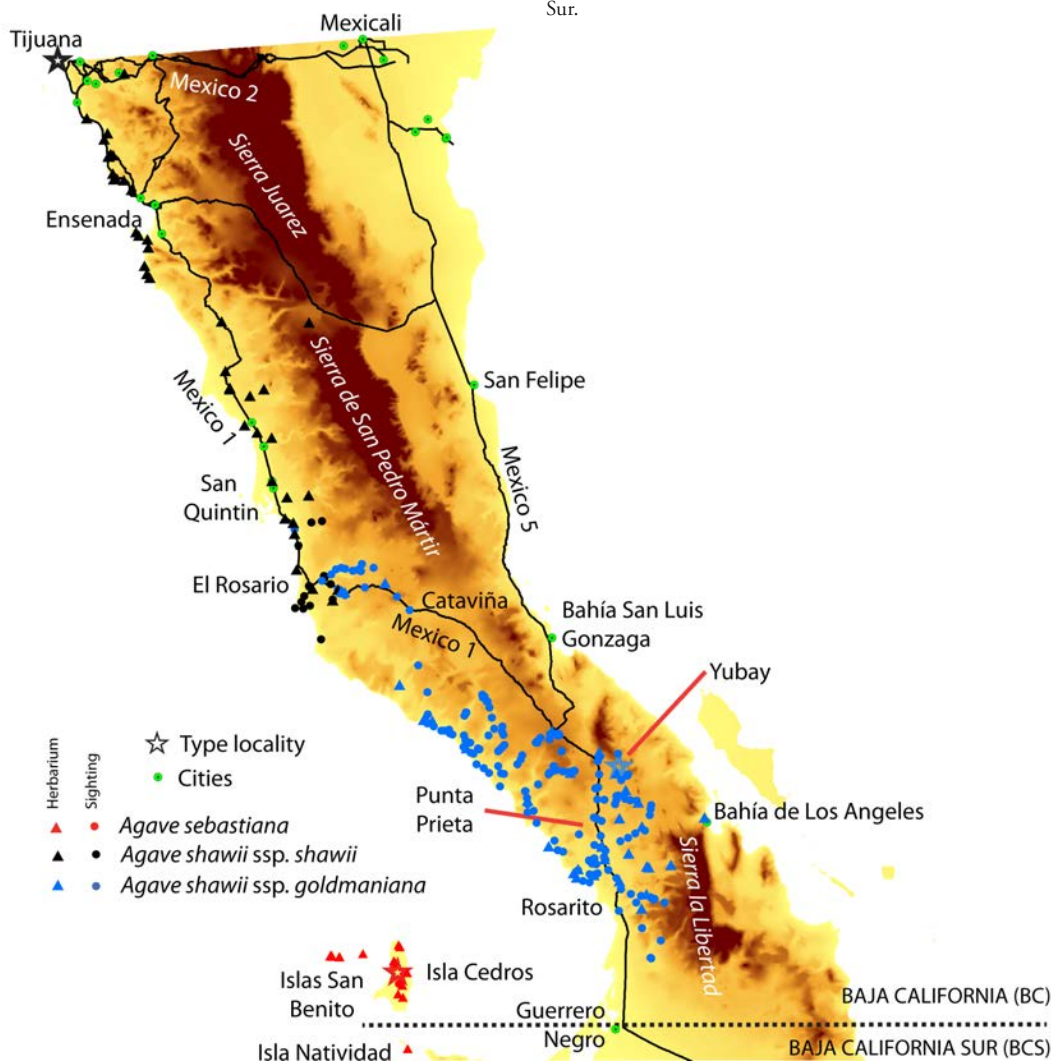


Figure 44. The distribution of *Agave sebastiana*, *A. shawii* ssp. *shawii*, and *A. shawii* ssp. *goldmaniana*.

*Agave shawii* ENGELMANNssp. *shawii*

(Fig. 45)

*Agave shawii* ENGELMANN, *Trans. Acad. Sci. St. Louis* 3: 314, 370. 1875**SYNONYM:** *Agave orcuttiana* TRELEASE, *Missouri Bot. Gard. Report* 22: 47, 1911.**SYNONYM:** *Agave pachyacantha* TRELEASE, *Missouri Bot. Gard. Report* 22: 48, 1911.**TYPE LOCALITY:** about 32 km south of San Diego on the US – México border, BC, July 1875 (Hitchcock s.n., MO) (Fig. 44).

This subspecies can be either solitary or offset prolifically, producing compact, green rosettes up to 100 cm in diameter with stems up to 2 m long. The rosettes can be either erect or decumbent and branch from leaf axils. The glossy, light to dark green leaves are mostly 20-50 cm long by 8-20 cm wide, ovate to linear-ovate, about as wide in mid-blade as at base, and slightly rough to the touch. The marginal spines vary in size and shape; in the middle of the leaf, they range from 5–20 cm long, straight or variously flexed, 1-2 cm apart, and reddish brown to dark gray. The terminal spine is 2-4 cm long, reddish brown to gray, straight or wavy, and decurrent for 8-10 cm or along entire leaf as a continuous margin. The inflorescence is 2-4 m tall with a stout shaft that has purple, succulent, closely imbricated bracts that envelope the lower lateral branches. The 8 to 14 lateral branches are stout, and bear numerous, tightly bunched flowers that are red in bud, opening yellow and measure 75-100 mm long. The key aspect of the inflorescence is that it generally has a rounded top and is as broad as or broader than tall.

*Agave shawii* ssp. *shawii* has a restricted distribution along the northwest Pacific coast of Baja California (Fig. 44), extending just into the United States, where it is severely threatened by development (Vanderplank 2014). This coastal habitat, with its fog and cooler air temperatures, contrasts strongly with the more arid and interior habitat of *Agave shawii* ssp. *goldmaniana*. These two subspecies differ primarily in size and shape of the inflorescence, which is taller and more open on *A. shawii* ssp. *goldmaniana* compared to the shorter and more compact inflorescence of *A. shawii* ssp. *shawii*. Gentry (1978) reported that the type subspecies also tends to offset more readily than ssp. *goldmaniana*, although differences in offsetting propensity are not obvious in the field. Although the vast majority of the two subspecies have widely separated distributions, there is a region east of El Rosario at the southern end of subspecies *shawii* and the northwestern extent of subspecies *goldmaniana* where the two intermingle and are difficult to separate from one another. This region of overlap is indicative of the very close relationship between the two subspecies, while the primarily coastal distribution of subspecies *shawii* and primarily inland distribution of subspecies *goldmaniana* indicate



**Figure 45.** *Agave shawii* ssp. *shawii* along México Highway 1 south of Colonet, between San Quintín and Ensenada, Baja California.

the two are possibly in the process of adapting to different environmental factors.

*Agave sebastiana* is restricted to the Pacific islands off the coast near Guerrero Negro and is easily distinguished from both subspecies of *A. shawii* by not only distribution, but also by leaf color and inflorescence structure. The silvery blue to glaucous gray-green leaf color and more compact inflorescence may be specific adaptations to the island climate, however the long period of separation of these islands from the peninsula warrant maintaining species status for *A. sebastiana*. The shorter inflorescences of both *A. sebastiana* and *A. shawii* ssp. *shawii* may be an adaptation to on-shore winds, which are more persistent than in the areas where *A. shawii* ssp. *goldmaniana* occurs.

*Agave shawii* ENGELMANN  
ssp. *goldmaniana* (TRELEASE) GENTRY  
(Fig. 46)

*Agave shawii* ENGELMANN ssp. *goldmaniana*  
(TRELEASE) GENTRY. *Occas. Pap. Calif. Acad. Sci.* No. 130: 93. 1978.

**TYPE LOCALITY:** Tinaja Yubay, BC, 1905 (Nelson & Goldman 7151, US). (Fig. 44).

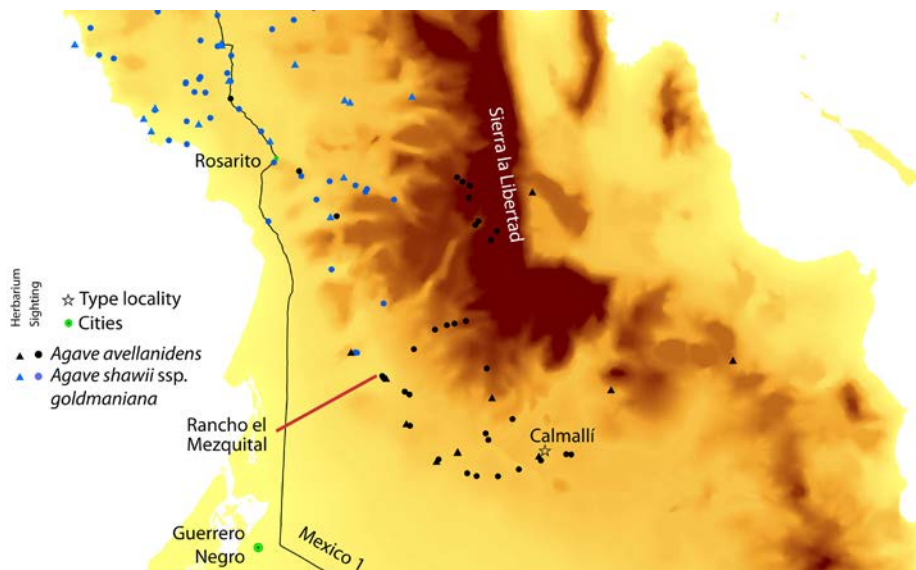
*Agave shawii* ssp. *goldmaniana* has rosettes up to 150 cm in diameter with gray-green leaves generally from 40-70 cm long by 10-18 cm wide, which tend to be lanceolate and long acuminate at the tip instead of linear-ovate as in *A. shawii* ssp. *shawii*. The leaves of *A. shawii* ssp. *goldmaniana* are consistently more acuminate than *A. shawii* ssp. *shawii*, which is a distinguishing characteristic of this subspecies. Marginal spines are typically 10-15 mm long in upper part of blade and may be paired or forked at the tips in a dark margin; the terminal spine typically is 3-4 cm long and brown to weathered gray. The inflorescence is 3-5 m tall with 18 to 25 laterals, creating a more conical top, instead of the rounded top of *A. shawii* ssp. *shawii*, and the bracts are smaller and spaced more widely as well in many (but not all) cases. The flowers are red in bud, opening yellow and 65-96 mm long, and contrast strongly with the generally reddish-brown desert landscape that this species occupies.

*Agave shawii* ssp. *goldmaniana* occurs in the north-central part of the peninsula, in the southern part of the state of Baja California and generally west of the peninsular divide (Fig. 44). Although Gentry (1978) discussed gaps in the distribution, he remarked that this subspecies has a nearly continuous and very large distribution independent of geology and soils. A clear gap occurs between a subpopulation that occurs just east of El Rosario and the main population centered on Punta Prieta (Fig. 44). *A. ce-*



**Figure 46.** *Agave shawii* ssp. *goldmaniana* east of La Cuesta de Vibora and El Rosario, Baja California.

*rulata* var. *nelsonii* is the most common taxa in this gap and is easily distinguished by its smaller rosette, thinner flower stalk, and more open inflorescence. *Agave shawii* ssp. *goldmaniana* occurs on both igneous and sedimentary rocks, and the densest stands occur in deep granitic alluvium between the Sierra la Asamblea to Punta Prieta. This part of the peninsula can have heavy nocturnal fogs from fall to spring, as indicated by the epiphytic lichens and *Tillandsia* on *Fouquieria columnaris* and *Pachycereus pringlei*.



