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Interim Report on Surveys for *Cirsium wrightii* and other rare plants in northeastern Sonora and northern Chihuahua, Mexico.

According to the 2017-2019-01 contract, this project would start on September 1, 2017; however, with the delay of the signature by the Rector of the University of Sonora and the Director of the Arizona Department of Agriculture, the project officially began until November 28, 2017.

Thanks to a collaboration with the Banco de Semillas de la Facultad de Estudios Superiores Iztacala de la Universidad Nacional Autónoma de México (FESI-UNAM) and with the support of a loan from the University of Sonora, it was possible to carry out 16 days of field work, divided into three exploration trips on 18 localities in the states of Sonora and Chihuahua.

Some of the sites visited are historical localities of rare plants. These trips for fieldwork were carried out between September 29, 2017 and April 11, 2018, having traveled great distances for a total of almost 4,000 km.

So far, a total of 129 specimens of herbarium have been collected, however only two records of rare plants were obtained: *Eryngium sparganophyllum* and *Leucosyris blepharophylla* in localities of Sonora and Chihuahua respectively. These specimens are going to the Herbario USON at Hermosillo, and some duplicates including those of rare plants will be going to University of Arizona Herbarium.

In addition, around 350 field observations of plants were recorded and these will be entered into the database of Observaciones Generales de Flora del Noroeste de México (RHNM), all of these records (specimens and field observations) will be available online through the portal of the Red de Herbarios del Noroeste de México and SEINet.

The following pages describe some of the field work carried out between November 2017 and April 2018 and some preliminary results obtained in relation with the rare plant species surveyed.

September 29, 2017 (Sonora; municipalities of Moctezuma, Huásabas, Huachinera, Bacerac and Bavispe)

Sierra La Madera. Our first stop was at the southern base of the Sierra La Madera, municipality of Moctezuma, Sonora (29.86095, -109.46941; 995 meters elevation). The site is located 22.8 km east of Moctezuma, on highway 14 in the direction of Huásabas. Here we do not find *Pectis imberbis* but, on this trip, we recorded the northernmost occurrence of *Bursera stenophylla*, a characteristic tree of the low deciduous forest and of the low elevations of the holm oaks (Felger, 2000). The place has grasses such as *Aristida ternipes* var. *ternipes*, *Bouteloua repens*, *Melinis repens* subsp. *repens*, *Pennisetum ciliare*, *Urochloa arizonica*, *Heteropogon contortus*, and also shrubs and low trees such as *Baccharis sarothroides*, *Euphorbia cymosa*, *Acacia millefolia*, *Lysiloma watsonii*, *Ipomoea arborescens*, *Stenocereus thurberi*, y *Quercus chihuahuensis*.



Semi-desert grassland between the Moctezuma-Huásabas highway. *Acacia millefolia* (left), *Euphorbia cymosa* (center) and the northernmost record of *Bursera stenophylla* (right).

The next stop was in the Sierra Alta region of Sonora, to visit a couple of historical locations of *Pectis imberbis*.

Norte de Horconcitos. The first historical site is the Ciénega de Horcones (30.29528 -108.95833, 1,054 meters of elevation). This site is located in Rancho El Bajío del Oso, in the municipality of Bacerac, 10.4 km (by road) north of Huachinera, immediately after crossing the bridge. In this first trip we could not access because the door had a lock. Later, in Bacerac we were informed that the ranch belongs to the Swanson family, residents of Hermosillo who until now we have not been able to contact.

Cañón de La Petaquilla. The next historical site of *Pectis imberbis* is located west of Bavispe on Arroyo La Petaquilla, tributary of the Bavispe River (30.46889 -108.99056, 1,112 meters of elevation). We did not get to this place because when we asked the people of Bavispe how to access this site, they showed little collaboration (they were drunken) because they were celebrating the traditional village festivities. With the knowledge of the insecurity to travel during the night towards Agua Prieta, we wait the following day in Huachinera.

30 de septiembre de 2017 (Sonora, municipalities of Bacerac and Bavispe)

Paseo campestre sobre el Río Bavispe. This site is located near Bacerac, Sonora, 2.5 km to SSW Bacerac (30.34266, -108.94801, 1,037 meters elevation). We look for *Pectis imberbis* around this place but we did not find it. Here, the vegetation is a combination of semi-desert grassland with a thorn scrub with low trees and shrubs such as *Prosopis velutina*, *Gutierrezia sarothrae*, *Rhus coriophylla*, *Condalia warnockii*, *Eysenhardtia orthocarpa*, *Juniperus coahuilensis*, *Mimosa biuncifera*, *Ambrosia monogyra*, *Baccharis sarothroides*, *Fouquieria splendens*, *Nissolia schotti*, *Brickelia coulteri*, *Perityle californica*, *Perityle emoryi*, *Acourtia* sp., *Elytraria imbricata*, *Porophyllum macrocephallum*, *Tetramerium nervosum*, *Portulaca umbraticola*, *Commicarpus scandens*, *Talinum paniculatum*, *Xanthisma spinulosum*, and *Amaranthus palmeri*.



