



# A new species of *Bursera* (Burseraceae) from the East Cape Region in Baja California Sur, Mexico

## Una nueva especie de *Bursera* (Burseraceae) del Este de la Región de Los Cabos en Baja California Sur, México

José Luis León de la Luz<sup>1,2</sup> , Alfonso Medel Narváez<sup>1</sup>, Reymundo Domínguez Cadena<sup>1</sup>

1 Centro de Investigaciones Biológicas del Noroeste, S.C., Herbario HCIB, Apdo. postal 128, 23000 La Paz, Baja California Sur, México.

2 Autor para la correspondencia: jlleon04@cibnor.mx

Citar como:

León de la Luz, J. L., A. Medel Narváez y R. Domínguez Cadena 2017. A new species of *Bursera* (Burseraceae) from the East Cape Region in Baja California Sur, Mexico. *Acta Botanica Mexicana* 118: 97-103. DOI: <http://dx.doi.org/10.21829/abm118.2017.1202>

Recibido: 11 de septiembre de 2015.

Revisado: 18 de mayo de 2016.

Aceptado: 7 de octubre de 2016.

DOI:

<http://dx.doi.org/10.21829/abm118.2017.1202>

### ABSTRACT:

**Background and Aims:** Intensive fieldwork along the shore of the East Cape Region in the Baja California Peninsula by the authors has resulted in the discovery and publication of some new species for the Mexican flora in recent years.

**Methods:** An additional novelty found was a tree considered at first to be *Bursera microphylla*, but a more detailed inspection showed the leaflets to be few in number and broadly obovate-elliptic. These and additional differences of the leaves and flowers warrant recognition of this plant as a new species.

**Key results:** We here describe and illustrate *Bursera exequielii* (Burseraceae), which belongs to section *Bursera* and we discuss its morphological relationship with *B. microphylla*, from which it differs mainly by the number, form and size of the leaflets.

**Conclusions:** The only known population is threatened due to the mega-touristic developments in the zone.

**Key words:** biodiversity, new species, Sonoran Desert, taxonomy.

### RESUMEN:

**Antecedentes y Objetivos:** El intensivo trabajo de exploración por parte de los autores sobre la costa Este en la Región de los Cabos, en la península de Baja California, ha resultado recientemente en el descubrimiento y publicación de varias nuevas especies para la flora Mexicana.

**Métodos:** Una novedad adicional es un árbol identificado inicialmente como *Bursera microphylla*, pero una inspección más detallada mostró que los folíolos eran pocos en número y ampliamente obovados-elípticos. Estas y otras diferencias de las hojas y las flores justifican el reconocimiento de esta planta como una nueva especie.

**Resultados clave:** Ilustramos y describimos el nuevo taxon *Bursera exequielii* (Burseraceae), el cual pertenece a la sección *Bursera*, y se discute su relación morfológica con *B. microphylla* de la cual difiere principalmente por el número, la forma, y el tamaño de los folíolos.

**Conclusiones:** La única población conocida se encuentra amenazada por mega-desarrollos turísticos en la zona.

**Palabras clave:** biodiversidad, Desierto Sonorense, nueva especie, taxonomía.

### INTRODUCTION

*Bursera* is an American genus with around 100 species, most of them native to the Mexican dry tropics on the Pacific slope (Espinosa et. al., 2006; De Nova et al., 2012). According to Rzedowski (2015) the current number of *Bursera* taxa in Mexico is 89. It is a difficult taxonomic group because it is dioecious and mostly deciduous, and the leaves are often absent from flowering or fruiting specimens. As a consequence, field observations and several collections are necessary. Moreover, vegetative structures are difficult to preserve and analyze in voucher specimens since they easily disassemble at drying. Hence, *Bursera* taxonomy is based

on morphological characteristics of leaves, flowers, fruits, and bark when observed mainly in fresh material, at the time of collecting (Rzedowski et al., 2004).

