Figure 1. Tropical deciduous forest near Álamos in late summer 1991. *Photo credit M.A. Dimmitt.*

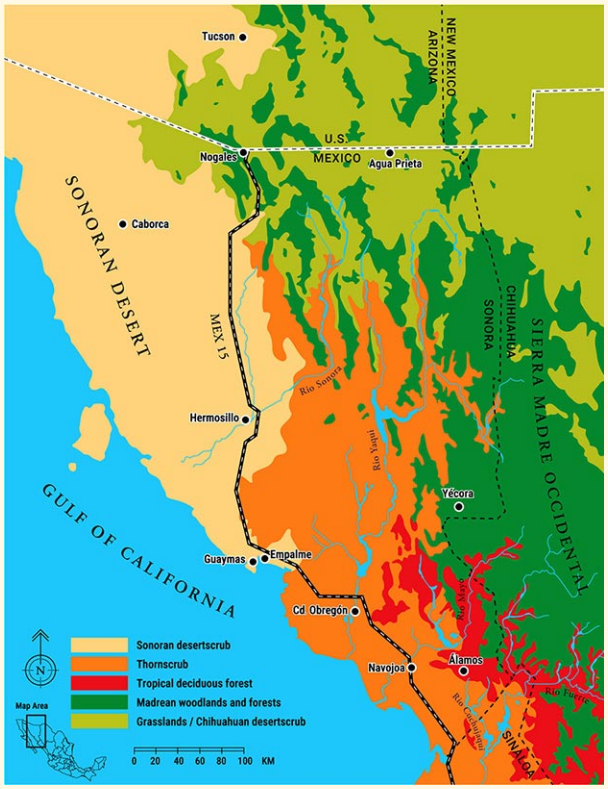

Figure 2. Map of the vegetation of Sonora. Modified from Brown & Lowe (1982).

Coastal Thornscrub Flora and Vegetation in the Municipality of Huatabampo, Sonora, Mexico

by Thomas R. Van Devender[1], Samuel L. Friedman[2], Andrew C. Sanders[3], and Ana Lilia Reina-Guerrero[1]

Abstract

The Municipality of Huatabampo is located along the coast of the Gulf of California in southern Sonora, Mexico. The vegetation is coastal thornscrub, the more xeric version of tropical deciduous forest. In 1890, Edward Palmer collected plants at Agiabampo in the municipality. In the late 1980s and 1990s, Paul S. Martin and his associates extensively surveyed the Municipality as part of the 1998 *Gentry's Rio Mayo Plants* book project. In the 1990s, Samuel L. Friedman studied the flora and vegetation of coastal thornscrub for his 1996 master's degree at Arizona State University. David Yetman, Van Devender, Reina-G., and Rigoberto López-E. collected plants in the area as part of the 2002 *Mayo Ethnobotany* book project. The flora of the Municipality of Huatabampo currently has 529 species plus two additional varieties in 93 families and 320 genera. The most species-rich families are Poaceae (52), Fabaceae (50), Asteraceae (42), Euphorbiaceae (35), Convolvulaceae (28), Solanaceae (26), Malvaceae (25). and Cactaceae (21). There are 39 non-native species (7.2%) but none are invasive. Many species are new Sonoran state records, regional endemics, and northern range extensions of tropical species. *El Pitahayal* near Las Bocas is a unique coastal thornscrub dominated by dense tree-like organ pipe cacti (*Stenocereus thurberi*). In 2000, David Yetman and Vicente Tajia created the Coteco Biological Reserves in the Masiaca Indigenous Community to protect 563 acres of this world class succulent habitat. Since 2018, the Tucson Cactus and Succulent Society has supported Coteco.

Resumen

El Municipio de Huatabampo está ubicado a lo largo de la costa del Golfo de California en el sur de Sonora, México. La vegetación es matorral espinoso costero, la versión más xérica de la selva baja caducifolia. Edward Palmer colectó ejemplares de herbario en Agiabampo en el municipio en 1890. A finales de las décadas de 1980 y 1990, Paul S. Martin y sus colaboradores hicieron estudios botánicos extensos en el Municipio como parte del proyecto del libro *Gentry's Rio*

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Figure 3. Álamos, Sonora. A. La Parroquia de la Purísima Concepción church. B. Gazebo in plaza. *Photos credit Van Devender.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

Mayo Plants (Martin et al. 1998). En la década de 1990, Samuel L. Friedman estudió la flora y vegetación del matorral espinoso costero para su maestría en la universidad Arizona State University (Friedman 1996). David Yetman, Van Devender, Reina-G. y Rigoberto López-E. colectaron ejemplares botánicos en el área como parte del proyecto del libro *Mayo Ethnobotany* (Yetman & Van Devender 2002). La flora del Municipio de Huatabampo cuenta actualmente con 529 especies más dos variedades adicionales en 93 familias y 320 géneros. Las familias más diversas son Poaceae (52), Fabaceae (50), Asteraceae (42), Euphorbiaceae (35), Convolvulaceae (28), Solanaceae (26), Malvaceae (25) y Cactaceae (21). La flora incluye 39 especies no nativas (7.2%) pero ninguna es invasora. Algunas especies son registros nuevos para Sonora, otras endémicas regionales, o extensiones del rango hacia el norte de especies tropicales. *El Pitahayal* cerca de Las Bocas es un matorral espinoso costero único dominado por montes densos de pitahayas (*Stenocereus thurberi*) arborescentes. En 2000, David Yetman y Vicente Tajia crearon las Reservas Biológicas Coteco en la Comunidad Indígena de Masiaca para proteger 563 acres de este hábitat de suculentas único en el mundo. Desde 2018, la asociación Tucson Cactus and Succulent Society ha patrocinado la vigencia de Coteco.

Introduction

Although the Tropic of Cancer (23.45°N) just north of Mazatlán, Sinaloa, is often said to be the northern limits of the New World tropics, the northernmost tropical deciduous forest (Figures 1 & 2) is in Sierra San Javier in south-central Sonora (28.6°N; 800 km north-northeast of Mazatlán, 300 km south of the Arizona border). Thornscrub is an important,

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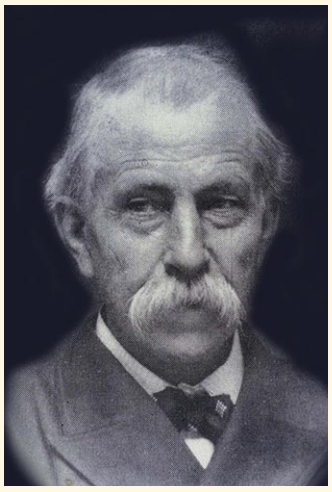
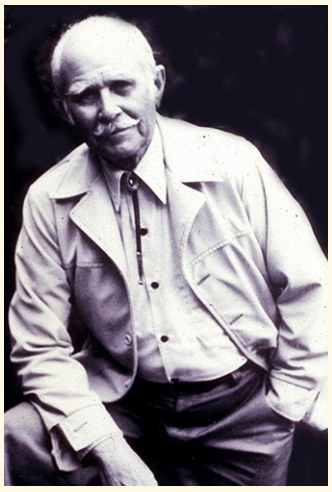

Figure 4. A. Edward Palmer. B. Howard S. Gentry. C. Paul S. Martin. *Photo credit K. Moore.* D. Andrew C. Sanders pressing plants in Álamos in 1994. *Photo credit Ceal Smith.*

Coastal Thornscrub Flora and Vegetation, Huatabampo

continued

widespread, transitional tropical vegetation type in Sonora (Van Devender et al. 2013, Van Devender & Reina-G. 2021). In southern Sonora, it is transitional between tropical deciduous forest and Sonoran desertscrub, and in central Sonora, between oak woodland and Sonoran desertscrub. Foothills thornscrub extends northward in river valleys to ca. 30.4°N (104 km south of the Arizona border; Van Devender et al. 2013), where it merges into desert grassland as winter temperatures decline. Coastal thornscrub extends on the coastal plain of the Gulf of California in southern Sonora north to merge with Sonoran desertscrub in the Plains of Sonora Subdivision of the Sonoran Desert near Guaymas (27.930°N, Van Devender & Reina-G. 2021, Van Devender et al. 2024). Here, we discuss the flora and vegetation of coastal thornscrub in the Municipality of Huatabampo, Sonora.