Río Bavispe with semi-desert grassland, 2.5 km south of Bacerac, Sonora.

Along the river, we also recorded some trees such as *Prosopis velutina*, *Salix gooddingii* y *Populus fremontii*; también, arbustos como *Baccharis salicifolia*, *Celtis pallida*, *Rhus microphylla*, and some succulents such as *Agave parryi*, *Opuntia phaeacantha*, *Cylindropuntia spinosior*, *Acacia greggii*, and the non-native *Nicotiana glauca*. Ferns and related plants were also recorded here, such as *Astrolepis* sp., y *Selaginella rupincola*.

October 1, 2017 (Sonora, municipality of Agua Prieta)

Rancho San Bernardino, Cuenca Los Ojos. This site is located on federal highway 2, 24 km east of Agua Prieta, Sonora (31.33312, -109.26393; 1,130 meters elevation). The Ciénega de San Bernardino is located right on the border between the United States and Mexico, on the Mexican side, just two hundred meters south of the place (in Arizona, United States) where the holotype of *Cirsium wrightii* was collected. Currently, we have permission from the owners to explore the San Bernardino Ciénega next summer of 2018, during the flowering season of this species.



Dam south of the spring and near of the San Bernardino Creek, Rancho San Bernardino, Sonora.

Rancho Los Ojos. This ranch is located in the municipality of Agua Prieta, Sonora and also belongs to Cuenca Los Ojos (31.283954, -108.999119; 1,350 meters elevation). Although we did only a brief exploration, we realized that the grasslands of this ranch can be a potential habitat for *Pectis imberbis*, so between August and October 2018, we will also make a new visit to this site.

Ojo Caliente. We also searched for *Cirsium wrightii* and *Eryngium sparganophyllum* on the hot spring of Ojo Caliente (31.284219, -108.99024; 1,385 meters elevation) but we did not found them.



Grassland at Rancho Los Ojos, municipality of Agua Prieta, Sonora.

October 2, 2017 (Chihuahua, municipality of Janos)

Antelope Grassland. This site is located between Agua Prieta, Sonora and Janos, Chihuahua, on federal highway 2, 6 km NW of the intersection with the road to the Antelope Wells border crossing (31.295 -108.648333, 350 meters). This locality corresponds to a semi-desert grassland with *Prosopis glandulosa* and *Yucca elata* with potential to find *Pediomelum pentaphyllum*. In this place species considered of interest for the conservation were registered like *Opuntia pottsii* and *Coryphantha vivipara*. Other species recorded here were *Gutierrezia sarothrae*, *Mimosa biuncifera*, *Cylindropuntia spinosior* and *Opuntia phaeacantha* and the invasive plant *Salsola tragus*.



Semidesert grassland with *Prosopis glandulosa* y *Yucca elata* between Agua Prieta, Sonora and Janos, Chihuahua.

October 3, 2017 (Chihuahua, municipality of Casas Grandes)

Ojo Vareleño, Casas Grandes, Chihuahua (30.40073 -107.98573, 1,494 meters elevation). Also known as El Ojito, it is a private hot springs spa located in the northwest of Casas Grandes. It is a historic locality of *Eryngium sparganophyllum* which we could not access because the place was closed. A sign at the entrance indicated that the spa would open again in the month of April.

On this exploration trip and in the search of a historical locality for *Graptopetalum bartramii* we also went to Colonia Pacheco in the Sierra Madre Occidental.

Cueva de la Olla/Cueva de las Golondrinas (30.15302, -108.32571, 1,850 meters elevation). This are a pair of contiguous localities on the bed of the Río Piedras Verdes; here, we only had time to perform a short search and found no evidence of *Graptopetalum bartramii*.



Río Piedras Verdes, in front of the Cueva de las Golondrinas, 7.5 km north of Colonia Pacheco.

Río Piedras Verdes, Colonia Pacheco. Located in the municipality of Casas Grandes, Chihuahua, it is a historic locality for *Graptopetalum bartramii* (30.08063, -108.34063; 1915 meters elevation). It is in the Sierra Madre Occidental, 68.8 km SW of Casas Grandes. In the area there are some canyons where the Río Piedras Verdes flows and where, between April and May of 2018, it will be explored carefully to try to register this species.



Colonia Pacheco, municipality of Casas Grandes, Chihuahua. Canyon (left) and Río Piedras Verdes (right).