## MATERIAL AND METHODS

As a result of intensive fieldwork along the Baja California Peninsula during a project to document the floristic composition of the beaches of Mexico (Espejel Carbajal et al., 2015), the eastern shore of the southern Baja California Sur, known as the East Cape Region, was visited by the authors in different locations for plant collecting and vegetation sampling, resulting in the discovery of some interesting plants (León de la Luz and Levin, 2012; León de la Luz and Medel Narváez, 2013). An additional novelty found was a tree located just beside a beach, on a sandy marine terrace. This tree was considered at first to be a “torote rojo”, *Bursera microphylla* A. Gray, one of the most common sarcocaulous trees along most of the Baja California peninsula from sea level up to 1000 m, and whose natural distribution “almost is coincident with the Sonoran Desert province” (Turner et al., 1995). However, a more detailed inspection showed the leaflets to be few in number and broadly obovate-elliptic. These and additional differences of the leaves and flowers warrant recognition of this plant as a new species.

## RESULTS

*Bursera exequielii* León de la Luz, sp. nov. Figs. 1, 2.

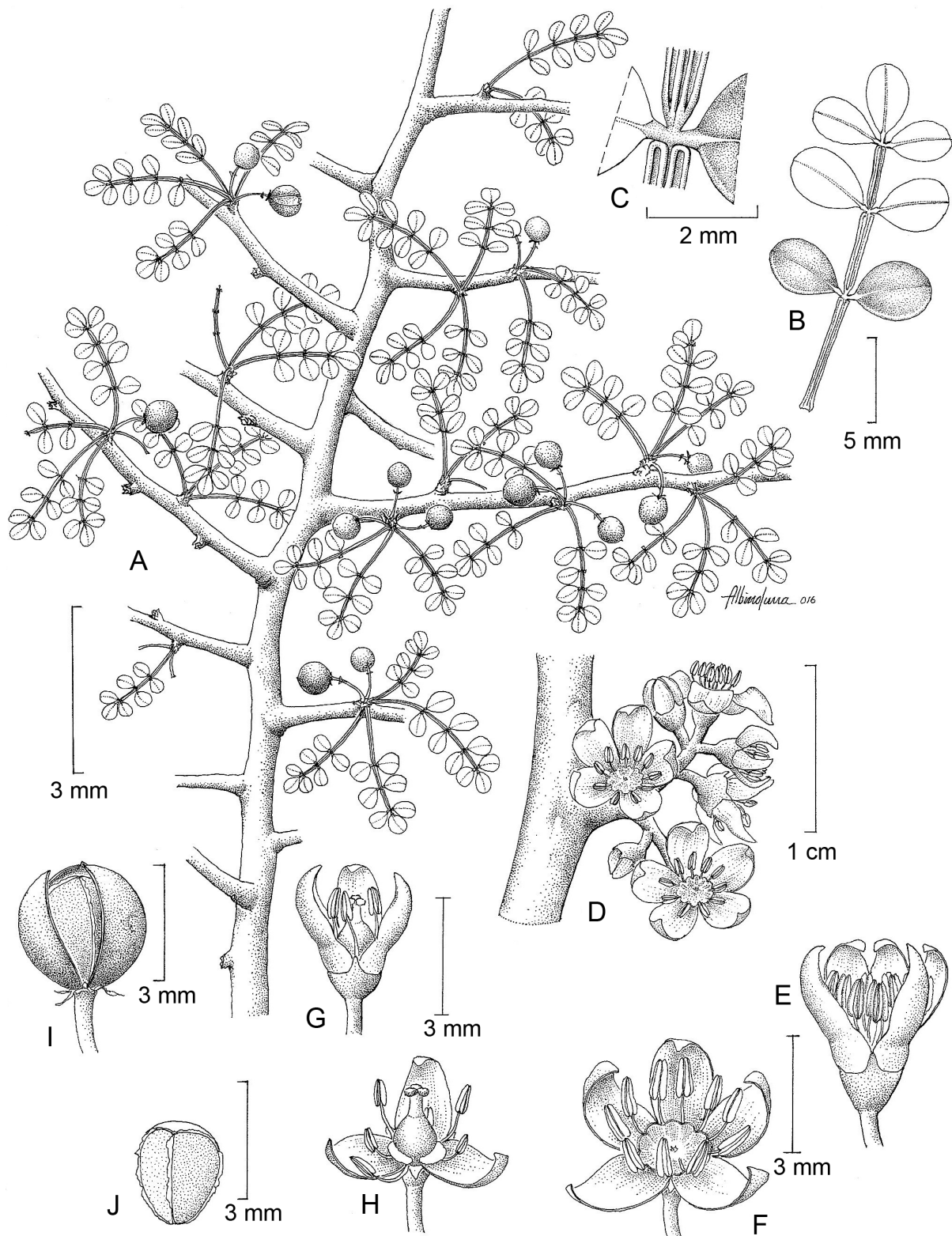
TYPE: MEXICO. Baja California Sur, municipio de Los Cabos, rancho Las Lagunas, Punta Arena del Sur, matorral de dunas costeras, 23.54381°N, -109.48435°W, 5 m, 20.VI.2014, J.L. León de la Luz 12073 (holotype: HCIB!, isotypes: IEB!, MEXU!, SD!, more to be issued).