Figure 5. Map of the Municipio of Huatabampo area.

Botanical History

The first botanical studies in northwestern Mexico were in tropical southern Sonora. Álamos was founded by Jesuit missionaries in 1630 and, after fabulously rich silver deposits were discovered in 1863 at nearby Aduana, thrived as a mining and religious center (Figure 3). The 21 missions founded by Padre Eusebio Francisco Kino in northern Sonora and southern Arizona in the mid-1600s were funded by the Diocese of Álamos.

Spanish physician Martín Sessé y Lacasta and Mexican botanist José Mariano Mociño led the Royal Botanical Expedition to New Spain in 1787–1803 which resulted in about 7,500 new species of plants (McVaugh 2000). They collected many plants in the Álamos area in 1790.

In 1890, Edward Palmer (Figure 4A) collected in Agiabampo (Figure 5 inset), which was then the seaport for Álamos, connecting it to the rest of the world. Rose (1895) described nine of Palmer's 55 collections as new species, including *Acalypha papillosa, Jatropha purpurea,* and *Justicia mexicana* (now *Justicia candicans*). Howard S. Gentry collected plants in the Río Mayo region in southern Sonora from 1933 to 1940 (Figure 3B, Martin et al.1998). His monumental book *Rio Mayo Plants* was the first comprehensive flora of tropical deciduous forest in Mexico (Gentry 1942). Although most of the Municipality of Huatabampo is not in the Río Mayo drainage, Palmer's collections from Agiabampo and Gentry's from the Las Bocas area were included in the flora.

Study Area

The Municipality of Huatabampo is on the coastal plain of the Gulf of California from the Sinaloa border (26.318°N) north to Huatabampo (26.852°N). The eastern boundary of the municipality is Mexican Federal Highway 15 (MEX 15, 109.009 to 109.365°W; Figure 5). This is not an ecological boundary as coastal thornscrub extends eastward to merge into the botanically rich tropical deciduous forest in the Sierra de Álamos (Van Devender et al. 2000). Elevations in the Municipality mostly range from sea level to 50 m but reach 236 m on Cerro Tasirogojo near Francisco Sarabia. The coastal plain between the Sierra de Álamos and the Gulf of California is drained by Arroyo Masiaca and many smaller arroyos. The mouth of the Río Mayo is west of Moroncarit in the northernmost Municipality of Huatabampo. The Bahías de Agiabampo (Figure 8A) and Yavaros are large bays on the southern and northern ends of the municipality. Plants were collected at Agiabampo, Arroyo Jeberojaqui, Arroyo Masiaca, Bachoco, Bachomojaqui, Bacorehuis, Bahía Santa Bárbara, Barochipa, Camahuiroa, Cerro Tasirogojo, Chichibojoro, Ejido 10 de Abril, Estero El Tecucure, Francisco I. Madero, Francisco Sarabia, Huatabampito, Huatabampo, Las Aguilas, Las Bocas, Loma Chomojabires, Mate Mula, Melchor

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Coastal Thornscrub Flora and Vegetation, Huatabampo

continued

Figure 6. Pitahayal on Las Bocas road. *Photo credit Van Devender.*

Ocampo, Moroncarit, Navopatia, Nescotahueca, Punta Lobera, Sirebampo, Tierra y Libertad, Tojahui, and Yavaros.

Methods

Howard Gentry's plant specimens collected in the Río Mayo Region in 1933–1940 (Martin et al. 1998) are in the University of Arizona Herbarium (ARIZ, Gentry 1942). In 1958, Richard S. Felger visited Agiabampo, Huatabampo, and Yavaros, where he collected *Encelia halimifolia, Euphorbia californica, E. lomelii, Jatropha cinerea,* and *Maytenus phyllanthoides.* Andrew C. Sanders' (Figure 4D) many specimens collected in the Municipality in 1983–1984, 1988–1989, and 1992–1994, were deposited in the University of California at Riverside Herbarium (UCR) and ARIZ. In the late 1980s and 1990s, the flora of coastal southern Sonora was surveyed extensively by Paul S. Martin (Figure 4C) and his many students and colleagues as part of the *Gentry's Río Mayo Plants* book project (Martin et al. 1998); all of the specimens were deposited in ARIZ. Samuel L. Friedman's numerous specimens collected for his master's degree were deposited in the Arizona State University Herbarium (ASU, Friedman 1996). Additional specimens collected by Van Devender, David A. Yetman, Reina-G., and Rigoberto A. López-E. as part of the *Mayo Ethnobotany* book project (Yetman et al. 2000, Yetman & Van Devender 2002) were deposited into ARIZ and the Herbario de la Universidad de Sonora (USON). Specimens collected in the Yavaros area by J. Jesús Sánchez-E. in 2010 are in USON. Municipality of Huatabampo specimens were also deposited in 12 other herbaria in the United States and Mexico. Collection dates in the Municipality were December 25, 1983; December 15, 1988; September 4, 1989; February 1, October 7–8, 1992; March 13, 15, 21–22, November 23–24, 1993; April 4, 8–9, 15, September 10, 22, 1994; April 13, September 27, 1995; October 23–24, 1998; February 23, December 1, 2007; September 2010; August 2020; December 15, 2023; March 21–22, 2024.

Additional botanist who collected in the Municipality of Huatabampo include Karen Adams, John L. Anderson, Marc A. Baker, G. Balmer, C. David Bertelsen, D. Charlton, Oscar F. Clarke, Mark A. Dimmitt, R. L. Dressler, Julie Emmett, Mark Fishbein, J. D. Freech, Philip D. Jenkins, Kristen J. Johnson, L. Lubinsky, Adrian Mayor, Stephanie A. Meyer, Shelley McMahon, G. Guadalupe Morales-F., Edgar Felipe Morán-P., Mary K. O'Rourke, Donald J. Pinkava, Barbara Pitzer, David Sánchez, David Silverman, Barbara Skye, Victor W. Steinmann, John F. Wiens, Rebecca K. Wilson, and Jack R. Zittere.

Early plant collections in southern Sonora were made before the advent of GPS and Google Earth, which provide coordinates for accurate localities. In the last 40 years, most herbaria including ARIZ, ASU, UCR, and USON have digitized and integrated their records into the SEINet-SYMBIOTA public online herbarium network, greatly helping botanical studies using geographic distributions. The preliminary flora for the Municipality (Checklist) was compiled from 1,239 records and observations in the Madrean Discovery Expeditions (**madreandiscovery.org**, a SEINet portal) and linked databases.

Results

The flora of the Municipality of Huatabampo currently has 529 species plus two additional varieties and one hybrid in 93 families and 320 genera (Checklist). The most species-rich

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Figure 7. A. *Pholisma culiacanum*. *Photo credit Philip D. Rosen.* B. Slipper flowers (*Euphorbia lomelii*). *Photo credit Van Devender.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

families are Poaceae (52), Fabaceae (50), Asteraceae (42), Euphorbiaceae (35), Convolvulaceae (28), Solanaceae (26), Malvaceae (25), Cactaceae (21), Amaranthaceae (20), Cyperaceae (18), Apocynaceae (15), Acanthaceae (13), and Nyctaginaceae (11). The most species-rich genera are *Cyperus, Euphorbia,* and *Ipomoea* (14); *Cuscuta* and *Physalis* (7); *Lycium* (6); *Pectis* and *Solanum* (6); *Acalypha, Bouteloua, Cenchrus, Croton,* and *Metastelma* (5); and *Abutilon, Acacia, Boerhavia, Cylindropuntia, Heliotropium, Jatropha, Justicia,* and *Panicum* (4).