October 4, 2017 (Chihuahua, municipalities of Galeana and Buenaventura)

Ojos de Arrey. Located in the municipality of Galeana, Chihuahua (30.06009, -107.59093, 1,445 meters of elevation), this is a historic site for *Cirsium wrightii* and *Eryngium sparganophyllum*. It is located in La Angostura, 7 km south of Galeana on Federal Highway 10. Until the eighties, Ojos de Arrey was a spa hot springs that harbored a great diversity of aquatic organisms as can be seen in the following images.



Ojos de Arrey Spa, October 1982 (Photos courtesy of Frank Reichenbacher).



Ojos de Arrey Spa, October 2017.

On this trip, we met in La Angostura with Adrián Hernández-Cárdenas, who told us that for about 15 or 18 years, the waterhole began to dry out due to the excessive pumping of the aquifer in nearby Mennonite farms, where they allocate water for agricultural use. As a result, the spring that fed the thermal waters dried up and now the spa is in total abandonment and almost destroyed. We found no evidence here of *Cirsium wrightii* and *Eryngium sparganophyllum*, nor of other aquatic plant species. The images above speak for themselves.

Rancho Ojo Caliente. Municipality of Buenaventura, Chihuahua (29.90278, -107.25774, 1,575 meters elevation). It is a private hot springs spa, located 21 km (by the road) to the E of Buenaventura, 1.3 km south of the federal highway 10.

Ojo Caliente is a site with potential to find *Eryngium sparganophyllum*, *Cirsium wrightii* and maybe *Leucosyris blepharophylla*. The visit to this site was very brief, we did not find any of the species we were looking for, although, for the limited time available, we only searched around the lagoon and in the water discharge of the baths. I believe that more exploration should be done in this entire area.



Laguna en la descarga de agua de los baños termales en el Rancho Ojo Caliente, municipio de Buenaventura, Chihuahua.

5 de octubre de 2017 (Chihuahua, San Diego de Alcalá)

Baños de San Diego. It is located in San Diego de Alcalá, municipality of Aldama, Chihuahua (28.58814, -105.54761, 1,140 meters of elevation). This spa, historic locality of *Leucosyris blepharophylla*, is 65 km (by road) to the E of the city of Chihuahua.

Baños de San Diego is a private hot springs spa which earlier this year had to face a complaint from the NGO Pronatura Noreste who argue, with good reason, that the constructions and modifications to the land have altered the natural condition of the spring; This, together with the introduction of exotic plant species, has caused the loss of at least five species of animals endemic to this ecosystem.



Pond from where the hot water is pumped to the private bathrooms, in Baños de San Diego.

The good news is that there is still a good population of *Leucosyris*, the bad news is that the habitat is being destroyed and the land modified by the use of heavy machinery; In addition, exotic palm species are being introduced with the purpose of turning the site into a tropical oasis.



Plants of *Leucosyris blepharophylla*, growing in the hot springs spa of Baños de San Diego.

March 20, 2018 (Sonora, municipality of Agua Prieta)

Cuenca Los Ojos. In the search for *Pectis imberbis*, we also explored a site located 48 km (by air) east of Agua Prieta, with vegetation of semi-desert grassland and oak forest, with *Quercus arizonicus*, *Cupressus arizonicus*, *Garrya wrightii*, *Rhus coriophylla*, *Arctostaphylos pungens*, *Yucca madrensis*, *Agave palmeri*, *Agave schottii*, *Cylindropuntia spinosior*, *Echinocereus rigidissimus*, *Nolina sp.*, *Bouteloua curtipendula*, among others.

To explore potential locations of *Pediomelum pentaphyllum*, we traveled east of the municipality of Agua Prieta, Sonora. First we went to a semi-desert grassland with secondary vegetation characteristic of the Chihuahuan desert, located 36.5 km (by air) to the E of Agua Prieta (30.64694, -109.42566, 940 meters elevation). Among the species that define the vegetation of this place include *Cupressus arizonicus*, *Prosopis velutina*, *Fouquieria splendens*, *Opuntia clorothica*, *Rhus microphylla*, *Mortonia scabrella*, *Yucca madrensis*, *Dasyliirion wheeleri*, *Opuntia sp.*, and *Agave palmeri*.

Rancho Las Barras. Belonging to the NGO Cuenca Los Ojos, this is a site located in the Mexican extension of Animas Valley (31.309722, -108.896388, 1609 meters elevation). Here we explored a semi-desert grassland and the probability of finding *Pediomelum pentaphyllum* at this site was very low due to the absence of *Prosopis*, *Larrea tridentata* and *Yucca elata*.



Semi-desert grassland in Rancho Las Barras, E of Agua Prieta, Sonora.

21 de marzo de 2018 (Sonora, municipio de Nacozari de García)

Ciénega Agua Caliente. The only known site for *Eryngium sparganophyllum* in Sonora is located at Rancho Agua Caliente, which is 17.5 Km (by air) east of Esqueda in the municipality of Nacozari de García, Sonora (30.64694, -109.42566; 940 meters). We were pleased to find here an abundant population of *Eryngium sparganophyllum*, hundreds of plants are distributed along the marsh where the water of the spring flows. Some of the associated aquatic plants are *Eleocharis parishii*, *Juncus bufonius*, *Schoenoplectus americanus*, *Almutaster pauciflorus*, *Sisyrinchium demissum*, and *Pluchea salicifolia*.