Arbor dioica ad 4 m alta, ramificatione tortuosa, cortice exfolianti flavida. Folia imparipinnata, 7-11 foliolis late obovatis vel late ellipticis, 6-9 mm longis, 5-6 mm latis, glabris. Paniculae laxae 3-5 floribus unisexualibus, pedicellis quam 2 mm brevioribus. Fructus 3-valvi,

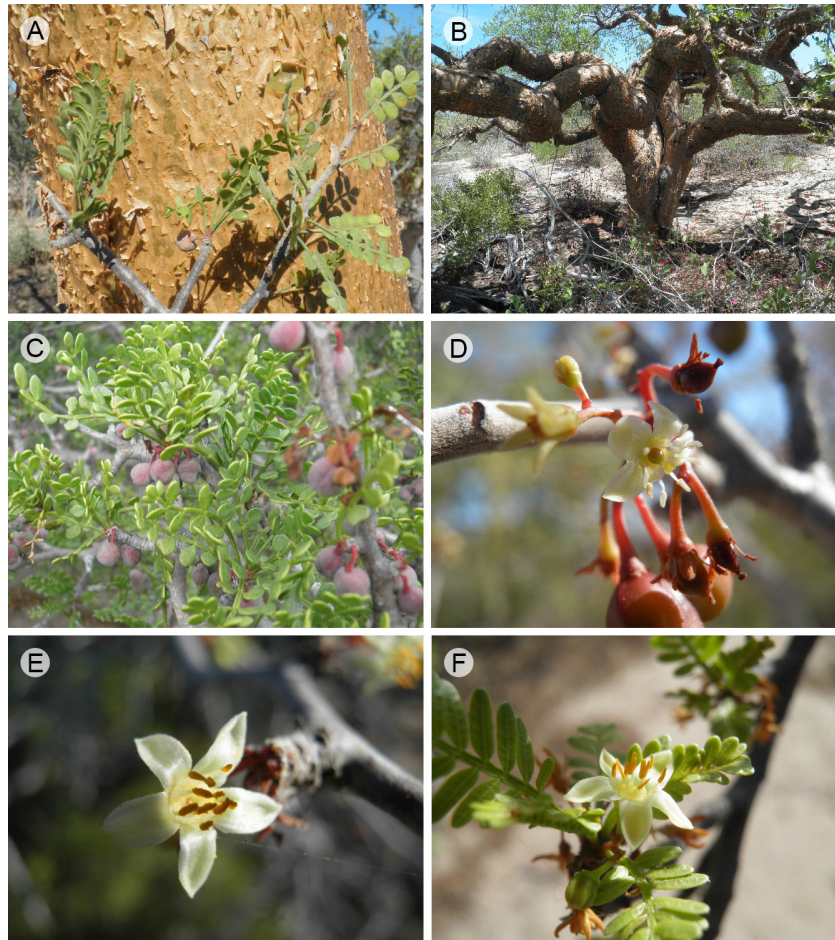
subglobossi; putamine 5-6 mm diam, pseudoarilo flavido obtecto; hilo depresso.