Dicoria argentea is endemic to coastal thornscrub in Sonora while *Agave aktites, Aldama congesta, Asclepias subaphylla,* and *Jatropha purpurea* are near endemics with records in northern Sinaloa. Other new Sonoran records are near endemic coastal thornscrub species whose ranges extend into adjacent tropical deciduous forest to the east or Plains of Sonora desertscrub to the north are *Aloysia sonorensis, Neltuma articulata* (= *Prosopis articulata*), and *Pholisma culiacanum* (Figure 7A).

Pholisma is a genus of three species of root parasites in the Lennoacease. *P. culiacanum* is a tropical deciduous forest (Figure 7A) and thornscrub relative of *P. sonorae*, the sand food of the Tohono O'odham people on sand dunes in Arizona, California, and Sonora.

Non-native species. There are 39 non-native species (7.2% of the flora) in the Municipality of Huatabampo. Some of them are serious invasive species in other parts of Sonora (Van Devender et al. 2020), but not in the study area. In the 1930s, Howard Gentry only collected seven of these species in the Río Mayo region, including rubber vine (*Cryptostegia grandiflora*), stink grass (*Eragrostis cilianensis*), tree tobacco (*Nicotiana glauca*), and Johnsongrass (*Sorghum halepense*; Gentry 1942). He did not find the other non-native species (82.1%), including the grasses, giant reed (*Arundo donax*), common wild oat (*Avena fatua*), buffelgrass (*Cenchrus ciliaris*), swollen fingergrass (*Chloris barbata*), Bermuda grass (*Cynodon dactylon*), crowfoot grass (*Dactyloctenium aegyptium*), Kleberg's bluestem (*Dichanthium annulatum*), Asian crabgrass (*Digitaria bicornis*), jungle rice (*Echinochloa colona*), blue panic (*Panicum antidotale*), and littleseed canary grass (*Phalaris minor*); the legumes, river tamarind or *guaje* (*Leucaena leucocephala*), burr medic (*Medicago polymorpha*), and sweet clover (*Melilotus indicus*); the mustards, black and field mustards (*Brassica nigra, B. rapa*), shepherd's purse (*Capsella bursa-pastoris*), lesser swine-cress (*Lepidium didymum*), and London rocket (*Sisymbrium irio*); the cleome, Asian spiderflower (*Corynandra viscosa*); the tamarisks, athel tree (*Tamarix aphylla*) and saltcedar (*T. chinensis*); the spurge, castor bean (*Ricinus communis*); the mallow, cheeseweed (*Malva parviflora*); the composite, common sowthistle (*Sonchus oleraceus*); and the nutsedge (*Cyperus rotundus*).

Some of the Huatabampo non-native species are cultivars that escaped or were discarded, including *aloe vera* or *sábila* (*Aloe barbadensis*), dill (*Anethum graveolens*), watermelon or *sandía* (*Citrullus lanatus*), muskmelon (*Cucumis melo*), pink morning glory (*Ipomoea carnea*), sesame (*Sesamum orientale*), and tomato (*Solanum lycopersicum*). Most (87.2%) of the non-natives are herbs and grasses. The only Huatabampo woody non-natives are athel tree, castor bean, pink morning glory, river tamarind, rubber vine, and saltcedar. All of the Huatabampo non-natives were present in the Rio Mayo region, including the coastal plain, by the mid-1990s (Martin et al 1998). It is remarkable that so many non-native species

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Figure 8. A. Mangroves at Bahía Agiabampo. *Photo credit Van Devender.* B. White mangrove (*Rhizophora mangle*) at Bahía Concepción, Baja California Sur. *Photo credit Susan D. Carnahan.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

apparently arrived after 1940. The absence of Natal grass or *zacate rosado* (*Melinis repens*) is notable.

Vegetation

Gentry used the terms *short tree forest* and *thorn forest* for the tropical vegetation in the Río Mayo region, following Forrest Shreve's (1937) description of the lowland vegetation of Sinaloa. Today, we call these vegetation types *tropical deciduous forest* and *thornscrub* (Van Devender & Reina-G. 2021). Shreve's Foothills Subdivision of the Sonoran Desert (Shreve 1964) was redefined as *thornscrub* (Felger & Lowe 1976, Turner & Brown 1994), a tropical vegetation type. Brown (1994) called it *Sinaloan thornscrub* but this term was abandoned because it is a typical Sonoran vegetation type that barely extends into northernmost Sinaloa. Friedman (1996) and Martin et al. (1998) recognized *coastal thornscrub* on the coastal plain of the Gulf of California and *foothills thornscrub* on rocky slopes inland. These vegetation types have been recognized in subsequent publications, including Búrquez et al. (1999), Martínez-Y. et al. (2000), Martínez-Y. et al. (2010), Van Devender et al. (2010), Van Devender et al. (2013), Van Devender & Reina-G. (2021), and Van Devender et al. (2024). The vegetation of the Municipality is mostly coastal thornscrub.

Along the coast of the Gulf of California in the Municipality of Huatabampo, dunescrub occurs behind the beaches and halophytic plants such as *Allenrolfea occidentalis, Arthrocnemum subterminale, Batis maritima,* and *Salicornia bigelovii, Sarcocornia pacifica, Sesuvium portulacastrum, S. verrucosum, Suaeda esteroa,* and *S. nigra* are present in saline flats and estuaries.

Manglares are mangrove communities in coastal estuaries along the coast of the Gulf of California in Sinaloa and Sonora, including Agiabampo (Figure 8A) and Yavaros in the Municipality of Huatabampo. Black, red, and white mangroves (*Avicennia germinans, Rhizophora mangle* (Figure 8B), and *Laguncularia racemosa,* respectively) as well as button mangrove (*Conocarpus erecta*), *jamiolaama* (*Stegnosperma halimifolium*), and *mangle dulce* (*Maytenus phyllanthoides*) are present. In Sonora, black and white mangroves occur as far north in Sonora as Punto Sargento (29.0°N), and north of Bahía de Kino (28.8°N): in Baja California Sur, red and white mangroves are at La Paz (24.2°N).

Pitayhayal. The *pitahayal* is a large area of diverse succulent coastal thornscrub that is especially well-developed near Las Bocas and Camahuiroa. It is dominated by very tall organ pipe cactus or *pitahaya* (*Stenocereus thurberi*; Bustamante & Búrquez 2008, Figure 9). This columnar cactus is a shrub that branches from the ground in drier areas in Sonora, Baja California, and Arizona but is a tree in the *pitahayal* (Figure 6) and tropical deciduous forest in southern Sonora (Yetman & Van Devender 2001, Yetman 2006). Other cacti in the *pitahayal* include *Cylindropuntia fulgida, C. leptocaulis, C.*

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Figure 9. Organ pipe cactus (*Stenocereus thurberi*) near Sirebampo. *Photo credit Reina-G.*

Figure 10 (above). Twisted barrel cactus (*Ferocactus herrerae*) at Baguo. A. Exceptionally spiraled plant. B. Top of stem. *Photos credit Reina-G. and Van Devender.*

Figure 11. *Lophocereus schottii* var. *tenuis*. A. Large, dense plant near Sirebampo. *Photo courtesy Reina-G.* B. Top of stem near San Marcial. *Photo credit Van Devender.*

Figure 12. *Jejeri* (*Pereskiopsis porteri*) on Mesa Masiaca. A. Leaves. B. Spiny stem. *Photo credits Van Devender.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

thurberi, Echinocereus leucanthus, Ferocactus herrerae (Figure 10), *Lophocereus schottii* var. *tenuis* (Figure 11), *Mammillaria bocensis, M. grahamii, M. mazatlanensis, Opuntia bravoana, O. decumbems, Peniocereus marianus, P. striatus, Pereskiopsis porteri* (Figure 12), *Selenicereus vagans,* and *Stenocereus alamosensis* (Figure 13). Other succulents present include *Agave aktites, A. angustifolia, Euphorbia cymosa, E. lomelii* (Figure 7b), *Ibervillea sonorae* (Figure 14), *Jatropha cardiophylla, J. cinerea, J. cordata,* and *J. purpurea.*

The twisted barrel cactus or *biznaga* (*Ferocactus herrerae*) is a striking species with deep sulci between often spiraled ribs in tropical deciduous forest in Sinaloa and coastal thornscrub in Sonora (Figure 10). *Senita* (*Lophocereus schottii*) is endemic to the Sonoran Desert Region in Sonora, adjacent Arizona in Organ Pipe Cactus National Monument, and throughout the Baja California Peninsula. *Lophocereus schottii* var. *tenuis* with slender stems with more ribs is found in coastal thornscrub in southern Sonora (Figure 11). Leafy cacti in the genus

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Figure 13. Octopus cactus (*Stenocereus alamosensis*) near Benjamín Hill. *Photos credit Van Devender.* A. Plant. B. Flower. C. Fruit.