The Ciénega of Rancho Agua Caliente (left) and some plants of *Eryngium sparganophyllum* (right) growing next to the water stream.

Although the condition of the population of *Eryngium* is very good, the habitat is somewhat disturbed, so the owner of the ranch should be made aware of the importance of avoiding more impact on the site to conserve this species.

10 de abril de 2018 (Sonora, municipio de Quiriego)

Los Bajíos (Ejido Los Conejos). This locality is in the northernmost region of the Guarijíos ethnic group (Makurawe). It is one of the two southernmost historic locations of *Pectis imberbis* in Sonora, and 40 km (by air) east of the town of Quiriego. According to our informant, Rafael Méndez (75 years old) ex-Governor of the Guarijíos in Los Bajíos, in the twentieth century beginning the 1950s, the site began to transform from grasslands with oak (called “sabanillas”) to what is now the foothills thornscrub or as they call: “monte mojino”. This transformation of the vegetation was largely due to overgrazing of the original grasslands.



Left, our guide and informant Mr. Rafael Méndez (with the director of this project Jesús Sánchez-Escalante, and field assistant Jesús Pablo Carrillo-León). Right, a panoramic view of the Guarijíos community of Los Bajíos.

The species recorded in the surroundings of Los Bajíos were *Sebastiania pavoniana*, *Sebastiania bilocularis*, *Guazuma ulmifolia*, *Pachycereus pecten-aboriginum*, *Ipomoea arborescens*, *Lysiloma divaricatum*, *L. watsonii*, *Fouquieria macdougalii*, *Callaeum macropterum*, *Karwinskia humboldtiana*, *Randia echinocarpa*, *Heliocarpus attenuatus*, *Croton sp.*, *Diphysa suberosa*, *Ambrosia cordifolia*, *Agave vilmoriniana*, *Bursera fagaroides*, *B. laxiflora*, *B. grandifolia*, *Haematoxylum brasiletto*, *Stenocereus thurberi*, *Ferocactus pottsii*, *Opuntia wilcoxii*, *Prosopis glandulosa* var. *torreyana*, *Wimmeria mexicana*, *Struthanthus palmeri*, *Parkinsonia praecox*, *Hintonia latiflora*, *Vachellia campechiana*, *Senna atomaria*, and *Cylindropuntia thurberi*.

Maybe, in the summer, we should to explore a couple of localities in the tropical deciduous forest between Quiriego and Los Bajíos where we watch small patches of grasslands with oak woodland. Perhaps we could find *Pectis imberbis* here.

April 11, 2018 (Sonora, municipality of Rosario)

La Estrella. It is located 12 km (by air) to the E of Rosario Tesopaco, it is another of the two southernmost historical localities of *Pectis imberbis*. Pedro Borbón-Valenzuela (64 years old), resident of La Estrella and owner of Rancho El Sabinito told us that the vegetation in certain areas has changed from the sabanillas (grasslands with oak woodland) when he was a child, to the current thornscrub or Monte Mojino.

The species recorded here were *Pachycereus pecten-aboriginum*, *Ipomoea arborescens*, *Lysiloma divaricatum*, *L. watsonii*, *Fouquieria macdougalii*, *Callaeum macropterum*, *Karwinskia humboldtiana*, *Randia echinocarpa*, *Croton sp.*, *Senna sp.*, *Desmanthus sp.*, *Ambrosia cordifolia*, *Parthenium tomentosum* var. *stramonium*, *Bursera fagaroides*, *B. laxiflora*, *B. grandifolia*, *Malphigia emarginata*, *Haematoxylum brasiletto*, *Zanthoxylum fagara*, *Lantana hispida*, *Stenocereus thurberi*, *Mimosa palmeri*, *Opuntia wilcoxii*, *Prosopis glandulosa* var. *torreyana*, *Wimmeria mexicana*, *Struthanthus palmeri*, *Parkinsonia praecox*, *Hintonia latiflora*, *Vachellia campechiana*, *Senna atomaria*, and *Cylindropuntia thurberi*.

According to Pedro Borbón, in other ranches with higher elevations there are still areas of sabanillas and between August and October of this year there would be a good chance for finding *Pectis imberbis* in these places. Mr. Borbón offered to arrange a permit with the owners to have access to those ranches during the next summer.



Left, Mr. Pedro Borbón-Valenzuela from Rancho El Sabinito (with Jesús Sánchez-Escalante, project manager). Right, condition of Monte Mojino near of La Estrella where were sabanillas.