Dioecious trees to 4 m tall; bark glabrous, orange-yellowish, exfoliating in papery strips as stems thicken; trunk straight but branching tortuous, wood pithy and soft, young stems puberulent with short trichomes; dioecious, exceptionally some male flowers with functional pistils; leaves imparipinnate, produced from brachyblasts, growing gradually during the season, 3-3.5 cm long, oblong in outline; petioles 10-12 mm long, winged, somewhat aromatic when crushed; rachis more narrowly winged than petiole, involute when drying, and appearing quadrangular; leaflets 7-11, 5-6 × 6-9 mm, subsessile, semi-succulent, and broadly obovate to broadly elliptic, yellowish-green, opaque, midvein on abaxial surface prominent; indument spiculate on stems, reproductive structures glabrous, foliage with resinous papilla. Inflorescences produced before leaves, subtended by small bracts on reduced cymes with 2-5 flowers per cluster, flowers rarely solitary; peduncles stout, 2-3 mm long, pedicels slender, <2 mm long, with a basal small and caducous bracteole <1 mm, soon deciduous. Male flowers: to 4-5 mm wide at anthesis; sepals (4)5(6), triangular, red tipped, <1 mm long, petals (4)5(6), broadly lanceolate, 1 mm long, 0.5 mm wide; stamens to 1.5 mm long, twice as much as petals, in two series, opposite and alternate to petals, filaments inserted on edge of annular, papillose disk; pistillode <1 mm long, reduced and rarely functional. Female flowers: to 4-5 mm wide at anthesis; sepals 3(4), <1 mm long, triangular, red tipped; petals 3(4), lanceolate to broadly lanceolate, 1 mm long, 0.5 mm wide; staminodes (5)6, anthers <1 mm long, sterile, filaments 1 mm long, free, inserted on edge of annular, papillose disk; ovary superior, 3-celled, style short, stigma 3-lobed, tiny; fruits subglobose, 3-angled, glabrous; exocarp 3-valved; pyrene one per fruit, covered all by a yellow-reddish pseudoaril; seeds one per fruit, rounded, 5-6 mm diameter, hilum with an irregular depression.

Paratypes: MEXICO. Baja California Sur, municipio de Los Cabos, rancho Las Lagunas, Punta



**Figure 1:** *Bursera exequielii* León de la Luz. A. branchlet with leaves, leaflets, and fruits; B. detail of the leaf and broadly elliptic leaflets; C. detail of the rachis and subsessile leaflet; D., E., F. detail of male cluster of cymes, and 5-merous flower with annular papillose disk; G., H. details of 3-merous female flower with staminodes; I. detail of fruit, and J. seed with a thin pseudoaril. Illustration by Albino Luna.



**Figure 2:** Images of *Bursera exequielii* León de la Luz. A. bark and leaves; B. mature plant; C. bundle of leaves; D. uncommon 4-merous female flower; E. 5-merous male flower; F. 5-merous male flower of *B. microphylla* A. Gray, note foliole form and synchronous appearing of flowers and leaves.