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

Pereskiopsis are mostly found in tropical Central America and Mexico, with one species in Bolivia. *Jejeri* (*Pereskiopsis porteri*) is found in tropical deciduous forest and coastal thornscrub in Sinaloa, Sonora, and the Cape Region in Baja California Sur. Octopus cactus or *sina* (*Stenocereus alamosensis*) is a red-flowered "galloping" cactus found in tropical deciduous forest and coastal and foothills thornscrub from southern Sinaloa into Sonora. The northernmost stands are in Plains of Sonora desertscrub near Benjamín Hill (30.2°N; Figure 13). Hybrids between organ pipe and *sina* (*S. alamosensis* X *S. thurberi*) are known in tropical deciduous forest near Masiaca east of MEX 15 in the Municipality of Navojoa (26.7°N; Yetman & Van Devender 2002).

Slipper flower or *candelilla* (Figure 7B) is found in coastal thornscrub from northern Sinaloa into southern Sonora and from the tropical Cape Region in Baja California Sur north to the Vizcaíno Sonoran desertscrub in central Baja California. With its elegant red or orange flowers and red fruits, it is a commonly cultivated succulent. *Güerequi* (*Ibervillea sonorae,* Figure 14A, B, & C) occurs in coastal thornscrub in northern Sinaloa and Sonora as far north as Carbó in central Sonora in Sonoran desertscrub as well as in Baja California Sur. Its tuberous rootstocks are widely used medicinally for rheumatism, diabetes, and cancer (Yetman & Van Devender 2002) and it is overharvested in the *pitahayal.*

Notable woody shrubs in the *pitahayal* include boatthorn acacia or *güinolo* (*Acacia cochliacantha*), *Atamisquea emarginata, Bonellia macrocarpa, Celtis pallida, Condalia globosa, Cordia parvifolia, Forchhammeria watsonii, Fouquieria macdougalii* (Figure 14D), *Guaiacum coulteri* (Figure 15), *Havardia sonorae, Jatropha cordata, Neltuma odorata* (= *Prosopis glandulosa* var. *torreyana*), *Parkinsonia praecox, Phaulothamnus spinescens,* and *Sarcomphalus* (= *Ziziphus*) *amole.*

The following includes other notable trees and shrubs found in coastal thornscrub. Lollipop tree or *jito* (*Forchhammeria watsonii*) is a distinctly shaped tree in coastal thornscrub and southern Plains of Sonora desertscrub in Sonora and Central Gulf Coast desertscrub in Baja California Sur. *Guayacán* (*Guaiacum coulteri*) is a common shrub or small tree with intense blue-purple flowers in late spring (Figure 15). It is in the same genus as the threatened *lignum vitae* (*G. sanctum*), a tropical tree which has dense, highly prized wood. *Ébano* (*Libidibia sclerocarpa*) is a tropical tree on the western coast of Mexico as far north as the Culiacán, Sinaloa area, with a disjunct stand in the Huatabampo study area in Sonora. Reaching 15 m in height, it is one of the tallest trees in coastal

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Clockwise from top left:

Figure 14. *Güerequi* (*Ibervillea sonorae*). A. Tuberous plant. B. Young fruit. C. Mature fruit and leaves. D. Tree ocotillo (*Fouquieria macdougalii*) near Benjamín Hill. *Photos credit Reina-G. and Van Devender.*

Figure 15. *Guayacán* (*Guaiacum coulteri*). A. Flowering tree at Hermosillo. Jesús Sánchez-E. near plant. *Photo credit G. Guadalupe Morales-F.* B. Flowers at Mátape. *Photo credit Van Devender.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

thornscrub (Martin et al. 1998) and has one of the densest woods in the world. Cudjoewood (*Bonellia macrocarpa*) is a tropical shrub from Panama north to western Mexico. In Sinaloa and Sonora, *san juanico* (*B. m.* subsp. *pungens*) is in tropical deciduous forest, coastal and foothills thornscrub, and Plains of Sonora desertscrub. The needle-sharp spines on the leaf tips and small orange flowers are distinctive.

Most of the 11 species of *Fouquieria* in the family Fouquieriaceae are small trees. The *ocotillo* (*Fouquieria splendens*) with multiple long stems from the base and boojum tree or *cirio* (*F. columnaris*) with a single swollen trunk and small side branches are the exceptions. *Ocotillo* is one of the most widely distributed desert plants in North America in the Chihuahuan, Mohave, and Sonoran Deserts. Tree ocotillo or *ocotillo macho* (*F. macdougalii*) is a common succulent tree in tropical deciduous forest in Sinaloa and coastal and foothills thornscrub and Plains of Sonora desertscrub in Sonora (Figure 14D). *Palo Adán* (*F. diguetii*) is a shrubby ocotillo common from the Vizcaíno subdivision south to the tropical Cape Region in Baja California with mainland populations in Plains of Sonora desertscrub in the Guaymas area and in coastal thornscrub near Las Bocas in southern Sonora.

Discussion

The strongest floristic affinities of the Huatabampo flora are with the New World tropics. Species that are new records for Sonora and northern range extensions of tropical species include *Bastardia viscosa, Citharexylum scabrum, Clinopodium brownei, Doyerea emetocathartica, Fimbristylis pallidula, Kosteletzkya depressa, Libidibia sclerocarpa, Marsilea deflexa, Mimosa pigra* var. *asperata, Neptunia plena, Pithecellobium unguis-cati, Lycium carolinianum, Okenia hypogaea,* and *Varronia globosa. Nesaea longipes* in the Municipality is the first record from Sonora, the second for Mexico, and a range extension of a Texas species. *Tumamoca macdougalii* is a Sonoran Desert species that was federally listed in the United States in 1986 and then delisted in 1993. The southern limit of its range is in the coastal thornscrub area.

Palmer's 1890 specimen from Agiabampo was the holotype of *Jatropha purpurea. Euphorbia gentryi* was described from Mesa Masiaca just east of the Huatabampo study area in the Municipality of Navojoa (Steinmann & Daniel 1995). Both species are endemic to coastal thornscrub in southern Sonora and adjacent Sinaloa.

Conservation. The *pitahayal* is a succulent-dominated unique vegetation type unmatched in northern Mexico or the southwestern United States. Large areas of the Municipality of

continued next page

Figure 16. Coteco Biological Reserves near Las Bocas. A. David A. Yetman in 2000. *Photo credit Van Devender.* B. Caretaker Pilar Sesma and Van Devender. *Photo credit Reina-G.*

Coastal Thornscrub Flora and Vegetation, Huatabampo *continued*

Huatabampo — where water is available from the Sinaloa border north to Francisco Sarabia and near Huatabampo in the north — have been cleared for agriculture. Less than half of the *pitahayal* remains intact. In 2000, David Yetman (Figure 16A) and Vicente Tajia created the Coteco Biological Reserves on Masaica Indigenous Community land near Las Bocas. Areas of about 500 and 63 acres were fenced to prevent cattle grazing and wood harvesting (Yetman 2006; Figure 16B). Since 2018, the Tucson Cactus and Succulent Society has supported Coteco. Working with Nature and Culture International, there is a current initiative to create a Reserva Estatal El Pitayal (a Sonoran state reserve) to protect a remnant area of *pitahayal* on Bahía Agiabampo in southernmost Sonora near La Estación de Campo Navopatia, a non-profit organization incorporated in 2002 (Arellano 2023).