**Figure 47.** Zone of overlap in the distribution of *Agave avellanidens* and *A. shawii* ssp. *goldmaniana*.



Gentry (1978) found considerable variability in the leaves of *Agave shawii* ssp. *goldmaniana* and described five forms of them, indicating a wide range of vegetative variation in this subspecies. At the southern limit of its distribution, *Agave shawii* ssp. *goldmaniana* overlaps with *A. avellanidens* (Gentry 1978, Fig. 47), and they are so similar vegetatively that the best way to identify them is by the shape of the living or dried inflorescence. *A. avellanidens* has a tall conical inflorescence with small, nearly inconspicuous bracts, whereas *A. shawii* ssp. *goldmaniana* has a rather broad, shorter and pyramidal inflorescence with larger, more prominent triangular bracts. *A. avellanidens* is mostly solitary, whereas *A. shawii* ssp. *goldmaniana* is either solitary or offsetting. The two are difficult to distinguish in the coastal hills between Punta Prieta and Rosarito (Figs. 9, 47).

## DISCUSSION AND CONCLUSIONS

We revise the genus *Agave* on the Baja California peninsula in northwestern Mexico, changing the groups of Trelease (1911) and Gentry (1978) into sections and expanding the number of sections from four to six. Gentry (1978), the most recent treatment, included 22 taxa, 21 of which are endemic; we increased this to 23 taxa with 22 endemics (Table 1), eliminating one variety and describing two new species, while restoring one subspecies to species rank, reducing one subspecies to a variety, and reducing two other species to subspecies or varieties. We present biogeographical range maps that depict a more accurate species ranges on the peninsula.

The two recently described species included in this revision are assigned to the two newly created sections. In accord with the suggestions in the protologue (Webb & Salazar-Ceseña 2011), we placed *Agave turneri* in section *Conicae* to reflect its close relationship to *A. moranii* and *A. gigantensis* and the nature of its conical inflorescence that is between the narrow cylindrical ones of section *Deserticolae* and the broad cylindrical-pyramidal ones of section *Umbelliflorae*. The recently described *Agave azurea* (Webb & Starr 2014b) addressed a problem originally posed by Gentry (1978), prompting its placement with close relative *A. vizcainoensis* in section *Intermediae*. We add that the unusual and highly variable plants of *A. vizcainoensis* on the Vizcaíno Peninsula warrant further taxonomic investigation.

The relationship of *Agave shawii* ssp. *goldmaniana* to *A. avellanidens* remains perplexing. Although they are in two different sections based on floral characteristics, they are very similar vegetatively and very difficult to identify when not in bloom. The two extremes of the inflorescences are easy to separate; *Agave shawii* ssp. *goldmaniana* with short and broadly pyramidal inflorescences, the side branches crowded together, thick stalks and enlarged bracts beneath the fertile section and *A. avellanidens* with the tall and narrow, more cone-like inflorescences, widely spaced side branches, thinner stalks and smaller, more pa-

pery bracts below the fertile section. The two are especially difficult to separate in the hills around Rosarito (Fig. 47), especially when the inflorescences of *Agave shawii* ssp. *goldmaniana* become taller with the side branches more widely spaced and resembling those of *A. avellanidens*. Further work would be required to determine whether Gentry's (1978) intergrading of the two species, including his assertion that *A. shawii* ssp. *goldmaniana* extends to Rancho el Mesquiteal, is valid. As noted under *A. avellanidens*, we believe some unusually large plants southeast of Rosarito may represent hybrids between *A. shawii* ssp. *goldmaniana* and that species, although the putative hybrid has much larger rosettes than either putative parent.

Martorell & Ezcurra (2007) reported from experimental and field studies that the most efficient plants dependent upon fog as a water source have narrow leaves, including three species of *Agave* from mainland Mexico. They also noted that total leaf area resulted in greater water harvesting from fog. This second explanation best fits the fog-associated agaves of Baja California, including the species with the highest width-to-length ratios, all from the Umbelliflorae: *Agave sebastianiana* and both subspecies of *Agave shawii*. Moreover, Burgess (1988) found that leaves of *Agave cerulata* become narrower with increasing aridity away from the Pacific Ocean, in contrast to Martorell & Ezcurra's (2007) conclusion that narrow-leaf species are better adapted to fog-influenced areas. An alternative explanation could be that the fog-adapted species of Baja California have larger leaves to maximize photosynthetic potential in the relatively low light conditions in persistently foggy areas. Still another explanation is that the compact rosettes of the fog-influenced coastal areas are also shaped by persistent on-shore winds.

Finally, we believe the most serious taxonomic problem within the genus *Agave* on the Baja California peninsula lies with the variety of forms in the *Agave sobria* complex found in the Sierra de la Giganta. The difficult geography of the Baja California peninsula, which limited the efforts of previous researchers (especially Gentry 1978), remains a serious problem in this long mountain range in Baja California Sur. As many as five forms of *A. sobria* are present that differ from the plants at the type locality near Comondú; several of these could be new species or subspecies. In particular, plants found east of Misión San Javier west of Loreto, which we believe have been confused with *A. gigantensis*, and those growing near Mesa Siquito west of Bahía Agua Verde, require further study to determine their status within the diverse taxa of the Baja California peninsula.

## ACKNOWLEDGMENTS

We thank José Luis León de la Luz of Centro de Investigaciones Biológicas del Noroeste (CIBNOR), La Paz, for his help with this project. Ray Turner helped with the manuscript, and Len Newton provided advice and technical comments. Richard Fel-

ger, Benjamin Wilder, and one anonymous reviewer provided comments on the manuscript. Herbarium specimens were collected under Dirección General de Vida Silvestre permit Oficio Núm. SPGA/DGVS/07004/11.

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## APPENDIX 1. GENTRY (1978) EXSICCATAE REVISED.

Gentry (1978) used his exsiccatae to list herbarium specimens to document taxonomy and create his distribution maps. We have updated Gentry's exsiccatae using on-line resources to harvest herbarium specimens filed after Gentry's work as well as some specimens that Gentry did not include for unknown reasons. Our efforts more or less doubled the number of herbarium specimens considered in our work compared with that of Gentry (1978). The collectors' last names with their collection numbers are listed first, followed by the accepted abbreviation for the herbaria. Neither Gentry nor we have visited all herbaria to annotate herbarium sheets to reflect changes. Many ranchos where specimens were collected, and even some towns, have either changed names or have commonly used names in Baja California; geospatial coordinates help to rectify this problem.

### ABBREVIATIONS FOR HERBARIA.

- A = Arnold Arboretum, Harvard University, Cambridge, Massachusetts (<http://arboretum.harvard.edu/plants/herbaria/herbarium-of-the-arnold-arboretum/>).
- ASU = Arizona State University, Tempe, Arizona (<http://research.calacademy.org/botany/collections/>; accessed 13 February 2013).
- ARIZ = University of Arizona, Tucson, Arizona

(<http://swbiodiversity.org/seinet/collections/misc/collprofiles.php?collid=2>; accessed 13 February 2013).

BH = Bailey Hortorium, Cornell University, Ithaca, New York (<http://bhort.bh.cornell.edu/>).

CAS = California Academy of Sciences, Golden Gate Park, San Francisco, California (<http://research.calacademy.org/botany/collections>; accessed 7 June 2012).

DES = Desert Botanical Garden, Phoenix, Arizona (<http://swbiodiversity.org/seinet/collections/misc/collprofiles.php?collid=5>; accessed 13 February 2013).

DS = Dudley Herbarium, now in CAS.

GH = Gray Herbarium, Harvard University, Cambridge, Massachusetts.

MEXU = Instituto de Biología, Universidad Nacional Autónoma de México (<http://www.gulfbase.org/organization/view.php?oid=hnm>; accessed 8 June 2012).

MICH = University of Michigan, Ann Arbor, Michigan (<http://herbarium.lsa.umich.edu/>; accessed 11 October 2013).

MO = Missouri Botanical Garden, St. Louis, Missouri (<http://www.missouribotanicalgarden.org/plant-science/plant-science/resources/herbarium.aspx>; accessed 7 June 2012).

NA = National Arboretum Herbarium, Washington, D.C. (<http://www.usna.usda.gov/Research/Herbarium/>; accessed 11 October 2013).

NY = New York Botanical Garden, Steere Herbarium, New York, NY (<http://sciweb.nybg.org/science2/SteereHerbarium.asp.html>; accessed 7 June 2012).

POM = Rancho Santa Ana Botanic Garden with Pomona College, Claremont, California (<http://www.rsabg.org/component/content/article?catid=154:articles&id=120:herbarium>; accessed 11 October 2013).

SBBG = Santa Barbara Botanic Garden, Santa Barbara, California (<http://www.sbbg.org/conservation-research/herbarium>; accessed 11 October 2013).

SD = San Diego Museum of Natural History, San Diego, California (<http://www.sdnhm.org/science/botany/collections/search-herbarium-collection/>; accessed 7 June 2012).

UC = University of California, Jepson Herbarium, Berkeley, California (<http://ucjeps.berkeley.edu/>; accessed 11 October 2013).

US = National Herbarium, Natural History Museum, Washington, D.C. ([http://botany.si.edu/colls/collections\\_overview.htm](http://botany.si.edu/colls/collections_overview.htm); accessed 11 October 2013).

Specimens collected by Howard Scott Gentry, which are the majority of *Agave* specimens from Baja California, are in numerous herbaria, but mostly at US, MEXU, DES, and ARIZ.

*Agave aurea* Brandegee ssp. *aurea*.

TYPE LOCALITY: *Brandegee s.n.*, UC, DS, MO. La Purísima, 13 February 1889.

*Barclay & Arguelles* 1988, DES, MEXU, ARIZ,

US. Low, granitic hills 8 km north of Todos Santos along road to La Paz, 20 April 1966.

*Brandegee s.n.*, MO. Cape Region mountains, 20 September 1899.

*Carter 5132*, UC, MO. Southwest end of Mesa de San Gerónimo, about 1,110 m elevation, north from Rancho Viejo on road from Loreto to San Javier, 8 May 1966.

*Carter 5484*, ARIZ, UC, US. North-facing canyon wall north of Rancho Puerta Vieja on road from Loreto to Comondú, Sierra de la Giganta, about 430-460 m elevation, 4 July 1970.

*Carter 5779*, UC, MEXU. Mesa de Humi, about 750 m elevation, a mesa on crest of Sierra de la Giganta opposite the north end of Isla San Jose, 20 March 1973.

*Carter AGA841345*, MEXU. Vicinity of Rancho Puerta Vieja north of San Javier on road to Comondú, 500 m elevation, 4 July 1970.

*García Mendoza, Franco & Esparza AGA1212809*, MEXU. Loreto, 26 km al oeste de camino de terracería Loreto a San Javier, 500 m elevation, 20 March 2007.

*García Mendoza, Franco & Piña AGA1196480*, MEXU. Todos Santos, acerca de 10 km al sur de km 37 del entronque San Pedro a Todos Santos, 193 m elevation, 23 January 2006.

*Gentry 11299*, DES. Polymorphic population on mesa northwest of Comondú.

*Gentry 11255*, MEXU, US. Thorn forest on arkose sediments, Las Cuevas, Cape district, 7 October 1951.

*Gentry 11295*, ARIZ. 5 km northwest of Comondú on rocky basaltic canyon slope or mesa, 18 October 1951.

*Gentry 12341*, DES, MEXU, US. Coastal thorn forest near sea level 8 km north of Todos Santos, 22 November 1952.

*Gentry 12375*, DES, MEXU, US. Rocky basaltic canyon slope or mesa 5 km north of Comondú, 30 November 1952.

*Gentry 10321*, DES, MEXU, ARIZ, US. Rocky basaltic canyon slope or mesa north of Comondú, 2 April 1951.

*Gentry 11253*, DES, MEXU, ARIZ, US. Desert with dispersed trees and shrubs on granitic terrain about 16 km west of San José del Cabo, 5 October 1951.

*Gentry 11198*, DES, US, MEXU, ARIZ. Dispersed desert shrub over dissected bajada about 20-25 km east of La Paz, 29 September 1951.

*Gentry 4272*, ARIZ, DES, DS, US. About 1,200 m on volcanic slopes & crags, Cerro de la Giganta, 1 March 1939.