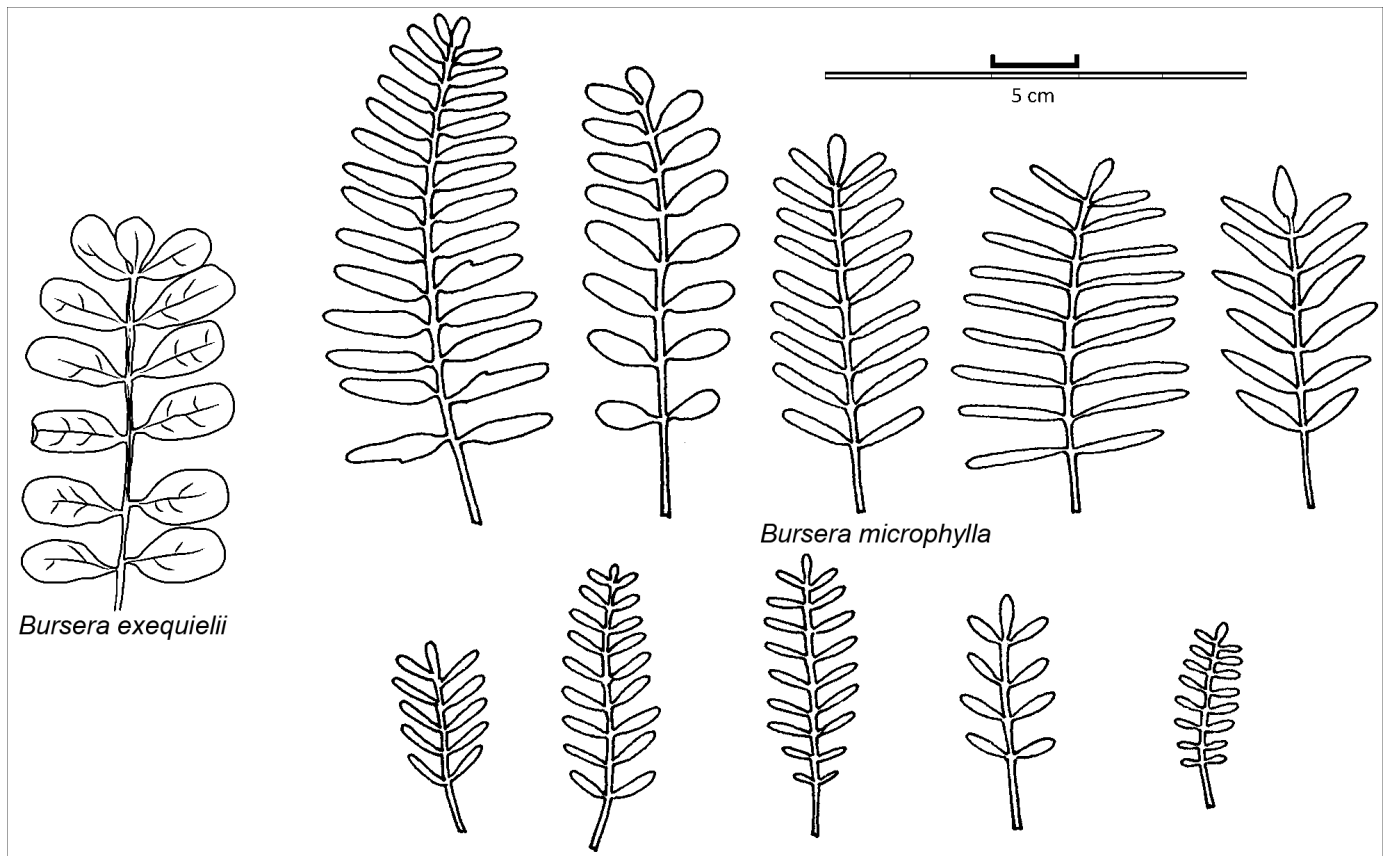
Arena del Sur, matorral de dunas costeras, 23.54788°N, -109.47352°W, 5 m, 1.XII.2013, *J. L. León de la Luz 11912* (HCIB); Punta Arena, ca. 12 km southeast of La Ribera and ca. 18 km north of the village of Cabo Pulmo, 23.5334°N, -109.4829°W, 15.VI.2015, *B. T. Wilder 2015-44* (MEXU), 2015-45 (MEXU).

### Observations

The exfoliating bark, winged leaf rachis, and 3-valved fruits place this species in section *Bursera*, the “cuajote” group in the Mexican mainland vernacular nomenclature (McVaugh and Rzedowski, 1965; Rzedowski et al., 2004), also known by the bajacalifornians as “torote”.

In addition to belonging to section *Bursera*, *B. exequielii* and *B. microphylla* both have tortuous branching and similar flower and fruit morphology, but the new species differs from *B. microphylla* by the 7-11 (vs. 7-35) leaflets that measure 7-9 × 5-6 mm (vs. 5-25 × 1-3) and are broadly elliptic to obovate (vs. linear-oblong to elliptic or lanceolate). Moreover, inflorescences are denser in *B. microphylla*.

Hence, *B. exequielii* seems to be a local population possibly descendent from the widely distributed *B. microphylla*. Following the proposal of Becerra (2003), who reconstructed a phylogenetic hypothesis of 66 species and varieties of *Bursera* using parsimony analyses,



**Figure 3:** Image of a leaf of *Bursera exequielii* León de la Luz with broadly-ovate to broadly-elliptic folioles, and comparison with *Bursera microphylla* A. Gray leaves variation (modified from Johnson, 1992).

this new species must be included in the section *Bursera* and *Microphylla* group. In addition, De-Nova et al. (2012) published a *Bursera* phylogeny at species level by estimating divergence times, temporal diversification heterogeneity, and geographical structure, in order to determine when species could have first appeared in Mexican territory. With respect to *B. microphylla* they assessed that this species established some 8 My ago; i.e., just when the peninsular territory split off from the Mexican mainland by the opening of the Gulf of California (Ferrari et al., 2007).