Acknowledgments

We thank the many individuals who helped survey plants in the Municipality of Huatabampo, especially David Yetman and Rebecca K. Wilson. Specialists who helped with identifications and taming the ever-changing scientific names were Michael Bauer (Poaceae), Sue Carnahan (general), Mark Fishbein (Apocynaceae), Socorro González, Max Licher, and Gordon Tucker (Cyperaceae), Guy Nesom (Asteraceae), Victor Steinmann (Euphorbiaceae), and George Yatskievych (ferns). Careful editing by Sue Carnahan and Ries Lindley improved the manuscript. Sue Carnahan, Mark Dimmitt, K. Moore, Guadalupe Morales-F., Philip Rosen, and Ceal Smith provided images. Thomas Staudt of the Tucson Cactus and Succulent Society helped with information about Coteco. Marina Maskaykina at Greater Good Charities drafted the maps.

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CHECKLIST: Municipality of Huatabampo, Sonora, Mexico *page 1 of 6*

An asterisk (*) denotes non-native status.

Pteridophytes

MARSILEACEAE

Marsilea deflexa A. Braun

Marsilea vestita Hook. & Grev.

OPHIOGLOSSACEAE

Ophioglossum nudicaule L. f.

PTERIDACEAE

Cheilanthes lozanoi (Maxon) R.M. Tryon & A.F. Tryon

Eudicots

ACANTHACEAE

Avicennia germinans (L.) L.

Carlowrightia arizonica A. Gray

Carlowrightia pectinata Brandegee

Dicliptera resupinata (Vahl) Juss.

Elytraria imbricata (Vahl) Pers.

Henrya insularis Nees ex Benth.

Justicia californica (Benth.) D. Gibson

Justicia candicans (Nees) L. Benson

Justicia longii Hilsenb.

Justicia masiaca T.F. Daniel

Ruellia ciliatiflora Hook.

Tetramerium nervosum Nees

Tetramerium yaquianum T.F. Daniel

ACHATOCARPACEAE

Phaulothamnus spinescens A. Gray

AIZOACEAE

Sesuvium portulacastrum L.

Sesuvium verrucosum Raf.

Trianthema portulacastrum L.

AMARANTHACEAE

Allenrolfea occidentalis (S. Watson) Kuntze

Alternanthera stellata Uline & Bray

Amaranthus fimbriatus (Torr.) Benth. ex S. Watson

Amaranthus palmeri S. Watson

Amaranthus venulosus S. Watson

Arthrocnemum subterminale (Parish) Standl.

Atriplex barclayana D. Dietr.

Atriplex linearis S. Watson

**Chenopodiastrum murale* (L.) S. Fuentes, Uotila & Borsch

Chenopodium ficifolium Sm.

Chenopodium palmeri Standl.

Chenopodium pratericola Rydb.

Dysphania graveolens (Willd.) Mosyakin & Clemants

Gomphrena globosa L.

Gomphrena sonorae Torr.

Salicornia bigelovii Torr.

Sarcocornia pacifica (Standl.) A.J. Scott

Suaeda esteroa W.R. Ferren & S.A. Whitmore

Suaeda nigra J.F. Macbride

Tidestromia lanuginosa (Nutt.) Standl.

APIACEAE

**Anethum graveolens* L.

Eryngium nasturtiifolium Juss. ex F. Delaroche

APOCYNACEAE

Asclepias subaphylla Woodson

Asclepias subulata Decne.

**Cryptostegia grandiflora* R. Br.

Dictyanthus altatensis (Brandegee) W.D. Stevens

Funastrum clausum Schltr.

Funastrum heterophyllum (Engelm. ex Torr.) Standl.

Funastrum pannosum Schltr.

Metastelma arizonicum A. Gray

Metastelma californicum Benth.

Metastelma cuneatum Brandegee

Metastelma schaffneri A. Gray

Metastelma schlechtendalii Decne. var. *arenicola* Liede & Meve

Polystemma canisferum McDonnell & Fishbein

Ruehssia edulis (S. Watson) L.O. Alvarado

Vallesia glabra Link

ARISTOLOCHIACEAE

Aristolochia watsonii Wooton & Standl.

ASTERACEAE

Aldama congesta (Rose ex Ralph Hoffm.) E.E. Schill. & Panero

Ambrosia ambrosioides (Cav.) W.W. Payne

Ambrosia confertiflora DC.

Ambrosia cordifolia (A. Gray) W.W. Payne

Baccharis salicifolia (Ruiz & Pav.) Pers.

Baccharis sarothroides A. Gray

Bebbia juncea (Benth.) Greene

Blumea viscosa (Miller) Badillo

Brickellia coulteri A. Gray

Chloracantha spinosa (Benth.) G.L. Nesom

Chromolaena sagittata (A. Gray) R.M. King & H. Rob.

Dicoria argentea Strother

Eclipta prostrata (L.) L.

Egletes viscosa (L.) Less.

Encelia farinosa A. Gray ex Torr.

Encelia halimifolia Cav.

Flaveria trinervia (Spreng.) C. Mohr

Gamochaeta stagnalis (I.M. Johnst.) Anderb.

Helenium laciniatum A. Gray

Hymenoclea monogyra Torr. & A. Gray ex A. Gray

Lagascea decipiens Hemsl.

Lasianthaea fruticosa (L.) K.M. Becker

Melampodium appendiculatum B.L. Robins.

Melampodium cupulatum A. Gray

Melampodium divaricatum (Rich.) DC.

Palafoxia arida B.L Turner & Morris

Palafoxia linearis (Cav.) Lag. var. *linearis*

Pectis coulteri Harvey & A. Gray

Pectis cylindrica (Fern.) Rydb.

Pectis papposa Harv. & A. Gray var. *papposa*

Pectis prostrata Cav.

Pectis purpurea Brandegee var. *sonorae* Keil

Pectis stenophylla A. Gray

Perityle californica Benth.

Perityle microglossa Benth.

Pluchea carolinensis G. Don

Pluchea symphytifolia (Miller) W.T. Gillis

Porophyllum gracile Benth.

**Sonchus oleraceus* L.

Trixis californica Kellogg var. *californica*

Verbesina encelioides (Cav.) Benth. & Hook. f. ex A. Gray var. *encelioides*

CHECKLIST: Municipality of Huatabampo, Sonora, Mexico

Viguiera dentata (Cav.) Spreng.

*Xylothamia diffusa (*Benth.) G.L. Nesom

BATACEAE

Batis maritima L.

BIGNONIACEAE

Handroanthus impetiginosus (Mart. ex DC.) Mattos

Macfadyena unguis-cati (L.) A.H. Gentry

BIXACEAE

Cochlospermum palmatifidum (DC.) Byng & Christenh.

BORAGINACEAE

Johnstonella grayi (Vasey & Rose) Hasenstab & M.G. Simpson var. *cryptochaeta* (J.F. Macbr.) Hasenstab & M.G. Simpson

BRASSICACEAE

**Brassica nigra* (L.) W.D.J. Koch

**Brassica rapa* L.

**Capsella bursa-pastoris* (L.) Medik.

Descurainia pinnata (Walter) Britton

Dryopetalon runcinatum A. Gray

**Lepidium didymum* L.

Lepidium lasiocarpum Nutt.

Rorippa teres (Michx.) Stuckey

**Sisymbrium irio* L.

BURSERACEAE

Bursera fagaroides (Kunth) Engl. var. *elongata* McVaugh & Rzed.

Bursera laxiflora S. Watson

Bursera microphylla A. Gray

CACTACEAE

Cylindropuntia fulgida (Engelm.) Knuth

Cylindropuntia leptocaulis (DC.) F.M. Knuth

Cylindropuntia leptocaulis (DC.) F.M. Knuth x *C. thurberi* (Engelm.) F.M. Knuth

Cylindropuntia thurberi (Engelm.) F.M. Knuth var. *thurberi*

Echinocereus leucanthus N.P. Taylor

Ferocactus herrerae Ortega

Lophocereus schottii (Engelm.) Britton & Rose var. *tenuis* G.E. Linds.