*Gentry 12382, 12383*, DES, MEXU, US. Steep north slope about 5 km north of Misión San Javier, Sierra de la Giganta, 2 December 1952.

*Gentry & Cech 11255*, DES, MEXU, ARIZ, US. Las Cuevas, Cape District, 7 October 1951.

*Gentry & Cech 11283*, DES, MEXU, US, ARIZ. Thorn forest on calcareous sedimentary slope, about 56 km northwest of La Paz, 11 October 1951.

*Gentry & Cech 11295*, DES, MEXU, ARIZ. US. Rocky basaltic canyon slope or mesa about 5 km northwest of Comondú, 18 October 1951.

*Gentry & Cech 11297*, US. Rocky basaltic canyon slope or mesa, 5 km northwest of Comondú, 18 October 1951.

*Gentry & Cech 11301*, DES, MEXU, ARIZ. US. Shade side of cliffs in close desert shrub about 16 km west of Canipolé along road to La Purísima (US 2539999 as *A. capensis*).

*Gentry & Gentry 23182*, ARIZ, DES, MEXU, US. About 5 km north of Comondú on lava fields, 450 m elevation, 10 April 1973.

*Harbison s.n.*, SD, ARIZ. Mesa about 3 km north of Comondú, elevation 400 m, 7 October 1967.

*Harbison s.n.*, ARIZ. Todos Santos, 1 April 1966.

*Harbison s.n.*, SD, ARIZ. 10 km north of Todos Santos, 1 January 1999.

Leuenberger & Schiers *AGA838268*, ARIZ. 160 km west of Los Planes on steep, south-facing hillside in mountains, 21 December 1958.

*Moran 7144*, CAS, DS, MEXU. SD. Cape District, 4 km north of La Huerta, 400 m, 25 January 1959.

*Moran & Reveal s.n.*, ARIZ. 7 km north of La Huerta, Cape Region, 25 January 1959.

*Moran & Reveal 20050*, ARIZ. 8 km north of San Hilario, 12 February 1973.

*Nelson & Goldman 7274*, US, MO. Comondú, 183 m, 6 November 1905.

*Purpus s.n.*, MO. UC. San Jose del Cabo, January-March 1901.

*Valiente, Alfonso & Chiang AGA655354*, ARIZ. Sierra de La Giganta. Cerro del Venado, 2 km al sur del Rancho Santa Inés, 28 May 2003.

*Wiggins 14470*, CAS, DS, MEXU. About 160 km west of Los Planes, elevation about 490 m, south-facing slopes, 21 December 1958.

*Wiggins 14531*, CAS, DS, MEXU. UC. 10.3 km north of Todos Santos along road to La Paz, 25 December 1958.

*Agave aurea* Brandegees var. *capensis* (Gentry) R.H.Webb & G.D.Starr.

TYPE LOCALITY: *Gentry & Fox 11247, 11250*, DES. MEXU, US. Open shrub and tree association over granitic slopes, Cabo San Lucas & vicinity, 5 October 1951.

*Barclay & Arguelles 1987*, MEXU, ARIZ, US. Rocky slopes above town, elevation about 91 m, vicinity of Cabo San Lucas, 19 April 1966.

*Bezy 542-C*, ARIZ. Cabo San Lucas, 1 April 1966.

*Brandegee s.n.*, UC. Cabo San Lucas, 18 March 1892.

*García Mendoza, Franco & Piña AGA1196385*, MEXU. Cabo San Lucas, entrada al hotel Sunset Beach, afueras de ladera con exposición sur, 158 m elevation, 23 January 2006.

*Gentry 10080*. DES, MEXU, US. Huntington Botanical Gardens, San Marino, California, 9-15 January 1951.

*Gentry 19676*, DES, MEXU, US. Cultivated.

under deodars, east of El Rodeo, 17 April 1962.

*Gentry, 11247, 11250*, US, ARIZ, MEXU. Open shrub and tree association over granitic slopes, Cabo San Lucas and vicinity, 5 October 1951.

*Gentry 11264*, ARIZ. Cabo San Lucas and vicinity, open shrub and tree association over granitic slopes, 5 October 1951.

*Gentry & Fox 11823*, DES, MEXU, US. About 5 km north of Todos Santos, 4 May 1952.

*Lindsay s.n.*, ARIZ. 10 km north of Todos Santos, 4 November 1983.

*Purpus, C. A. s.n.*, US. San José del Cabo, 1901-03.

*Rose, J. N. 16326*, US, Cabo San Lucas, 10 m elevation, 23 March 1911.

*Starr 707*, ARIZ., 10.3 km north of Todos Santos, 5 November 1983.

*Agave aurea* Brandegees ssp. *promontorii* (Trelease) R.H.Webb & G.D.Starr.

TYPE LOCALITY: *Nelson & Goldman 7437*, US. From San Bernardo to El Sauz, Sierra La Laguna, about 700-1,500 m elevation, 21 January 1906.

*Arguelles & Gentry 11200*, ARIZ. Cape Region Mountains, 1899-09-20. (as *Agave brandegeei*).

*Barclay 1988-266203*, ARIZ. Sierra de la Laguna, 1 April 1966.

*Barclay & Arguelles 1986*, DES, MEXU, US, ARIZ. Open, rocky (granitic) slopes in oak and pine zone, 1,829 m elevation, western summit of Sierra de la Laguna, 15 April 1966.

*Brandegee s.n.*, UC. Sierra de la Laguna, 24 April 1892.

*Brandegee s.n.*, UC. San Jose del Cabo, cultivated in San Diego, 1903.

*Gentry 10164*, DES, MEXU, US. Huntington Botanical Gardens, San Marino, California, 9-15 January 1951.

*Gentry 11257-266275*, ARIZ. Sierra de la Laguna, 1 October 1951.

*Gentry 11218*, DES, MEXU, US, ARIZ. Mixed pine and oak forest on granites with patches of chaparral, Rancho Laguna and vicinity, 1,676 to 1,829 m elevation, Sierra de la Laguna, Cape District, western summit, 3 October 1951.

*Gentry 19671*, DES. Sierra de la Laguna, Cape District, plants cultivated at Murrieta, photos in 1962 of plants collected in 1952.

*Gentry 11229*, DES, MEXU, US. Short-tree forest over dissected granitic slopes, 610 m elevation, Rancho Burrera at west base of Sierra de la Laguna, 1-4 October 1951.

*Moran 7451*, CAS, SD, US. Sierra la Laguna, La Aguaé, elevation 1,900 m, 18 May 1959.

*Agave avellanidens* Trelease.

TYPE LOCALITY: *Brandegee s.n.*, UC. Paraíso, 1 May 1889.

*García Mendoza, Franco & Esparza AGA1212883*, MEXU. El Datilar, 2-3 km de la desviación a camino de terracería a Rancho Miramar, 319 m elevation, 24 March 2007.

*García Mendoza, Franco & Esparza* AGA1212808, MEXU. Rancho San Marcos, SW del aprox a 10 km sobre el camino de terracería a Miramar, 324 m elevation, 24 March 2007.

*Gentry & Fox* AGA160782, MEXU. About 13 km east of Punta Prieta, 19 May 1952.

*Gentry & Fox* 11944, DES, MEXU, US. About 30 km east of Punta Prieta, 19 May 1952.

*Gentry & Fox* 11929, DES, MEXU, ARIZ, US. About 10 km west of Calmallí, 17 May 1952.

*Gentry & Fox* 11932, 11933, DES, MEXU, ARIZ, US. About 10 km west of Calmallí, 17 May 1952.

*Gentry & Gentry* 23184, DES, MEXU, ARIZ, US. Open valley plain with sandy soil at 305 m elevation about 9 km west of Calmallí, 12 April 1973.

*Gentry & Gentry* 23186, DES, MEXU, ARIZ, US. About 24-27 km southeast of Mesquital, 183 m elevation, 12 April 1973.

*Gentry & Gentry* 23187, DES, MEXU, US. About 11 km southeast of Mesquital along road to El Arco, 12 April 1973.

*Hammerly* 69, CAS. About 47 km north of Mesquital, 27 September 1941 (Gentry 1978 referred to this as doubtfully placed under *A. avellanidensis*).

*Harbison s.n.*, ARIZ. 710 km southwest of Mesquital along the road to El Arco, 12 April 1973.

*Wiggins* 5726, DS, US. Between Calmallí and Mesquital Rancho on mesas, 31 May 1931.

***Agave azurea*** R.H.Webb & G.D.Starr.

TYPE LOCALITY: *R.H.Webb & G.D.Starr* 20130418-1, HCIB. Picachos de Santa Clara, 50 km north of Punta Abreojos. April 2013.

*García Mendoza, Franco & Esparza* AGA1212899, MEXU. Picachos de Santa Clara, Picacho de San Ramón, camino de terracería Rancho San Lucas-Rancho Santa Clara, 358 m elevation, 23 March 2007 (as *A. gigantensis*).

*García Mendoza, Franco & Esparza* AGA1212900, MEXU. Picacho Santa Clara, 315 m elevation, 23 March 2007 (as *A. gigantensis*).

*García Mendoza, Franco & Esparza* AGA1231721, MEXU. Picachos de Santa Clara, al pie del Picacho El Gato, 296 m elevation, 23 March 2007 (as *A. gigantensis*).

*Gentry* 7713, 7693, ARIZ, DES, DS, MICH, UC, UM. Picachos de Santa Clara, Vizcaino Desert, 5-10 November 1947 (Gentry 1978 assigned these to *A. gigantensis* and *A. vizcainoensis* in ARIZ as *A. gigantensis* but not *A. vizcainoensis*).

*Gentry* 10339, 10342, DES, MEXU, US. Picachos de Santa Clara, Vizcaino Desert, 4-5 April 1951 (Gentry 1978 assigned these to *A. gigantensis*).

***Agave cerulata*** (Trelease) Gentry ssp. *cerulata*.

TYPE LOCALITY: *Nelson & Goldman* 7180, US. Calmallí, about 240 m elevation, 29 September 1905.

*Barclay & Arguelles* 1991, US, Dry, rocky hills approximately 8 km west of San Ignacio on road to El Arco, 29 April 1966.

*Brandeggee* s.n. DS. Cardón Grande (between San

Ignacio & Calmallí), 22 April 1889.

*Broder* 473, US. In granitic alluvium in gently sloping hills, 5 km west northwest of Santa Catarina, 100 km southeast of Ensenada, 1250 m elevation, 25 May 1961.

*Broder* 547, US. Growing in granitic alluvium, 5 km west of Santa Catarina, 100 km southeast of Ensenada, 1,145 m elevation, 18 August 1961.

*Burgess* 7124, ARIZ. South of Bahía Los Angeles junction via Mexico 1, granitic bajada, 6 July 1986.

*Burgess* 7034, ARIZ, MEXU. East end of Arroyo El Rosario bridge via Mexico 1, shoulder of ridge, alluvium, 27 June 1986.

*Burgess* 7124, ARIZ, MEXU. South of Mexico 1 via turnoff, 1.0 km northwest of Café San Ignacio, north of Arroyo Jaraguay, north of Mesa San Ignacio, shallow alluvium and outcrops of light-colored quartz, 29 June 1986.

*Burgess, Ames, Horak & Turner* 7124, ARIZ. South of Bahía Los Angeles junction via Mexico 1, granitic bajada, 6 July 1986.

*Burgess, Ames, Horak & Turner s.n.*, ARIZ. North of Mexico 1 via road to San Francisco. Mesa Las Calabazas, southwest of Sierra Agua Verde, 4 July 1986.

*Carter & Kellogg* 2953, UC. Isolated red hill in sandy plain, 18.2 km west of Misión Santa Gertrudis, 18 December 1950.

*Ferris* 8576A, DS. About 1.6 km south of Laguna Seca Chapala, 6 March 1934.