Several botanists have noticed that across the broad range of *B. microphylla*, it exhibits variation in leaf and leaflet size, but not in form. Johnson (1992) illustrated such differences for several populations of Sonora, Mexico (see Fig. 3), which show significant variation in leaflet

size but a consistent length/width ratio  $\geq 4$ , and the leaflets are consistently linear-oblong to narrowly lanceolate. Flower sex of *B. microphylla* has been barely documented. Available bibliography, such as Shreve and Wiggins (1964), relates the species as dioecious, whereas Felger (2000) stated that in *B. microphylla* sepals and petals are usually 3 on female flowers and (4)5 on male flowers. In *B. exequielii* we observed that female flowers have 3(4) sepals and petals, and male flowers (4)5(6) sepals and petals. Moreover, few fruits were seen on male individuals, but due to its low frequency this trait could be considered rather as unusual functional pistils in staminate flowers more than genuine hermaphrodite flowers that would give the polygamodioecious character to the species. The number of cymes per cluster is also a noticeable difference, since in *B. exequielii* there are commonly 2-3 cymes,

whereas in *B. microphylla* there are 4-6, although both taxa could have 2-3 flowers per cyme.

Fruit morphology of the two species is similar in shape and size, but the pseudoaril of *B. microphylla* seems to be more reddish than yellowish. An additional difference could be noticed in the sprouting of the flowers: in *B. microphylla* leaves and flowers are produced synchronously (Johnson, 1992; see Fig. 2F), while in *B. exequielii* we observed first the flower development (Fig. 2D, E), and the bud leaves appear a couple of weeks later; both structures continue growing during the rainy season.

### Ecology

The main population of this taxon inhabits a marine terrace of Holocene origin (DEGETENAL, 1981), formed by sand deposited by the sea surf. *Bursera exequielii* seems to be the only species of *Bursera* or “torote” in this zone where it grows with spinescent shrubs such as *Ebenopsis confinis* (Stand.) Britt. & Rose, *Sideroxylon occidentale* (Hems.) T.D. Penn., *Condalia globosa* I.M. Johnston, *Paulothamnus spinescens* A. Gray, sarcocaulous forms as *Jatropha cinerea* (Ortega) Müll.-Arg., *Forchhammeria watsonii* Rose, *Cyrtocarpa edulis* (Brandege) Stand., and cacti such *Cylindropuntia cholla* (F.A.C. Weber) F.M. Knuth, *C. alcahes* (F.A.C. Weber) F.M. Knuth, and *Stenocereus gummosus* (Engelm.) A. Gibson & K.E. Horak. We estimated the density of plants of this new species at 15 to 20 per hectare. The individuals appear vigorous, but we saw no evidence of regeneration. Some individuals were observed up to 5 km inland, mixed in the scrubland with *B. microphylla* on calcareous soils. Intermediate forms were not found.

### Etymology

The taxon is named in honor of Dr. Exequiel Ezcurra (University of California, Riverside), an ecologist and leading conservationist who has tirelessly researched and defended the peninsula of Baja California.

### AUTHORS CONTRIBUTIONS

RDC worked on the herbarium vouchers and realized the specimen was possibly a new taxon. JLLL and AMN vis-

ited the population to collect more samples to verify this. JLLL, RDC and AMN discussed the possibility of these samples belonging to a new taxon. RDC and AMN carried out the morphological observations. JLLL wrote the manuscript in collaboration with RDC and AMN. All authors contributed to the description, discussion and conclusions.

### FUNDING

This research was partially supported by Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) funds (HJ-007).

### ACKNOWLEDGEMENTS

We express our gratitude to several persons that helped in several stages of this work. We are grateful to our elder colleague Miguel Domínguez L. for field assistance, Victor Steinmann for encouraging the study of this taxon, and Rosalinda Medina Lemos for reviewing an earlier version of the manuscript. The authors are also grateful to Danira León C. for an earlier drawing, to Albino Luna for the illustration of the species which is published here, to Fernando Chiang Cabrera for the Latin diagnosis, and to the anonymous referees of *Acta Botanica Mexicana* whose observations and comments improved the final version of the manuscript.