Mammillaria bocensis R.T. Craig

Mammillaria grahamii Engelm.

Mammillaria mazatlanensis K. Schum.

Opuntia bravoana E.M. Baxter

Opuntia decumbens Salm-Dyck

Opuntia maxonii J.G. Ortega

Opuntia aff. *wilcoxii* Britton & Rose

Pachycereus pecten-aboriginum Britton & Rose

Peniocereus marianus (Gentry) Sánchez-Mej.

Peniocereus striatus (Brandegee) Buxbaum

Pereskiopsis porteri Britton & Rose

Selenicereus vagans Britton & Rose

Stenocereus alamosensis (J.M. Coult.) A.C. Gibson & K.E. Horak

Stenocereus thurberi (Engelm.) Buxbaum

CANNABACEAE

Celtis pallida Torr.

CAPPARACEAE

Atamisquea emarginata Miers ex Hooker & Arnott

Capparis flexuosa (L.) L.

CARYOPHYLLACEAE

Drymaria glandulosa Bartl.

CELASTRACEAE

Maytenus phyllanthoides Benth.

CLEOMACEAE

Cleome tenuis S. Watson

**Corynandra viscosa* (L.) Cochrane & Iltis

COMBRETACEAE

Conocarpus erecta L.

Laguncularia racemosa S. Watson

CONVOLVULACEAE

Cressa truxillensis Kunth

Cuscuta americana L.

Cuscuta boldinghii Urban

Cuscuta desmouliniana Yunck.

Cuscuta erosa Yunck.

Cuscuta indecora Choisy

Cuscuta legitima Costea & Stefanovic

Cuscuta tuberculata Brandegee

Evolvulus alsinoides L. var. *angustifolia* Torr.

Ipomoea arborescens (Humb. & Bonpl.) G. Don var. *glabrata* (A. Gray) Gentry

Ipomoea barbatisepala A. Gray

Ipomoea bracteata Cav.

**Ipomoea carnea* Jacq.

Ipomoea costellata Torr

Ipomoea cristulata Hallier f.

Ipomoea imperati (Vahl) Giseb.

Ipomoea jalapa Schiede & Deppe ex G. Don

Ipomoea pedicellaris Benth.

Ipomoea pes-caprae Roth

Ipomoea plummerae A. Gray

Ipomoea scopulorum Brandegee

Ipomoea ternifolia Torr. var. *leptotoma* (Torr.) J.A. McDonald

Ipomoea triloba L.

Jacquemontia agrestis (Mart. ex Choisy) Meisn.

Jacquemontia polyantha Hallier f.

Jacquemontia pringlei A. Gray

Merremia palmeri Hallier f.

Operculina pinnatifida (Kunth) O'Donell

CORDIACEAE

Cordia parvifolia G. Don

Varronia curassavica Jacq.

Varronia globosa Jacq.

CUCURBITACEAE

Apodanthera palmeri S. Watson

**Citrullus lanatus* (Thunb.) Matsum. & Nakai

**Cucumis melo* L.

Cucurbita argyrosperma K. Koch subsp. *sororia* (L.H. Bailey) Merrick & D.M. Bates

Doyerea emetocathartica Grosourdy

Echinopepon cirrhopedunculatus Rose

Echinopepon wrightii (A. Gray) S. Watson

Ibervillea sonorae Greene

Tumamoca macdougalii Rose

EBENACEAE

Diospyros sonorae Standl.

ELATINACEAE

Bergia texana (Hook.) Seub.

EUPHORBIACEAE

Acalypha aliena Brandegee

Acalypha californica Benth.

CHECKLIST: Municipality of Huatabampo, Sonora, Mexico *page 3 of 6*

Acalypha ostryifolia Riddell ex J. M. Coult.
Acalypha papillosa Rose
Acalypha subviscida S. Watson
Adelia brandegeei V.W. Steinm.
Argythamnia serrata (Torr.) Müll.-Arg
Bernardia viridis Millsp.
Croton californicus Müll.-Arg
Croton ciliatoglandulifer Ortega
Croton flavescens Greenm.
Croton sonorae Torr.
Croton subjucundus Croizat
Euphorbia abramsiana L.C. Wheeler
Euphorbia albomarginata Torr. & A. Gray
Euphorbia californica Boiss.
Euphorbia capitellata Engelm.
Euphorbia cymosa Poir.
Euphorbia florida Engelm.
Euphorbia hyssopifolia L.
Euphorbia incerta Brandegee
Euphorbia lomelii V.W. Steinm.
Euphorbia pediculifera Engelm.
Euphorbia petrina S. Watson
Euphorbia polycarpa Benth.
Euphorbia tomentulosa S. Watson
Euphorbia trachysperma Engelm.
Jatropha cardiophylla (Torr.) Müll.-Arg
Jatropha cinerea (Ortega) Müll.-Arg
Jatropha cordata Müll.-Arg.
Jatropha purpurea Rose
Manihot davisiae Croizat
**Ricinus communis* L.
Tragia glanduligera Pax & K. Hoffm.
Tragia mcvaughii Urtecho

FABACEAE

Acacia cochliacantha Humb. & Bonpl. ex Willd.
Acacia constricta Benth.
Acacia farnesiana (L.) Willd.
Acacia russelliana (Britton & Rose) Lundell
Albizia sinaloensis Britton & Rose
Caesalpinia platyloba S. Watson
Caesalpinia pulcherrima (L.) Sw.
Calliandra eriophylla Benth.
Chloroleucon mangense (Jacq.) Britton & Rose var. *leucospermum* (Brandgee) Barneby & Grimes
Coursetia caribaea (Jacq.) Lavin var. *caribaea*
Coursetia glandulosa A. Gray
Dalea mollis Benth.
Desmanthus covillei (Britton & Rose) Wiggins ex B.L. Turner
Desmodium procumbens (P. Mill.) A.S. Hitchc.
Erythrina flabelliformis Kearney
Erythrostemon palmeri (S. Watson) Gagnon & G.P. Lewis
Eysenhardtia orthocarpa (A. Gray) S. Watson
Gretheria sonorae (S. Watson) Duno & Torke
Haematoxylum brasiletto Karst.
Havardia mexicana (Rose) Britton & Rose
**Leucaena leucocephala* (Lam.) de Wit
Libidibia sclerocarpa (Standl.) Britton & Rose
Lonchocarpus hermannii M. Sousa
Lonchocarpus mexicanus Pittier
Lysiloma divaricatum (Jacq.) J.F. Macbr.
Macroptilium atropurpureum (Moc. & Sessé ex DC.) Urban
Marina palmeri (Rose) Barneby
Marina peninsularis (Rose) Barneby
Mariosousa russelliana (Britton & Rose) Seigler & Ebinger
**Medicago polymorpha* L.
**Melilotus indicus* (L.) All.
Mimosa distachya Vent.
Mimosa pigra L. var. *asperata* (L.) Zarucchi, Vincent & Gandhi
Neltuma articulata (S. Watson) Britton & Rose
Neltuma odorata (Torr. & Frém.) C.E. Hughes & G.E. Hughes
Neptunia plena (L.) Benth.
Olneya tesota A. Gray
Parkinsonia aculeata L.
Parkinsonia florida (Benth. ex A. Gray) S. Watson
Parkinsonia praecox (Ruiz & Pav.) J.A. Hawkins
Piscidia mollis Rose
Pithecellobium dulce (Roxb.) Benth.
Pithecellobium unguis-cati (L.) Benth.
Rhynchosia minima (L.) DC.
Rhynchosia precatoria DC.
Senna atomaria (L.) H.S. Irwin & Barneby
Senna covesii (A. Gray) H.S. Irwin & Barneby
Senna pallida (Vahl) H.S. Irwin & Barneby
Sesbania herbacea (P. Mill.) McVaugh
Sphinctospermum constrictum (S. Watson) Rose

FOUQUIERIACEAE

Fouquieria diguetii (Tiegh.) I.M. Johnst.
Fouquieria macdougalii Nash

GENTIANACEAE

Eustoma exaltatum (L.) Salisb. ex G. Don

HELIOTROPIACEAE

Euploca fruticosa (L.) J.I.M. Melo & Semir
Heliotropium angiospermum Murray
Heliotropium curassavicum L.
Heliotropium hartwegianum (Steud.) Halse & Feuillet
Heliotropium macrostachyum Hemsl.