*García Mendoza, Franco & Esparza* AGA1212880, MEXU. El Arco, acerca de 3 km al norte de camino de terracería de El Arco a Calmallí, 301 m elevation, 24 March 2007.

*García Mendoza, Franco & Esparza* AGA1212881, MEXU. Pozo Alemán, acerca de 3 km al norte de camino de terracería de El Arco-Calmallí, 337 m elevation, 24 March 2007.

*García Mendoza, Franco & Esparza* AGA1212882, MEXU. Pozo Alemán, acerca de 7 km al noreste de camino de terracería El Arco-Calmallí, 341 m elevation, 24 March 2007.

*Gentry* 10346, DES, MEXU, ARIZ, US. Calmallí, alluvium of arroyo valley between sedimentary metamorphic rocks between mine and houses of town, 6 April 1951.

*Gentry* 11937, ARIZ. Calmallí, 1 May 1952.

*Gentry* 12341, ARIZ. Bahía de Los Angeles, n.d.

*Gentry* 23161, ARIZ. Laguna Chapala, 1 April 1963.

*Gentry* 10359, DES, MEXU, ARIZ, US. About 11 km south of Tinaja Yubay and 24 km northeast of Punta Prieta, 8 April 1951.

*Gentry* 10369, MEXU, ARIZ, US. Rocky granitic slope, Rancho Jaraguay, 732 m elevation, 9 April 1961.

*Gentry* 11160, US. Open slope of igneous and metamorphic rocks with low bush cover, 5-6 km north of San Fernando, 10 September 1951.

*Gentry* 11188, DES, MEXU, ARIZ, US. Low rolling hills with calcareous rubble about 6 km northwest of Laguna Chapala, 21 September 1951.

*Gentry* 19973, DES, MEXU, ARIZ, US. Rocky

bajada about 16 km south of Laguna Chapala, 610 m elevation, 29 April 1963.

*Gentry & Cech 11322*, DES, MEXU, ARIZ, US. Low rolling hills with calcareous rubble about 6 km northwest of Laguna Chapala, 24 October 1951.

*Gentry & Fox 11919, 11921, 11924*, DES, MEXU, ARIZ, US. About 10 km west of Calmallí, 17 May 1952.

*Gentry & Fox 11953*, DES, MEXU, ARIZ, US. About 34 km east of Punta Prieta on road to Bahía de Los Angeles, 20 May 1952.

*Gentry & Fox 11961*, 11962, DES, MEXU, ARIZ, US. About 6 km northwest of Laguna Seca Chapala, 20 May 1952.

*Gentry & Gentry 23159*, DES, MEXU, ARIZ, US. Granitic highland about 32 km southeast of San Agustín, about 640 m elevation, 5 April 1973.

*Gentry & Gentry 23185*, DES, MEXU, US. About 10 km west of Calmallí, 152-244 m elevation, 12 April 1973.

*Gentry & McGill 23298*, DES, MEXU, ARIZ, US. Granitic hill slopes about 16 km south of San Luis Gonzaga Bay along road to Laguna Chapala, 274 m elevation, 17 June 1973.

*Gentry & McGill 23302*, DES, MEXU, ARIZ, US. West of Sierra Calamujé, about 48 km north of Punta Prieta, 518 m elevation, 17 June 1973.

*Gentry & McGill 23306*, DES, MEXU, ARIZ, US. Open, cirio-cardón desert about 26-32 km northeast of Punta Prieta along road to Bahía de Los Angeles, 17 June 1973.

*Gentry & McGill 23307*, DES, MEXU, ARIZ, US. About 65 km northeast of Punta Prieta along road to Bahía de Los Angeles, 17 June 1973.

*Gentry & McGill 23311*, US. Sedimentary, rocky south slope, 7 km south of Bahía de Los Angeles road fork along road to Misión San Borja, 274 m elevation, 18 June 1973.

*Gentry & McGill 23314*, DES, MEXU, ARIZ, US. About 10-13 km south of road fork from Los Angeles Bay along road to Misión San Borja, 18 June 1973.

*Gentry & McGill 23315*, ARIZ, US. Sedimentary south-facing slope, 15 km north of Misión San Borja, 518 m elevation, 18 June 1973.

*Goldman 1142*, US. Alamo, 1,128 m elevation, 11 June 1905.

*Harbison s.n.*, SD. About 19 km east of Calmallí, 8 April 1947.

*Harbison s.n.*, SD. About 32 km south of Punta Prieta, 9 April 1947.

*Harbison s.n.*, SD. Agua Amarga, about 24 km west of Los Angeles Bay, 15 April 1947.

*Johnston 3487, 3489*, CAS, GH, SD, UC, US. Bahía de Los Angeles, in small groups on rocky mountainside, 6 May 1921.

*Johnston 3405 a-g*, CAS, US. Palm Canyon, gregarious on hillsides, Isla Angel de la Guarda, 3 May 1921.

*Miller 4013*, US, Calmallí, 30 October 1897.

*Miller, Merello & Pool 7300*, MO. 8 km north-northwest of San Ignacio on Mexico 1, 170 m eleva-

tion, 30 April 1992.

*Moran 4106*, BH, DS. Motherless Island, Bahía de Los Angeles, 10 May 1952.

*Moran 2007*, DS, UC. About 26 km north of Punta Prieta, about 520 m elevation, 22 April 1946.

*Moran 8167*, DS, SD, UC. About 5 km east of El Arco, about 250 m elevation, 5 April 1960.

*Moran 8185*, ARIZ, SD. Arroyo Estatón, Isla Angel de la Guarda, 15 April 1960; about 25 m elevation (Gentry 1978 noted "doubtfully assigned here").

*Moran AGA54985*, MEXU. San Ignacio, 7 km north on Mexico 1, 170 m elevation, 30 April 1992.

*Nelson & Goldman 7180*, MO. Calmallí, 250 m elevation, 29 September 1905 (as ssp. *dentiens*).

*Raven et al. 12631*, UC. 1.6 km south of Rancho Santo Ignacio, 560 m elevation, 21 April 1958.

*Stover & Harbison s.n.*, SD. About 56 km north of Punta Prieta, 5 May 1939.

*Tenorio & Romero s.n.*, ARIZ. Jaraguay, n.d.

*Tenorio, Lezama, Romero & Ignacio 13069*, ARIZ, MEXU. Punta Prieta, 21 km al este, 370 m elevation, 24 April 1987.

*Thomas 7972*, SD, US. Hillside about 1.6 km northwest of Pozo Alemán, about 240 m elevation, 26 May 1959.

*Wiggins s.n.*, MEXU. Isla Ventana, south end, about 15 to 50 m from beach. Bahía de Los Angeles, 18 May 1959.

*Wiggins 5721*, DS. About 24 km northwest of San Ignacio, 30 May 1931.

*Wiggins 5724*, DS, UC, US. Calmallí, 31 May 1931.

*Wiggins 5734, 5735*, DS, US. About 8 km north of Punta Prieta, 1 June 1931.

*Wiggins & Wiggins 14882*, CAS, DS. South end of Isla Ventana, Bahía de los Angeles, near beach, 18 May 1959.

*Agave cerulata* ssp. *dentiens* (Trelease) Gentry.

TYPE LOCALITY: *Rose 16819*, US. Isla San Esteban, 12 April 1911.

*Bostic s.n.*, SD. Isla San Esteban, sandy arroyo near SE corner, 21 June 1965.

*Johnston 3194*, CAS, UC. Isla San Esteban, 20 April 1921.

*Moran 4079*, SD. Isla San Esteban, 6 May 1952.

*Moran 21748*, ARIZ, SD. Isla San Esteban, arroyo near east side, large colonies on hillsides and in arroyo, April 1975.

*Rose 16819*, MO. Isla San Esteban, 0 - 10 m elevation, 13 April 1911.

*Sánchez Mejorada AGA556275*, MEXU. San Sebastian, 13 April 1911.

*Tenorio & Romero s.n.*, MEXU. Isla San Esteban, 15 August 1985.

*Wiggins AGA107321*, MEXU. Isla San Esteban, 15 August 1985.

*Agave cerulata* Trelease var. *nelsonii* (Gentry) R.H.Webb & G.D.Starr.

TYPE LOCALITY: *Nelson & Goldman 7111*, US.

San Fernando, 427 m elevation, 4 September 1905.

*Gentry 11185*, ARIZ, MEXU. About 7 km south-east of Rancho San Agustín, 600 m elevation, 21 September 1951.

*Gentry s.n.*, ARIZ. 16 km south of Bahía San Luis Gonzaga along road to Laguna Chapala, granitic hill slopes, 17 June 1973.

*Gentry s.n.*, ARIZ. 28 km east of Punta Prieta on road to Bahía Los Angeles, sandy valley, 20 May 1952.

*Gentry s.n.*, ARIZ. 7 km northwest of Laguna Seca Chapala, low rolling hills with calcareous rubble, 1 May 1952.

*Gentry s.n.*, ARIZ. 18 km east of El Rosario, Rancho Porvenir, Cardón forest, rocky sun slope, 24 June 1973.

*Gentry 11178*, ARIZ, MEXU. 40 km east of El Rosario, on Sierra San Miguel, rocky igneous slopes with *Idria*, *Agave* and low open bush cover, 13 September 1951.

*Gentry s.n.*, ARIZ. Near San Fernando, 1 January 1951.

*Gentry s.n.*, ARIZ. Near San Fernando, 1 September 1951.

*Gentry s.n.*, ARIZ, MEXU. 3-5 km north of San Fernando, open slope of igneous and metamorphic rocks with *Idria*, and low bush cover of *Franseria*, *Dalea*, etc., 10-11 September 1951.

*Gentry 10370*, ARIZ. 3-5 km north of San Fernando, Open slope of igneous and metamorphics with *Idria* and low bush cover of *Franseria*, *Dalea*, etc, 9-10 April 1951.

*Gentry 10359*, ARIZ, US. Dry sun slope of mesa shoulder; forested desert; grant. alluvium, about 10 km south of Tinaja Yubai and 20 km northeast of Punta Prieta, 457-549 m elevation, 8 April 1951.

*Gentry et al. 10370, 11155, 11160, 11162, 11164, 11165, 11665, 11666*, DES, MEXU, MICH, US. Open slope of igneous and metamorphics; low bush cover, about 3-5 km north of San Fernando, Sierra San Miguel, 9 April 1951, 10 September 1951, 10 April 1952.

*Gentry et al. 10376*, ARIZ, DES, MEXU, US. Rocky igneous slopes; low open bush cover, about 30 km east of Rosario, 10 April 1951.

*Gentry et al. 11178*, DES, MEXU, US. Rocky igneous slopes; low open bush cover, about 45 km east of Rosario on Sierra San Miguel, 13 September 1951.

*Gentry et al. 11179*, ARIZ, DES, MEXU, US. Rocky igneous slopes with low open bush cover; rocky south exposure, about 27 km east of Rosario, 14 September 1951.

*Gentry et al. 11185*, DES, MEXU, US. In gravel over quaternary silt, about 6 km southeast of San Agustín, about 200 m elevation, 21 September 1951.

*Gentry & Cech s.n.*, ARIZ. 7 km northwest of Laguna Seca Chapala, low rolling hills with calcareous rubble, 1 May 1952.

*Gentry & Fox s.n.*, ARIZ. 32 km southeast of San Agustín, granitic highland, 5 April 1973.

*Gentry & Fox s.n.*, ARIZ. 7 km northwest of Laguna Seca Chapala, low rolling hills with calcareous

rubble, 21 September 1951 (as *A. cerulata* ssp. *subcerulata*).

*Gentry & Gentry s.n.*, ARIZ. Rancho Jaraguay, rocky granitic slope, 9 April 1951.

*Gentry & Gentry s.n.*, ARIZ. 10-12 km south of road fork from Bahía de Los Angeles along road to San Borja, n.d.

*Gentry & Gentry s.n.*, ARIZ. 7-8 km northwest of Laguna Seca Chapala, rounded hills with gravel; Ocotillo, Larrea, Agave, 20 May 1952.