### LITERATURE CITED

- Becerra, J. X. 2003. Evolution of Mexican *Bursera* (Burseraceae) inferred from ITS, ETS, and 5S nuclear ribosomal DNA sequences. *Molecular Phylogenetics and Evolution* 26: 300-309.
- DEGETENAL (Dirección General de Geografía del Territorio Nacional). 1981. Carta de Geológica 1:1,000,000. Hoja La Paz. Secretaría de Programación y Presupuesto, Coordinación General de los Servicios Nacionales de Estadística, Geografía e Informática. México, D.F. México.
- De-Nova, J. A., R. Medina, J. C. Montero, A. Weeks, J. A. Rosell, M. E. Olson, L. E. Eguiarte and S. Magallón. 2012. Insights into the historical construction of species-rich Mesoamerican seasonally dry tropical forests:



- the diversification of *Bursera* (Burseraceae, Sapindales). *New Phytologist* 193: 276-287. DOI: <http://dx.doi.org/10.1111/j.1469-8137.2011.03909.x>
- Espejel Carbajal, M. I., O. Jiménez-Orocio y P. Peña-Garcilán. 2015. Flora de las playas y dunas costeras de México. Universidad Autónoma de Baja California, Facultad de Ciencias. Informe final SNIB-CONABIO, proyecto No. HJ-007. México, D.F., México. 115 pp.
- Espinosa, D., J. Llorente and J. Morrone. 2006. Historical biogeographical patterns of the species of *Bursera* (Burseraceae) and their taxonomic implications. *Journal of Biogeography* 33(11): 1945-1958. DOI: <http://dx.doi.org/10.1111/j.1365-2699.2006.01566.x>
- Felger, R. S. 2000. Flora of the Gran Desierto and Río Colorado of northwestern Mexico. Arizona University Press. Tucson, USA. 673 pp.
- Ferrari, L., M. Valencia-Moreno and S. Bryan. 2007. Magmatism and tectonics of the Sierra Madre Occidental and its relation with the evolution of the western margin of North America. In: Alaniz-Alvarez, S. A., A. F. Nieto-Sarmiento (eds.). *Geology of Mexico: Celebrating the Centenary of the Geological Society of Mexico: Geological Society of America, Special Paper 422*: 1-139. DOI: [http://dx.doi.org/10.1130/2007.2422\(01\)](http://dx.doi.org/10.1130/2007.2422(01))
- Johnson, M. 1992. The genus *Bursera* (Burseraceae) in Sonora, Mexico and Arizona, USA. *Desert Plants* 10(3): 126-144.
- McVaugh, R. and J. Rzedowski. 1965. Synopsis of the genus *Bursera* L. in western Mexico, with notes on the material of *Bursera* collected by Sessé & Mociño. *Kew Bulletin* 18(2): 317-382. DOI: <http://dx.doi.org/10.2307/4109252>
- León de la Luz, J. L. and R. A. Levin. 2012. *Pisonia calafia* (Nyctaginaceae) species nova from the Baja California peninsula, Mexico. *Acta Botanica Mexicana* 101: 83-93.
- León de la Luz, J. L. and A. Medel Narváez. 2013. A new species of *Bidens* (Asteraceae: Coreopsidae). *Acta Botanica Mexicana* 103: 119-126.
- Rzedowski, J., R. Medina Lemos and G. Calderón de Rzedowski. 2004. Las especies de *Bursera* (Burseraceae) en la cuenca superior del río Papaloapan (México). *Acta Botanica Mexicana* 66: 23-151.
- Rzedowski, J. 2015. Algunas reflexiones en torno al trabajo florístico en México. *Botanical Sciences* 93: 1-2. DOI: <http://dx.doi.org/10.17179/botsci.530>
- Shreve, F. and L. I. Wiggins. 1964. *Vegetation of the Sonoran Desert*. Vol. I, II. Stanford University Press. Stanford, USA. 1740 pp.
- Turner, R. M., J. E. Bowers and T. Burgess. 1995. *Sonoran Desert plants: an ecological atlas*. University of Arizona Press. Tucson, USA. 504 pp.