KOEBERLINIACEAE

Koeberlinia spinosa Zucc.

KRAMERIACEAE

Krameria erecta Willd. ex J.A. Schultes
Krameria sonorae Britton

LAMIACEAE

Clinopodium brownei (Sw.) Kuntze
Hyptis albida Kunth
Salvia misella Kunth
Salvia riparia Kunth
Teucrium cubense Jacq.
Teucrium glandulosum Kellogg
Vitex mollis Kunth

LENNOACEAE

Pholisma culiacanum (Dressler & Kuijt) Yatsk.

CHECKLIST: Municipality of Huatabampo, Sonora, Mexico *page 4 of 6*

LOASACEAE

Mentzelia aspera L.

LORANTHACEAE

Psittacanthus sonorae (S. Watson) Kuijt

Struthanthus palmeri Kuijt

LYTHRACEAE

Ammannia robusta Heer & Regel

Nesaea longipes A. Gray

MALPIGHIACEAE

Callaeum macropterum (Moc. & Sesse ex DC.) D.M. Johnson

Cottsia californica (Benth) W.R. Anderson & C. Davis

Galphimia angustifolia Benth.

Malpighia emarginata ex DC.

MALVACEAE

Abutilon abutiloides (Jacq.) Garcke ex Britton & Wilson

Abutilon californicum Benth.

Abutilon incanum (Link) Sweet

Abutilon palmeri A. Gray

Anoda pentaschista A. Gray

Ayenia filiformis S. Watson

Ayenia jaliscana S. Watson

Bastardia viscosa (L.) Kunth

Bastardiastrum cinctum (Brandegee) D.M. Bates

Byttneria aculeata (Jacq.) Jacq.

Ceiba aesculifolia (Kunth) Britten & Baker f.

Corchorus hirtus L.

Corchorus siliquosus L.

Guazuma ulmifolia Lam.

Herissantia crispa (L.) Briz.

Hibiscus biseptus S. Watson

Kosteletzkya depressa (L.) O.J. Blanch., Fryxell & D.M. Bates

**Malva parviflora* L.

Malvastrum bicuspidatum (S. Watson) Rose

Malvastrum coromandelianum (L.) Garcke

Melochia pyramidata L.

Melochia speciosa S. Watson

Melochia tomentosa L.

Sida abutilifolia Mill.

Sphaeralcea coulteri (S. Watson) A. Gray

MARTYNIACEAE

Proboscidea althaeifolia (Benth.) Decne.

Proboscidea parviflora (Wooton) Wooton & Standl.

MENISPERMACEAE

Nephroia diversifolia (DC.) L. Lian & Wei Wang

MOLLUGINACEAE

Glinus radiatus (Ruiz & Pav.) Rohrb.

Mollugo verticillata L.

MORACEAE

Ficus cotinifolia Kunth

Ficus petiolaris Kunth

NAMACEAE

Nama coulteri A. Gray

Nama hispidum A. Gray var. *sonorae* L.C. Hitchc.

NYCTAGINACEAE

Abronia maritima Nutt. ex S. Watson

Allionia incarnata L.

Boerhavia erecta L.

Boerhavia spicata Choisy

Boerhavia triquetra S. Watson var. *intermedia* (M.E. Jones) Spellenb.

Boerhavia xantii S. Watson

Commicarpus scandens (L.) Standl.

Okenia hypogaea Schltdl. & Cham.

Pisonia capitata (S. Watson) Standl.

Salpianthus arenarius Bonpl.

Salpianthus macrodontus Standl.

NYMPHAEACEAE

Nymphaea elegans Hook.

ONAGRACEAE

Ludwigia octovalvis (Jacq.) Raven

Oenothera drummondii Hook. subsp. *thalassaphila* (Brandegee) W. Dietr. & W.L. Wagner

Oenothera kunthiana (Spach) Munz

OPILIACEAE

Agonandra racemosa Standl.

PAPAVERACEAE

Argemone ochroleuca Sweet

PASSIFLORACEAE

Passiflora arida (Mast. & Rose) Killip

Passiflora foetida L. var. *gossypiifolia* (Desv. ex Ham.) Mast.

PEDALIACEAE

**Sesamum orientale* Sieber ex Presl

PETIVERIACEAE

Rivina humilis L.

PHYLLANTHACEAE

Phyllanthus evanescens Brandegee

PLANTAGINACEAE

Callitriche terrestris Raf.

Mecardonia procumbens (Mill.) Small

Nuttallanthus texanus (Scheele) D.A. Sutton

Sairocarpus costatus (Wiggins) D.A. Sutton

Stemodia durantifolia (L.) Sw. var. *durantifolia*

PLUMBAGINACEAE

Plumbago zeylanica L.

POLEMONIACEAE

Dayia sonorae (Rose) J.M. Porter

POLYGONACEAE

Antigonon leptopus Hook. & Arn.

Rumex inconspicuus Rech. f.

Rumex maritimus L.

PORTULACACEAE

Portulaca oleracea L.

Portulaca suffrutescens Engelm.

Portulaca umbraticola Kunth

PRIMULACEAE

Bonellia macrocarpa B. Ståhl & Källersjö subsp. *pungens* (A. Gray) B. Ståhl & Källersjö

RESEDACEAE

Forchhammeria watsonii Rose

Oligomeris linifolia (Vahl) J.F. Macbr.

RHAMNACEAE

Colubrina triflora Brongn.

Colubrina viridis (M.E. Jones) M.C. Johnst.

Condalia globosa I.M. Johnst.

Condaliopsis divaricata (A. Nelson) G.L. Nesom

Gouania rosei Wiggins

CHECKLIST: Municipality of Huatabampo, Sonora, Mexico *page 5 of 6*

Karwinskia humboldtiana Zucc.

Sarcomphalus amole (Sessé & Moc.) Hauenschild

RHIZOPHORACEAE

Rhizophora mangle Roxb.

RUBIACEAE

Chiococca alba (L.) Hitchc.

Hintonia latiflora Bullock

Mitracarpus hirtus (L.) DC.

Randia echinocarpa Sessé & Moc. ex DC.

Randia obcordata S. Watson

Randia thurberi S. Watson

Spermacoce tenuior L.

RUTACEAE

Amyris balsamifera L.

Esenbeckia hartmanii B.L. Robins. & Fernald

Zanthoxylum fagara Sargent

SALICACEAE

Populus mexicana Sarg. subsp. *dimorpha* (Brandegee) Eckenw.

SANTALACEAE

Phoradendron brachystachyum (DC.) Oliv.

Phoradendron californicum Nutt.

SAPINDACEAE

Cardiospermum corindum L.

Sapindus saponaria L.

Serjania palmeri S. Watson

SAPOTACEAE

Sideroxylon occidentale (Hemsl.) T.D. Penn.

SCHOEPFIACEAE

Schoepfia shreveana Wiggins

SCROPHULARIACEAE

Buddleja sessiliflora Kunth

SOLANACEAE

Calibrachoa parviflora (Juss.) D'Arcy

Capsicum annuum L. var. *glabriusculum* (Dunal) Heiser & Pickersgill

Datura discolor Bernh.

Datura innoxia Mill.

Datura lanosa Barclay ex Bye

Lycium andersonii A. Gray

Lycium berlandieri Dunal

Lycium brevipes Benth.

Lycium californicum Nutt. ex A. Gray

Lycium carolinianum Walter

Lycium fremontii A. Gray

**Nicotiana glauca* Graham

Nicotiana obtusifolia M. Martens & Galeotti

Physalis acutifolia (Miers) Sandw.