*Gentry & McGill s.n.*, ARIZ. 16 km south of Laguna Seca Chapala, Rocky bajada., 29 April 1963.

*Gentry & McGill s.n.*, ARIZ. Calmallí, between mine and houses of town, in alluvium of arroyo valley between sedimentary and metamorphic rocks, 6 April 1951.

*Gentry & McGill s.n.*, ARIZ. 40 mi NE of Punta Prieta along road to Bahía Los Angeles, bajada of igneous mountain, 17 June 1973.

*Gentry & McGill s.n.*, ARIZ. West of Sierra Calamajué, about 45 km north of Punta Prieta, 17 June 1973.

*Gentry & McGill s.n.*, ARIZ. 20-25 km northeast of Punta Prieta along road to Bahía Los Angeles, open *Idria-Pachycormus* desert, 17 June 1973.

*Gentry & McGill 23315*, ARIZ, DES, MEXU. 16 km north of Misión San Borja, 510 m elevation, 18 June 1978.

*Gentry & McGill s.n.*, ARIZ. 4-5 km north of San Fernando, open slope of igneous and metamorphic rocks, 10 September 1951.

*Gentry & McGill s.n.*, ARIZ. On north slope, south of Rancho San Miguel, 9 August 1975.

*Gentry & McGill 23311*, DES, MEXU, US. About 6 km south of Los Angeles Bay road fork on road to Misión San Borja, elevation about 275 m, 18 June 1973.

*Gentry & McGill 23322*, ARIZ, DES, MEXU, US. About 8 km north of San Fernando, Sierra San Miguel, 530 m elevation, 22 June 1973.

*Gentry & McGill 23324*, DES, MEXU, US. About 18 km east of Rosario, Rancho Porvenir, elevation about 140 m, 24 June 1973.

*Harbison s.n.*, ARIZ, MEXU, SD. 2 km west of Rancho Arenoso, 500 m elevation, 1 January 1973.

*Moran s.n.*, ARIZ. Ridge 3 miles southwest of San Isidoro, Occasional in Chaparral (predominantly *Adenostoma fasciculata*), no date.

*Moran 22643*, SD. South of Rancho San Miguel (Sierra San Miguel Range), about 900 m elevation, 9 August 1975.

*Moran & Reveal 22604*, SD. Ridge about 5 km southwest of San Isidoro, occasional in chaparral, about 1,120 m elevation, 20 July 1975.

*Nelson & Goldman 7117*, US, MO. Onyx, 549 m elevation, 7 September 1905.

*Agave cerulata* Trelease ssp. *subcerulata* Gentry.

TYPE LOCALITY: *Gentry 10330*, US. San Ignacio, 3 April 1951.

*Barclay & Arguelles 1991*, ARIZ, DES, MEXU, US. About 8 km west of San Ignacio, 29 April 1966.

*García Mendoza, Franco & Esparza* AGA1212920, MEXU. San Ignacio, 5 km al oeste de carr. Transpeninsular, San Ignacio-Guerrero Negro, 194 m elevation, 21 March 2007.

*Gentry* PVT172671 23320, MEXU. San Ignacio, 3 April 1951.

*Gentry* 11892, DES, MEXU, US. On gypsum hills; coarse detrital alluvium, Arroyo de la Tenería, Isla San Marcos, 13 May 1952.

*Gentry* 11247, ARIZ. San Ignacio, north slope with volcanic rocks; *Cardón-Fouquieria-Jatropha*, etc., 3 April 1951.

*Gentry & Fox* 11192, ARIZ. Cuesta de las Vírgenes, 23 September 1951.

*Gentry & Fox* 11926, ARIZ, DES, MEXU, US. About 10 km west of Calmallí, 17 May 1952.

*Gentry & Fox* AGA160776, MEXU. Punta Prieta, about 40 km north of southwest bajada of Sierra San Luis, 23 April 1952.

*Gentry & Gentry* 23170, ARIZ, DES, MEXU, US. Volcanic rocky sun slope about 16 km west of San Ignacio, 152 m elevation, 8 April 1973.

*Gentry & Gentry* 23175, ARIZ, DES, MEXU, US. Volcanic, rocky slope about 40 km east of San Ignacio along road to Santa Rosalía, 533 m elevation, 9 April 1973.

*Harbison* No. P, DES. Cuesta de las Vírgenes, 1972.

*Johnson* 3649, 3650, CAS, GH, SD, UC, US. In sheltered place in gypsum ravine, Isla San Marcos, 12 May 1921.

*Johnstone* AGA690751, ARIZ. Mexico 1, about 100 km west of Santa Rosalía, butte base, with *Yucca valida*, *Atriplex*, *Cercidium*, *Bursera*, 30 May 1974.

*Pinkava & McGill* P12287, ASU, DES. Base of butte about 110 km west of Santa Rosalía along Mexico 1, 30 May 1974.

*Sutherland s.n.*, ARIZ. Cuesta de las Vírgenes, n.d.

*Wiggins* 5721, US. 20 km northwest of San Ignacio, 30 May 1931.

***Agave datylio*** Simon ex Weber.

TYPE LOCALITY: *Nelson & Goldman* 7237, US, MO. About 8 km southwest of El Potrero, 600-1200 m elevation, 31 October 1905.

*Barclay* 1987-266244, ARIZ. About 7 km east of La Paz, granitic slopes and gravels with dispersed shrub and tree cover, 29 September 1951.

*Brandegee s.n.*, CAS. La Paz, Cape District, 4 November 1891.

*Brandegee* 581, UC. San Pedro, 29 October 1891.

*Brandegee s.n.*, UC. Purísima, 1899 (as var. *vexans*).

*Brandegee s.n.*, UC, MO. Paseo de los Dolores to Lake Ramon, 4 April 1889 (as var. *vexans*).

*García Mendoza, Franco & Piña* AGA1196463, MEXU. La Paz, 10 km al sur de km 205 de la carretera San José del Cabo-La Paz, 152 m elevation, 28 January 2006.

*García Mendoza, Franco & Piña* AGA1216985, MEXU. El Sargento, acerca de 8 km al sur, 33 m elevation, 24 January 2006.

*García Mendoza, Franco & Piña* AGA1196411,

MEXU. Jardín Botánico del Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias, campo experimental de Todos Santos, km 55.5 del entronque de San Pedro a Cabo San Lucas, 38 m elevation, 23 January 2006.

*García Mendoza & Franco* AGA1196466, MEXU. Misión San Luis Gonzaga, 1 km al northwest, 172 m elevation, 27 January 2006 (as var. *vexans*).

*Gentry* 11200, DES, MEXU, US. Granitic slopes and gravels with dispersed shrub and tree cover about 6 km east of La Paz, Cape District, 29 September 1951.

*Gentry* 10302, ARIZ, DES, MEXU. Rocky sedimentary slope, Rancho Panales, Arroyo Purísima, 31 March 1951 (as var. *vexans*).

*Gentry* 4322, DES, ARIZ, MEXU. Comondú, common over coastal plain and foothills, 10 March 1939 (as var. *vexans*).

*Gentry* 11218, ARIZ. 16 km south of La Paz, 7 November 1978.

*Gentry s.n.*, ARIZ. 20-22 km southwest of Comondú, north exposure of rocky hill slope, 10 May 1952.

*Gentry* AGA160747, MEXU. About 7 km east of La Paz, 29 September 1951.

*Gentry & Cech* 11292, DES. Sandy valley bottomland about 37 km southwest of Comondú, 16 October 1951 (as var. *vexans*).

*Gentry, Fox & Argüelles s.n.*, ARIZ. 32 km southwest of Comondú, sandy valley bottomland, 16 October 1951.

*Gentry & Gentry s.n.*, ARIZ. Rancho Panales, Arroyo la Purísima, rocky sedimentary slope, 31 March 1951.

*Gentry & Gentry* AGA172732, MEXU. Misión San Luis Gonzaga, 1 km al northwest, 172 m elevation, 27 January 2006 (as var. *vexans*).

*Hastings & Turner* 64-377, ARIZ, CAS. About 10 km by road west of San Luis Gonzaga northwest of La Paz at about 120 m elevation, 21 October 1964 (as var. *vexans*).

*Hastings & Turner* 64-373, ARIZ. 2 km north of Rancho El Obispo at 250 m elevation, 20 October 1964.

*Jones* 23751, MO. La Paz, 15 November 1926.

*López Forment* AGA284808, MEXU. La Paz, 6 km al sur de km 205 de la carretera San José del Cabo-La Paz, 180 m elevation, 1 August 1991.

*Moran* 3553, SD. Ensenada de los Muertos, Cape District, 1 April 1952.

*Nabhan et al., s.n.*, ARIZ, DES. 16 km south of La Paz, 7 November 1978.

*Peters* 124, UC. Los Planes, Cape District, arroyo bottom, about 90 m elevation, 27 March 1948.

*Rose* 1302, US. La Paz, 14 June 1897.

*Rose* 16540, US, La Paz, 29 March 1911.

unknown *s.n.*, MEXU. Rancho Las Tablitas al east de La Paz, 190 m elevation 12 October 1985.

*Wiggins* AGA108042, MEXU. Rancho el Obispo, 4 km north.in arroyo, 150 m elevation, 14 November 1959.

*Wiggins* 11501, DS. About 15 km west of La Paz.



*Wiggins 15475*, CAS, DS, MEXU. Rancho del Obispo, Llanos de Magdalena, elevation about 150 m, 15 November 1959.

*Wiggins 15205*, CAS. Mesa About 3 km north of Arroyo San Gregorio, 27 October 1959 (as var. *vexans*).

***Agave deserti*** Engelm.

TYPE LOCALITY: *Emory s.n.*, MO. Rancho San Felipe, San Diego County, California, 1846; Hitchcock and Palmer *s.n.*, M. Rancho San Felipe, San Diego County, California, 1875.

*Emory s.n.*, MO. Near San Felipe, 29 November 1846.

*Gentry s.n.*, DES. Granitic sandy highland on Mexico 2 south of Jacumba, April 1963.

*Gentry & Arguelles 22990*, DES, MEXU, US. Valle de Trinidad, about 800 m elevation, 3 May 1972.

*Gentry & McGill 23285*, DES, MEXU, US. Granitic substrate about 27-29 km west of San Felipe along road to Valle Trinidad, about 600 m elevation, 13 June 1973.

*Gentry & McGill 23286*. ASU, DES, MEXU, US. Sandy plain about 4 km southeast of Rancho Agua Caliente on east bajada of Sierra San Pedro Mártir, elevation about 440 m, 13 June 1973.

*Gilmartin AGA600682*, MEXU. Valle de la Trinidad, 780 m elevation, 3 May 1972.

*Hastings & Turner 66-6*. ARIZ. About 20 km west of turnoff toward Paseo San Matias, about 400 m elevation, 4 October 1966.

*Hutchison 710*, UC. Between Alaska and Mexicali, km 140, east slopes of the sierra, 31 December 1952.

*Mearns 3399*, US. Nachoguero Valley, 3 June 1894.

*Orcutt s.n.*, US. Locality unknown, 26 July 1883.

*Pinkava & McGill 8648*. ASU, DES. Along Mexico 2 about 62 km west of junction with main route to Mexicali, 7 June 1971.

*Wiggins AGA7081*, MEXU. 20 km west of intersection on Mexico 3, road to Paseo San Matias, 2 April 1960.

*Wiggins & Wiggins 16044*, DS. Granitic sandy bajada about 26 km west of Mexico 5, along Mexico 3 to Paseo San Matias, 2 April 1960.

***Agave gigantensis*** Gentry.

TYPE LOCALITY: *Gentry & McGill 23320*, DES, MEXU, US. Sierra de las Palmas, above Rancho San Sebastian, elevation about 1,200 m, 20 June 1973.

*Barclay & Arguelles 1990*, MEXU, ARIZ, US. Mountains above Rancho San Sebastian, abundant on rocky slopes, 1,067 m elevation, 28 April 1966.

*Carter 5093*, MO, MEXU, ARIZ. Sierra de la Giganta. On gentle north-facing slope of Cerro Gabilán, south of Portezuelo de Gabilán, 900 m elevation, 2 October 1965.

*Gentry & Fox 11778*, ARIZ. La Champagna, Sierra de las Palmas, south of Santa Rosalía, over undulating, broken terrain of volcanic mountain top, Nolina Grassland over undulating, broken terrain of volcanic mountain top, 27 April 1952.

*Gentry PVT181658 23287*, MEXU. Sierra de las Palmas, 50 km west of San Bruno, 20 June 1963.

*Gentry 10324, 10327*, ARIZ, MEXU, US. Rocky volcanic slope, 8-10 km east of Llano San Julio on lower slope of Sierra de la Giganta, 610 m elevation, 2 April 1951.

*Gentry & Fox 11778*, DES, MEXU, US. Sierra de las Palmas above Rancho San Sebastian, 27-29 April 1952.

*Gentry & McGill AGA780602*, MEXU. Sierra de las Palmas, 50 km west of San Bruno, 1,140 m elevation 20 June 1973.

*Johnston 3843*, CAS, US. Puerto Escondido, single plant in wash, 29 May 1921.

***Agave margaritae*** Brandegees.

TYPE LOCALITY: *Brandegee s.n.*, UC. Isla Magdalena, 14 January 1889.

*Beauchamp 2109*, SD. West end of north side of Bahía Margarita, elevation about 50 m, 6 April 1971.

*Beauchamp 2149*, SD. Bahía Magdalena, on slopes along arroyos north of Punta Magdalena, elevation about 5 m, April 1971.

*García Mendoza & Franco AGA1196471*, MEXU. Puerto Bahía Magdalena, Isla Magdalena, 24 m elevation, 26 January 2006.

*García Mendoza & Franco AGA1196410*, MEXU. Base Militar Cortés, 3 km en línea recta al sur de la Isla Margarita, 12 m elevation, 26 January 2006.

*García Mendoza, Franco & Esparza AGA1212886*, MEXU. Base Militar Cortés, 3 km en línea recta al sur de la Isla Margarita, 12 m elevation, 26 January 2006.

*Gentry, Fox & Arguelles 11903, 11905*, ARIZ, DES, MEXU, US. Cienegita, Isla Santa Margarita, on sandy bajada or plain, 15 May 1952.

*Moran 3540*, BH. Bahía Santa Maria, 31 March 1952.

*Moran 4187*, BH. Man-of-War Cove, Bahía Magdalena, 21 May 1952.

*Rose 16316*, US. Isla Magdalena, 21 March 1911.

*Rose 16261*, US. Bahía Santa Maria, Isla Santa Magdalena, 18 March 1911 (type of *A. connochaetodon*).

*Sanders s.n.*, MEXU. Isla Margarita, 5 m elevation, 16 February 1988.

***Agave moranii*** Gentry.

TYPE LOCALITY: *Gentry & McGill 23287*, DES, MEXU, US. About 3-5 km southeast of Agua Caliente, on eastern plain of Sierra San Pedro Mártir, 457 m elevation, 13 June 1973.

*Bezy s.n.*, ARIZ. Valle de la Trinidad, 1 April 1966 (probably *A. pringlei*).

*Chambers 629*, DS. Cañon del Diablo northwest of Picacho del Diablo, east flank of Sierra de San Pedro Mártir, about 10 km from canyon mouth, elevation about 1,400 m, 17 June 1954.

*Gentry 23287*, ARIZ. 3-5 km southeast of Agua Caliente on east plain of Sierra San Pedro Martir, 13 June 1973.

*Gentry PVT129886 11264*, MEXU. 3-5 km

southeast of Agua Caliente, on eastern plain of Sierra San Pedro Martir, 450 m elevation, 13 June 1973.

*Moran 18295*, DES, MEXU, US. Southeast side of San Felipe Valley, Sierra Santa Rosa, about 530 m elevation, 9 March 1971.

*Moran s.n.*, SD. Cerro Chato, south side of Sierra de San Pedro Mártir, elevation about 1,800 m, 3 June 1963.

*Moran 21562*, SD. Sierra San Pedro Mártir, Arroyo del Cajon, about 3 km from the mouth, elevation about 810 m, 28 December 1974.

*Agave pringlei* Engelman ex Baker.

TYPE LOCALITY: *Orcutt s.n.*, K, MEXU, US. Sierras Centrales, about 1,830 m elevation, 7 October 1882.

*Broder 547, 473*, DS, MEXU. About 5 km west-northwest of Santa Catarina, about 1,200 m elevation, 25 May 1961.

*Broder AGA245451*, MEXU. Santa Catarina, 5 km west and 100 km southeast of Ensenada, 1126 m elevation, 18 August 1961.

*Brown & Gilmartin AGA600683*, MEXU. Santa Catarina, 5 km west-northwest and 100 km southeast of Ensenada, 1,230 m elevation, 25 May 1961.

*Gentry 10287*, DES, MEXU, US. Sierra San Pedro Martir, north end, 1,500 m elevation, 23 March 1951.

*Gentry 10287*, DES, MEXU, US. Pinyon-chaparral, northwest end of Sierra San Pedro Mártir, 23 March 1951.

*Gentry 16723*, DES, MEXU, US. Near Paseo San Matias, 457 m elevation, 22 June 1957.

*Gentry 19959*, DES, MEXU, US. Paseo San Matias, 450 m elevation, 23-34 April 1963.

*Harbison s.n.*, SD. Near El Progreso, Sierra Juarez, about 1,500 m elevation, 1 August 1965.

*Hastings & Turner 66-17*, ARIZ. Paseo San Matias, about 31 km east of Valle Trinidad, about 600 m elevation, 5 October 1966.

*Moran 9838*, SD, UC. About 8 km southeast of Las Filipenas, Sierra Juarez, elevation about 1,620 m, 30 June 1962.

*Moran 9849*, SD. Just east of Paseo San Matias, about 1,020 m elevation, 30 June 1962.

*Moran 15256*, SD. Occasional in chaparral, Rancho San Pedro Mártir, Sierra San Pedro Mártir, about 1,700 m elevation, 5 July 1968.

*Moran 18639*, SD. About 3 km northeast of Alamito, Sierra Juarez, about 1,150 m elevation, 3 October 1971.

*Moran 21983*, SD. Sierra San Pedro Mártir, on metamorphic rock in small arroyo one mile northwest of oak pasture elevation about 1,600 m, n.d.

*Moran AGA762968*, MEXU. Rancho San Pedro Martir, Sierra San Pedro Martir, 1,700 m elevation, 5 July 1968.

*Moulis & McGill 555*, ASU, DES. Sierra San Pedro Mártir, about 30 km east of Meling Ranch, 21 August 1972.

*Orcutt s.n.*, US. Central mountains, 7 July 1883.

*Orcutt s.n.*, US. Sierra Juarez, near Hanson's

Ranch, 1,829 m elevation, 26 July 1883.

*Orcutt s.n.*, UC. Hanson's Ranch, 29 July 1883.

*Orcutt 300*, US. Central mountains, 26 July 1883.

*Orcutt 458a*, US. Central mountains, 1,829 m elevation, 7 October 1882.

*Orcutt 14951*, MO. Central Mountains, central plateau of California peninsula, 1,830 m, 7 October 1882.

*Orcutt & Orcutt s.n.*, MO. Mountains of Northern Lower California, 1 August 1883.

*Orcutt & Orcutt 943*, MO. Hanson's ranch, Lower California, 1,830 m elevation, 26 July 1883.

*Rempel 143*, MEXU. Ejido San Matias (Francisco R. Serrano), 1 km north of Mexico 3 between Ensenada and San Felipe, 6 May 1994.

*Agave sebastiana* Greene.

TYPE LOCALITY: *Greene s.n.*, CAS, DS, UC. Isla Cedros. 1 May 1885.

*Anthony 264*, DS, K, US, MO. Isla San Benito, plants collected on the islands off the coast of Lower California and on the adjacent mainland, 160 m elevation, March-June 1897.

*Anthony s.n.*, CAS. Isla San Benito, Mar.-June 1897.

*Beauchamp 2095*, SD. Isla San Benito Oeste, elevation about 130 m, 4 April 1971.

*Beauchamp 3193*, SD. Isla San Benito Oeste, common on slopes, 28 February 1972.

*Belding s.n.*, CAS. May 1881.

*Benedict s.n.*, SBBG. Isla Cedros, upper Campo Punta. Norte Canyon, easterly from Cerro del Norte, 15 March 1971.

*Benedict s.n.*, SBBG. Isla San Benito Oeste, about 180 m south of fishing village, southeast portion of island, 9 March 1971.

*Bezy s.n.*, ARIZ. 3 km from north end, Cedros Island, On south slope of Cerro 2102, 28 March 1974.

*Brandege s.n.*, UC. Isla San Benito, 27 March 1897.

*Brandege s.n.*, UC. Isla San Benito, 1 April 1897.

*Burgess 7062*, ARIZ. About 5 km northwest of town, Isla Cedros, Steep, rocky mountain slope, 19 May 1981.

*García Mendoza, Franco & Esparza AGA1212806*, MEXU. Punta Eugenia, 5 km al sur de camino de terracería a Bahía Tortugas, 94 m elevation, 22 March 2007.

*Harbison s.n.*, ARIZ. Isla San Benito Oeste, 8 November 1966.

*Howell 10691*, CAS. Southeast side of Isla Cedros, 16 August 1932.

*León de la Luz s.n.*, ARIZ. East-central part of Isla Cedros, at base of steep hill, n.d. (as *A. shawii* ssp. *shawii*).

*Mason 1986*, CAS, K, US, MO. Isla Cedros, 3 June 1925.

*McGill & Pinkava s.n.*, MEXU. Isla Cedros, 700 m elevation, 3 March 1964.

*Moran 2954*, CAS. Isla Cedros, n.d.

*Moran 4198*, BH, DS. Isla San Benito Oeste, 24 May 1952.

*Moran 15142*, SD, ARIZ, MEXU. Isla Natividad, near middle, elevation about 100 m, 24 June 1968.

*Moran 17430, 17431*, ARIZ, DES, MO, SD. Isla San Benito Oeste, elevation about 100 m, 19 April 1970.

*Moran 17449*, SD. Isla San Benito Este, elevation about 25 m, 20 April 1970.

*Moran 21206*, ARIZ, DES, SD. Isla Cedros, about 3 km from north end, elevation about 600 m, 28 March 1974.

*Moran 19924*, SD, ARIZ. East shore of Bahía Tortugas, elevation about 10 m, 8 February 1973 (probably a form of *A. vizcainoensis*).

*Philbrick B75-31*, SBBG. Isla San Benito Oeste, west facing slope, halfway between terrace & summit, 20 January 1975.

*Philbrick & Benedict B72-77*, SBBG. Arroyo Madrid, above Playa Madrid, north of Colorada, south-east part of Isla Cedros, 20 April 1972.

*Solis s.n.*, MEXU. Isla Cedros, 3 June 1925.

*Rose 16041*, MO. Isla San Benito, 0 - 150 m elevation, 9 March 1911.

*Rose 16122*, US. Isla Cedros, March 1911.

*Agave shawii* Engelman ssp. *goldmaniana* (Trelease) Gentry.

TYPE LOCALITY: *Nelson & Goldman 7151*, US, Yubay, about 48 km southeast of Calamujué, B.C., about 610 m elevation, 18 September 1905.

*Barclay & Arguelles 1985*. ARIZ, MEXU, US. Sandy flats about 40 km north of Punta Prieta, 6 April 1966.

*Ferris 8581*, DS. West of Sierra San Borja (Sierra Calamujué), about 19 km from Laguna Chapala along road to Punta Prieta, 6 March 1934.