Physalis crassifolia Benth.

Physalis latiphysa Waterfall

Physalis minuta Griggs

Physalis philadelphica Lam.

Physalis pubescens L.

Physalis subulata Rydb.

Solanum americanum Mill.

Solanum elaeagnifolium Cav.

Solanum ferrugineum Jacq.

Solanum grayi Rose

Solanum houstonii Martyn

**Solanum lycopersicum* L.

STEGNOSPERMATACEAE

Stegnosperma halimifolium Bentham

TALINACEAE

Talinum paniculatum (Jacq.) Gaertn.

TAMARICACEAE

**Tamarix aphylla* (L.) Karst

**Tamarix chinensis* Lour.

URTICACEAE

Parietaria hespera B.D. Hinton var. *hespera*

VERBENACEAE

Aloysia gratissima (Gillies & Hook.) Tronc.

Aloysia sonorensis Moldenke

Bouchea dissecta S. Watson

Citharexylum scabrum Sessé & Moc. ex D. Don

Lantana camara L.

Lippia graveolens Kunth

Lippia palmeri S. Watson

Phyla nodiflora (L.) Greene

Verbena halei Small

Verbena menthifolia Benth.

VIOLACEAE

Hybanthus attenuatus (Humb. & Bonpl. ex Willd.) Schulze-Menz

Hybanthus fruticulosus I.M. Johnst.

VITACEAE

Cissus mexicana Moc. & Sessé ex DC.

Cissus trifoliata (L.) L.

ZYGOPHYLLACEAE

Guaiacum coulteri A. Gray

Kallstroemia californica (S. Watson) Vail

Kallstroemia grandiflora Torr. ex A. Gray

Kallstroemia parviflora Norton

Monocots

ALISMATACEAE

Echinodorus berteroi (Spreng.) Fassett

Sagittaria longiloba Engelm. ex J.G. Sm.

AMARYLLIDACEAE

Hymenocallis sonorensis Standl.

ASPARAGACEAE

Agave aktites Gentry

Agave angustifolia Haw.

ASPHODELACEAE

**Aloe barbadensis* P. Mill.

BROMELIACEAE

Tillandsia exserta Fernald

Tillandsia recurvata (L.) L.

COMMELINACEAE

Commelina erecta L.

CYPERACEAE

Bolboschoenus maritimus (L.) Palla var. *paludosus* (A. Nelson) Á. Löve & D. Löve

Cyperus compressus L.

Cyperus dentoniae G.C. Tucker

Cyperus entrerianus Boeckeler

Cyperus esculentus L.

Cyperus flavicomus Michx.

Cyperus hermaphroditus (Jacq,) Standl.

Cyperus odoratus L.

Cyperus oxylepis Nees ex Steud.

Cyperus perennis (M.E. Jones) O'Neill

**Cyperus rotundus* L.

Cyperus semiochraceus Boeck.

Cyperus squarrosus L.

Cyperus surinamensis Rottb.

CHECKLIST: Municipality of Huatabampo, Sonora, Mexico *page 6 of 6*

Cyperus trachynotus Torr.

Fimbristylis annua (All.) Roemer & J.A. Schultes

Fimbristylis dichotoma Vahl

Fimbristylis pallidula Kral

POACEAE

Anthephora hermaphrodita (L.) Kuntze

Aristida adscensionis L.

Aristida californica Thurb. ex S. Watson var. *californica*

Aristida ternipes Cav. var. *ternipes*

**Arundo donax* L.

**Avena fatua* L.

Bouteloua aristidoides (Kunth) Griseb.

Bouteloua barbata Lag. var. *barbata*

Bouteloua barbata Lag. var. *rothrockii* (Vasey) Gould

Bouteloua barbata Lag. var. *sonorae* (Griffiths) Gould

Bouteloua diversispicula Columbus

**Cenchrus ciliaris* L.

Cenchrus echinatus L.

Cenchrus incertus M.A. Curtis

Cenchrus palmeri Vasey

Cenchrus spinifex Cav.

**Chloris barbata* Sw.

Chloris virgata Sw.

**Cynodon dactylon* (L.) Pers.

**Dactyloctenium aegyptium* (L.) Willd.

**Dichanthium annulatum* (Forssk.) Stapf

**Digitaria bicornis* (Lam.) Roem. & Schult.

*Dinebra panicea (*Retz.) P.M. Peterson & N. Snow subsp. *brachiata* (Steud.) P.M. Peterson & N. Snow

Dinebra panicoides (J. Presl) P.M. Peterson & N. Snow

Dinebra viscida (Scribn.) P.M. Peterson & N. Snow

Distichlis littoralis (Engelm.) H.L. Bell & Columbus

Distichlis spicata (L.) Greene

**Echinochloa colona* (L.) Link

**Eragrostis cilianensis* (All.) Vignolo ex Janch.

Eragrostis pectinacea (Michx.) Nees ex Steud.

Eriochloa aristata Vasey

Jouvea pilosa Scribn.

Luziola gracillima Prodoehl

Panicum alatum Zuloaga & Morrone var. *minus* (Andersson) Zuloaga & Morrone

**Panicum antidotale* Retz.

Panicum hirticaule J. Presl var. *hirticaule*

Panicum stramineum A.S. Hitchc. & Chase

Pappophorum philippianum Parodi

Paspalum squamulatum E. Fourn.

**Phalaris minor* Retz.

Setaria arizonica Rominger

Setaria liebmannii E. Fourn.

Setaria Setaria macrostachya Kunth

**Sorghum halepense* (L.) Pers.

Sporobolus cryptandrus (Torr.) A. Gray

Sporobolus pyramidatus (Lam.) A.S. Hitchc.

Sporobolus virginicus Kunth

Steinchisma hians (Elliott) Nash

Tridentopsis eragrostoides (Vasey & Scribn.) P.M. Peterson

Urochloa arizonica (Scribn. & Merr.) Morrone & Zuloaga

Urochloa fusca (Sw.) B.F. Hansen & Wunderlin

**Urochloa reptans* Stapf

PONTEDERIACEAE

Heteranthera limosa (Sw.) Willd.

Correction/Addition to Gymnosperm Article in *Plant Press Arizona* Vol. 47(1), Spring 2024

Two AZNPS members, Max Licher and Tom Van Devender, have pointed out that some of the information presented in the previous *Plant Press Arizona* issue article on Arizona gymnosperms should be expanded based on the lack of agreement among botanists on the taxonomic relationships of some of the species presented. Specifically, Max has made the following observations:

1. Single-needled Plants from NW through Central AZ. These trees should be called *Pinus edulis* var. *fallax*, *not Pinus monophylla*, based on a number of needle morphological characters, seasonal variation in number of needles per bundle, and habitat/climate adaptations. Tom Van Devender, however, disagrees with that conclusion and cited several studies that indicate that *Pinus monophylla* is indeed the correct name for the Arizona pinyon.

2. **The Bristlecone Pine in AZ.** The San Francisco Peaks trees are allied with the Rocky Mountain trees, not the Great Basin trees. Most taxonomic sources that he has seen treat this group as separate species, with *Pinus balfouriana* (Foxtail pine) along the Pacific coast, *Pinus longaeva* (Great Basin Bristlecone pine) in eastern CA, Nevada, and Utah, and *Pinus aristata* (Colorado Bristlecone pine), in Colorado, NM, and the San Francisco Peaks in AZ.

3. The Subalpine Firs. These trees pose a more complicated taxonomic question, with less agreement found in the literature. The *Flora of North America* (1993) treated Rocky Mountain plants, including Arizona species, as *Abies bifolia*, with *Abies lasiocarpa* relegated to the Pacific Coast. Ackerfield (2015) did the same in her recent *Flora of Colorado*. In this case, the Arizona Corkbark fir would best be treated as a variety of *A. bifolia*, rather than *A. lasiocarpa*, but Max does not believe that that combination has been published anywhere.