*Gentry 10349*, ARIZ, US. Fog desert on rolling hills of Sierra Lino with sparse open cover, near Marmolito, 7 April 1951.

*Gentry 10361, 10365, 10366, 10355*, ARIZ, MEXU, US. Forested desert on granitic alluvium, about 11 km south of Tinaja Yubay and about 24 km northeast of Punta Prieta, 457 to 549 m elevation, 8 April 1951.

*Gentry 10379, 10381, 10382*, ARIZ, DES, MEXU, US. Low maritime shrub on sandy or gravelly soil, about 10 km north of Socorro, 11 April 1951.

*Gentry 19974*, ARIZ, MEXU. 32 km north of Punta Prieta, valley west of Sierra San Luis, 570 m elevation, 30 April 1963.

*Gentry 11318, 11319, 11320*, MEXU, US. About 16 km north of Punta Prieta, 24 October 1951.

*Gentry 11935*, ARIZ, MEXU, US. About 8 km northwest of El Mesquital, Vizcaino Desert, 18 May 1952. Intermediate between *A. avellanidens* and *A. shawii* ssp. *goldmaniana*.

*Gentry 19974*, ARIZ, MEXU, US. Arborescent desert, valley west of Sierra Calamujué, about 40 km north of Punta Prieta, 30 April 1963.

*Gentry 11946, 11948*, ARIZ. Mesquital, 1 May 1952.

*Gentry & Fox 11948*, ARIZ, DES, MEXU, MICH,

US. About 24 km northeast of Punta Prieta, 20 May 1952.

*Gentry & Gentry 23166*, DES, MEXU, US. 11 km west of Misión San Borja, 270 m elevation, 7 April 1973.

*Gentry & Gentry 23161*, ARIZ, DES, MEXU, US. About 26 km northeast of Punta Prieta, 5 April 1973.

*Gentry & Gentry 23166*, ARIZ, DES, MEXU, US. About 13 km west of Misión San Borja, 274 m elevation, 7 April 1973.

*Gentry & McGill AGA172645*, ARIZ. 11 km west of Misión San Borja, open valley, 7 April 1973.

*Harbison s.n.*, CAS, ARIZ. Near Tinaja Yubay, 30 April 1964.

*Harbison s.n.*, SD. About 6 km south of San Andres, 25 July 1941.

*Harbison s.n.*, SD, ARIZ. Punta Prieta, 29 April 1940.

*Hastings & Turner 63-231*, DS. Arroyo Aguajito, about 24 km east of Rosario, elevation about 200 m, 19 October 1963.

*Kowski s.n.*, US. East-northeast of El Rodeo, 1897.

*Leuenberger & Schiers AGA838263*, MEXU. Punta Prieta, 38 km sur de Parador, 13 October 1981.

*Lindsay 42*, DES. Near San Andres, 1930s.

*López Ferrari, Espejo, & Flores AGA1029038*, ARIZ. Near San Andres, n.d.

*Moran 17027*, ARIZ, DES, SD. About 12 km north of Puerto Santa Catarina, 28 March 1970.

*Moran 17053*, SD. About 10 km east of Punta Canoas, elevation about 50 m, 29 March 1970.

*Moran 17121*, SD. Puerto San Jose, about 25 m elevation, 30 March 1970.

*Moran 17191*, SD. About 13 km south of Las Palomas, elevation about 140 m, 1 April 1970.

*Moran 17204*, SD. Boca de Marrón, about 5 m elevation, 2 April 1970.

*Perrill & Soule AGA722695*, ARIZ. 10 km north of Puerto Santa Catarina, 28 March 1970.

*Rempel 81*, ARIZ. 21 km al east de Punta Prieta, carr. a Bahía de Los Angeles, 24 April 1987.

*Tenorio, Lezama & Romero 13070*, ARIZ, MEXU. Punta Prieta, 21 km al este de carr. a Bahía de Los Angeles, 370 m elevation, 24 April 1987.

*Wiggins 5733*, US. Dry hillside 25 km west of Punta Prieta, 1 June 1931.

*Wiggins 4475*, DS, US. Semi-desert hills between El Marmól and El Rosario, about 64 km east of Rosario, 12 March 1930.

*Wiggins 5375*, US. Low ridges 2 km north of Punta Prieta, 16 April 1931.

*Wiggins & Thomas 171*, DS, US. About 23 km toward the coast from Cerro Blanco southeast of El Rosario, about 350 m elevation, 8 February 1962.

*Wiggins & Wiggins AGA107001*, MEXU. Cerro Blanco, about 20 km towards the coast, 360 m elevation 8 February 1962.

*Agave shawii* Engelman ssp. *shawii* Gentry.

TYPE LOCALITY: *Hitchcock s.n.*, MO. About 32 km south of San Diego about the US - México border, July 1875.

- Annable 2223*, US. Gravel pit 8 km south of Campo Costa Rica, 4 km north of Arroyo Hondo, 24 April 1984.
- Arnott 12, 21*, UC. About 6 km north of Socorro, 21 April 1955.
- Brandegee s.n.*, UC. Colnett, May 1893.
- Broder AGA253962*, ARIZ. North side of broad canyon of Río Guadalupe about 0.5 km inland from Pacific coast, Mexico 1 (free route) 1.6 km northwest of Puente Misión), south-facing slope with dense coastal, 21 March 1979.
- Carter AGA841350*, ARIZ. North side of broad canyon of Río Guadalupe about 0.5 km inland from Pacific coast, Mexico 1 (free route) 1.6 km northwest of Puente Misión), south-facing slope with dense coastal, 21 March 1979.
- Cox s.n.*, UC. San Telmo de Abajo, May 1931.
- Dressler 449*, MO. 50 km north of Ensenada, 37 m elevation, 26 March 1949.
- Farmer s.n.*, SD. Santo Tomas Valley, 24 December 1955.
- Ferris 8524*, DS. About 26 km from Colnett Wash on Santo Domingo Road, 2 March 1934.
- Ferris 8528, 8529*, DS, US. About 48 km north of Rosario on road to Santo Domingo, 3 March 1934.
- Formet AGA217388*, ARIZ. 1 km east of Bocana de Santo Tomás on the dirt road up the Valley of the Río Santo Tomas, common on coastal sage scrub covered slope, 23 November 1984.
- Gentry 4001*, ARIZ, UC, MO. Between San Vicente and Hamilton Ranch, 10 November 1938.
- Gentry 10079*, ARIZ, MEXU, US. Huntington Botanical Gardens, 9-15 January 1951.
- Gentry 10281*, ARIZ, MEXU, US. Coastal or maritime sagebrush, Km 57 south of Tijuana, 21 March 1951.
- Gentry 10285*, ARIZ, MEXU, US. About 16 km northeast of San Telmo, 23 March 1951.
- Gentry 23166, 265241*, ARIZ. Sierra Calamajué, 1 April 1963.
- Gentry 23320*, ARIZ. Agua Prieta, 1 April 1973.
- Gentry s.n.*, ARIZ. Near La Misión, 35 km north of Ensenada by power station, old road, 15 April 1973.
- Gentry s.n.*, ARIZ. Km 57 south of Tijuana, B.C. Coastal or maritime, March 21, 1951.
- Gentry & Arguelles 19968*, ARIZ, MEXU, US. About 24 km east of Rosario, 28 April 1963.
- Gentry & Gentry 23154*, ARIZ, DES, MEXU, US. About 19-21 km east of Rosario, south slope of arroyo valley, 270 m elevation, 4 April 1973.
- Gentry & Gentry 23190*, ARIZ, DES, MEXU, US. Near La Misión, About 43 km north of Ensenada by power station, old road, 46 m elevation, 15 April 1973.
- Harbison 45522*, SD. Santa Maria Valley, 31 August 1953.
- Harbison s.n.*, SD. About 11 km southeast of San Quintín, 21 April 1927.
- Harbison s.n.*, SD. San Simon, about 16 km east of San Quintín, 10 September 1955.
- Harbison s.n.*, SD. Camalú Point, 29 December 1949.
- Harbison s.n.*, SD. Arroyo ESE of Rosario, 29 December 1949.
- Harbison s.n.*, SD. Canyon above Hamilton Ranch, 15 December 1953.
- Harbison s.n.*, SD. La Misión Point, 30 December 1949.
- Harbison & Howe s.n.*, ARIZ, SD. Arroyo about 14 km east of Rosario, elevation about 200 m, 23 September 1965.
- Harding s.n.*, SD. Halfway between Ensenada and Tijuana, 28 December 1937.
- Jones s.n.*, DS, MEXU. West of Tijuana near the sea, 26 December 1924.
- Merello & Brunner 268*, MO. 15 km south of San Quintín along Mexico 1, 30 - 50 m elevation, 17 April 1992.
- Moran 16711*, DES, SD, UC, MO. Abundant on coastal terrace 2 km south of Jatay, south of La Misión, 3 January 1970.
- Moran s.n.*, ARIZ. 15 km east of El Rosario, 29 August 1966.
- Tenorio & Lezama AGA447098*, ARIZ. 15 km east of El Rosario, 19 August 1966.
- Orcutt s.n.*, MO. Near San Quentin, 25 m, 14 April 1886.
- Orcutt s.n.*, MO. Todos Santos Bay, 24 January 1883 (probably *A. aurea*).
- Orcutt s.n.*, US. San Quintin, 1886-04-14 (as *A. orcuttiana*).
- Orcutt s.n.*, US. East-northeast of El Rodeo, 14 April 1886.
- Orcutt 292*, US. Santo Junas, 15 July 1885.
- León 3676*, MEXU. Descanso, 27 December 1932.
- Lindsay s.n.*, MEXU. Mexico 1, südlich Colonet (paralelo 31) (Ensenada- El Rosario), 11 October 1981.
- Madrigal AGA130809*, MEXU. Bahía de los Angeles, 3 km al oeste, 28 May 1977.
- Moran & Reveal s.n.*, MEXU. 2 km south of Jatay, 100 m elevation, 3 January 1970.
- Wiggins 21, 442*, DS. Valle de San Telmo, about 24 km east of Mexico 1, 17 June 1971.
- Wiggins & Gillespie 3911, 4006*, CAS, DS, MEXU, US. About 60 km south of Tijuana, about 3 km south of Halfway House, 180 m elevation, 8 September 1929.
- Wiggins & Gillespie 4006*, US. Seaward slopes 3 km south of Halfway House, 50 km south of Tijuana, 180 m elevation, 8 September 1929.
- Wiggins & Gillespie AGA6978*, MEXU. 16 km north of Ensenada, 12 September 1929.
- Wiggins & Thomas AGA107041*, MEXU. About 60 km south of Tijuana, about 3 km south of Halfway House, 180 m elevation, 8 September 1929.
- Unknown *s.n.*, MO. Lower California, Rosarito Beach, February 1883.

*Agave sobria* Brandegees ssp. *frailensis* Gentry.

TYPE LOCALITY: *Gentry & Cech 11264*, ARIZ, MEXU, US. Stunted tree and shrub desert on seaward igneous rocky slopes, 10-12 km north of Punta

Frailles, 7 October 1951.

*Burgess 6103, 6104*, ARIZ. About 2 km north-northeast of Los Frailes, NE-facing slope of low mountain, west of road to La Rivera in rhyolite col-luvium, 21 October 1981.

*García Mendoza, Franco & Piña AGA1196461*, MEXU. Punta Frailes, about 1 km to the south, 33 m elevation, 24 January 2006.

*García Mendoza, Franco & Piña AGA1196373*, MEXU. Punta Frailes, 13-15 km al norte de en las afueras del P.N. Cabo Pulmo, a 1 km de Miramar, 17 km al sureste de La Ribera, 21 m elevation, 24 January 2006.

*Gentry 11876*, ARIZ. Punta Frailes, 1 June 1952 (as *A. sobria* ssp. *roseana*).

*Gentry 11679*, ARIZ. 6 km north of Punta Frailes, stunted tree and shrub desert on seaward igneous rocky slopes, 1 October 1951.

*Gentry & Cech 11257*, ARIZ, MEXU, US. About 8-13 km north of Punta Frailes, 7 October 1951.

*Gentry & Fox 11858*, ARIZ, MEXU, US. About 8-13 km north of Punta Frailes, 6 May 1952.

*Agave sobria* Brandegees ssp. *roseana* (Trelease) Gentry.

TYPE LOCALITY: *Rose 16854*, US. Isla Espiritu Santo, 18 April 1911 (as *A. roseana*).

*Brandegee s.n.*, UC. La Paz, 14 April 1892.

*Burgess & Turner s.n.*, ARIZ. Isla Espiritu Santo, 26 April 1977.

*Collins 134*, US. Isla Espiritu Santo, 1 April 1931.

*Collins 167*, US. Islote Gallo, 1 April 1931.

*García Mendoza, Franco & Piña AGA1216927*, MEXU. La Paz, acerca de 4 km al noreste de atrás del Cerro La Calavera, 38 m elevation, 28 January 2006.

*Gentry 11935-265237*, ARIZ. La Paz, 1 May 1952 (as *A. sobria* ssp. *sobria*).

*Gentry 11274*, ARIZ, MEXU, US. Sparse desert shrub on tuffaceous breccia, Islote Gallo, 10 October 1951.

*Gentry AGA129968*, MEXU. Islote Gallo, Golfo de California, 10 July 1957.

*Gentry & Cech 11277*, ARIZ, MEXU, US. Sparse desert shrub on brecciated lavas, west ridge of Isla Espiritu Santo, 10 October 1951.

*Gentry & Fox 11869*, ARIZ, MEXU, US. About 5 km east of La Paz, 7 May 1952.

*Gentry, Scott & McGill AGA172725*, ARIZ. 4-5 km northeast of La Paz, rocky sedimentary hillslope, 8 May 1952 (as *A. sobria* ssp. *sobria*).

*Harbison AGA228903*, MEXU. Pichilingue, 2 km north of La Paz on road to Puerta Balandra, 10 m elevation, 7 April 1972 (as an unresolved species).

*Hastings & Turner 64-154b*, SD. About 10 km north of La Paz.

*Jaunzems s.n.*, ARIZ. Isla Espiritu Santo, atrás de la playa La Bonanza, llano alluvial, 26 April 1977.

*Johnston 3989, 4001*, UC, US. Common on mesa-like ridge-crests, the Isthmus, Isla Espiritu Santo, 31 May 1921.

*Johnston 4002, 4003*, UC, US. Very common on

a lava capped mesa, Bahía San Gabriel, Isla Espiritu Santo, 1 June 1921.

*Johnston 3043*, US. La Paz, 11 April 1921 (as *A. sleviniana*).

*Mille, Merello & Pool AGA620093*, ARIZ. 10 km north of La Paz, about 2 km east of Pemex bulk plant, 7 October 1964.

*Rose 16524*, MO. Isla Pichilingue, 0 - 10 m elevation, 28 March 1911.

*Rose AGA63592*, ARIZ. San Gabriel Bay, Isla Espiritu Santo, 7 March 1937.

*Wiggins 17828*, DS. Isla Partida, just north of Isla Espiritu Santo, 20 April 1962.

*Wiggins & Gillespie AGA6977*, MEXU. Isla Partida, northern part of just north of Isla Espiritu Santo, 20 April 1962.

*Agave sobria* Brandegees ssp. *sobria* Gentry.

TYPE LOCALITY: *Brandegee s.n.*, DS, UC, MO. Comondú Mesas, 23 March 1889.

*Barclay & Arguelles 1989*, ARIZ, MEXU, US. Vicinity of San Miguel de Comondú, 26 April 1966.

*Barclay & Arguelles s.n.*, ARIZ. Grade south of Arroyo Liguí, 35 km south of Loreto on the Mexico 1, Sierra de la Giganta, on rounded hills, 8 July 1970.

*Brandegee s.n.*, ARIZ. Canyon above Puerto Escondido, 13 March 1937.

*Brandegee s.n.*, MO. UC. Cape region mountains, 20 September 1899 (as *A. brandegeei*, mixed with *A. aurea*).

*Carter 5486*, UC. Cumbre de la Cuesta de Las Parras, north of road from Loreto to San Javier, about 1,750 m elevation, 5 July 1970.

*Carter 5487*, ARIZ, UC, MEXU, MO. Cuesta south of Arroyo Liguí, 35 km south of Loreto, 100 m elevation, 8 July 1970.

*Carter & Reese 4552*, UC. Cuesta de las Parras just above Rancho de las Parras, road between Loreto and San Javier, about 350 m elevation, 5 June 1963 (as *A. gigantensis*).

*Carter & Heckard et al. AGA841344*, MEXU. Sierra de la Giganta, along trail from San José de Agua Verde to Bahía Agua Verde, on Gulf drainage, 360 m elevation, 4 June 1965.

*Carter & Sharnsmith 4940*, UC. Along trail from San Jose de Agua Verde to Bahía Agua Verde, on Gulf drainage, about 360 m elevation, 4 June 1965.

*García Mendoza & Franco AGA1196365*, MEXU. San Ignacio, 9 km al este, 14 February 1975.

*García Mendoza, Franco & Esparza AGA1212938*, MEXU. Loreto, 18 km al oeste de camino de terracería Loreto a San Javier, 428 m elevation, 20 March 2007.

*García Mendoza, Franco & Piña AGA1196372*, MEXU. Pichilingue, camino a km 14 pasando la playa del tesoro al norte de la Paz, 10 m elevation, 22 January 2006.

*García Mendoza, Franco & Piña AGA1196462*, MEXU. La Paz, acerca de 4 km al noreste de atrás del cerro La Calavera, 58 m elevation, 28 January 2006.

*Gentry 10304*, ARIZ, MEXU, US. Arroyo Purísi-

ma several km upstream from La Purísima, 31 March 1951.

*Gentry 10308*, ARIZ, MEXU, US. Arroyo Purísima above La Purísima. 1 April 1951.

*Gentry 11303*, ARIZ, DES. About 16 km west of Canipolé.

*Gentry 12382*, MEXU, US. About 5 km north of San Javier, Sierra de la Giganta, 2 December 1952.

*Gentry 12387*, ARIZ, MEXU, US. East side of Bahía Concepcion, Rancho Salto, 3 December 1952.

*Gentry & Cech 11291*, ARIZ, DES, MEXU, US. Comondú, north slope of volcanic rim, 15 October 1951.

*Gentry & Fox 11811*, ARIZ, MEXU. Rancho San Andres, Sierra de las Palmas, south of Santa Rosalía, *Nolina* grassland over undulating, broken terrain of volcanic mountain top, 27-29 April 1952.

*Gentry et al. 11876*, ARIZ, MEXU, US. About 3-5 km northeast of La Paz, 8 May 1952.

*Gentry et al. 11882*, ARIZ, DES, MEXU, US. Comondú, 10 May 1952.

*Harbison s.n.*, SD. Isla Danzante, 7 April 1962.

*Harbison s.n.*, ARIZ, SD. Top of grade on road from Comondú to Loreto, 6 October 1967.

*Harbison & Howe s.n.*, MEXU. Loreto, top of grade on road from Comondú, 500 m elevation, 6 October 1967.

*Hastings & Turner s.n.*, ARIZ. On road from Comondú to Loreto, Top of grade, 6 October 1967.

*Hutchinson 7399*, 7473, SD. About 21 km south of El Coyote, Bahía Concepcion near km 85 marker, May & January 1975.

*Johnston 3857*, CAS, US. Bahía Balleñas, Isla Danzante, 24 May 1921 (similar to *A. roseana*).

*Johnston 3887*, CAS, UC, US. Bahía Agua Verde, 26 May 1921.

*Moran 3936*, BH, DS. Isla Carmen, canyon south of Bahía Balandra, 18 April 1952.

*Purpus s.n.*, MO, UC. San Jose del Cabo, January-March 1901.

*Rebman, Cano & Lucero AGA703007*, MEXU. Rancho Santa Inez, 17 km north, 30 October 1983.

*Rempel 143*, ARIZ. Canyon above Puerto Escondido, 13 March 1937.

*Rose 16639*, US. Isla Carmen, 3 April 1911 (as *A. carminis*).

*Rose 16676*, MO. Head of Bahía Concepcion, 0-10 m elevation, 5 April 1911.

*Wiggins 11446*, UC. About 10 km west of Canipolé, 17 November 1946.

***Agave turneri*** R.H. Webb & J.M. Salazar-Ceseña.

TYPE LOCALITY: *Webb & Salazar-Ceseña 3740*, MEXU. Sierra Cucapá, 25 km southwest of Mexicali, 6 March 2009.

*Rebman 3795*, SD. Sierra Cucapá, south of Mexicali, Colonia La Puerta, 6 March 1997.

*Salazar 3722*, 3723, 3724, 3725, MEXU, NY, ARIZ, DES. Sierra Cucapá, 25 km southwest of Mexicali, 28 October 2008.

*Salazar 3739*, 3740, 3741, 3742, 3743, ARIZ, BCMEX, DES, MO, SD. Sierra Cucapá, 25 km

southwest of Mexicali, 6 March 2009.

***Agave vizcainoensis*** Gentry.

TYPE LOCALITY: *Gentry 7469*, ARIZ, DES, DS, MEXU, MICH, UC. Cerro Tordillo, Sierra Vizcaino, about 120-240 m elevation, 12-13 March 1947.

*García Mendoza, Franco & Esparza AGA1212811*, MEXU. Estación de microondas Indio, a 100 m de la entrada de la camino de terracería Bahía Tortugas-Vizcaino, 524 m elevation, 22 March 2007.

*García Mendoza, Franco & Esparza AGA1212834*, MEXU. Bahía Tortugas, 5 km al norte de camino de Terracería Bahía Tortugas-Vizcaino, 122 m elevation, 22 March 2007.

*García Mendoza, Franco & Esparza AGA1212807*, MEXU. Sierra de San José de Castro, Bajando la km 23 carr. de terracería San José de Castro-Bahía Asunción, 163 m elevation, 22 March 2007.

*García Mendoza, Franco & Esparza AGA1212885*, MEXU. Bahía de Tortugas, a 8-10 km de la sureste de Bahía Tortugas camino de terracería Vizcaino-Bahía Tortugas, 212 m elevation, 22 March 2007.

*García Mendoza, Franco & Piña AGA1196371*, MEXU. Sierra de San José de Castro, km 17.5 camino de terracería San José de Castro-Bahía Asunción, 524 m elevation, 22 March 2007.

*Howell 10660*, CAS. San Bartolomé Bay (= Bahía Tortuga), 14 August 1932.

*Tenorio, Lezama & Romero AGA557930*, ARIZ. 33 km al oeste de Bahía Asunción, brecha a Bahía de Tortugas, desierto sarcocauliscente, primaria, 20 April 1987 (as *A. shawii* ssp. *shawii*).

*Tenorio, Lezama & Romero AGA557931*, MEXU. Bahía Asunción, 33 km al oeste de brecha a Bahía de Tortugas, 110 m elevation, 20 April 1987 (as *A. shawii* ssp. *shawii*).

**UNRESOLVED SPECIES.**

*Burgess AGA847505*, MEXU. Between La Paz and Todos Santos, 8 March 1972.

*López-Forment AGA394799*, MEXU. Villa Insurgentes, 50 km east, 1 February 1980.

*Gentry & Fox 11944*, ARIZ. 13 km east of Punta Prieta, 19 May 1952.

*Gentry, Fox & Argüelles 11933*, ARIZ. 10 km west of Calmallí, sandy alluvial plain of forested desert, 17 May 1952.

*Purpus s.n.*, US. Calmallí, 1904 (as *Agave* sp.).