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Report to Arizona-Nevada Academy of Science on the Project: Vascular flora of Isla Tiburón and Satellite Islands, Gulf of California, Mexico

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To the Board of Governors of the Arizona-Nevada Academy of Science (ANAS), I am pleased to report considerable success thus far on my floristic project focused on Isla Tiburón and its satellite islands (Islas San Esteban, Dátil, Cholludo, Alcatraz, and Patos) in the Gulf of California, Mexico. This work represents a collaborative effort between myself; Dr. Richard Felger, Executive Director of Drylands Institute; Humerto Romero, Comcáac (Seri people) collaborator; and Jssús Sanchéz-Escalante, Curator of the University of Sonora Herbarium (USON). Additional Assistance has been received from Dr. Betsy Arnold, my project advisor who is an ANAS member. The project commenced in August of 2005 and since receiving funding from ANAS, December 15, 2005, I have completed four field expeditions to the study area and developed a working relationship with Humberto Romero. I have collected >200 significant plant specimens from the islands, representing 130 different species (Appendix 1). I presented the project to an international audience at the *Fifth International Symposium on the Native Flora of Arid Lands* in Hermosillo, Mexico, 29-31 March 2006. I have completed searching the University of Arizona Herbarium (ARIZ) for voucher specimens from the islands, and have initiated work on several publications. All of the field work on the islands is being carried out under Mexican federal collecting permits, with specimens collected being deposited at ARIZ, with duplicates to the Herbario de la Universidad de Sonora (USON), the San Diego Natural History Museum Herbarium (SD), and other appropriate institutions in Mexico and the US.

The goal of the project is to produce a comprehensive treatment of the flora of Isla Tiburón and its five satellite islands, with special attention being given to non-native, invasive species. In this effort, I am about half way towards completion. This project is providing me with significant growth in managing and completing a large-scale endeavor, developing grant writing skills, increasing my botanical knowledge and abilities, and providing many new experiences that are both challenging and stimulating. Working with Dr. Felger and the Seris in the Midriff region of the Gulf of California is an amazing opportunity that I am truly cherishing. The Assistance of the Arizona-Nevada Academy of Science in these pursuits is much appreciated.

Field Expeditions and Seri Collaboration

More than 95% of the flora of these islands has been collected over the last 75 years by multiple botanists, with the majority of the collections being made by Drs. Richard Felger and Reid Moran. The vast majority of these collections are located at ARIZ and SD. Thus, this floristic project is a specimen-based study. However, there are important gaps that exist in the floristic record of the islands. These are primarily new occurrences of exotic species from all islands and records from the higher elevations of the Sierra Kunkaak on Isla Tiburón. In the effort to fill in these gaps I have organized, obtained funding for, and successfully completed three collecting expeditions to Isla Tiburón and another trip to the Seri village of Punta Chueca.

Humberto Romero Morales, a Seri field guide who primarily works with taking bighorn sheep hunters to Isla Tiburón, was recommended as a contact for this project. On my first expedition to the Seri region and Isla Tiburón between 29 December 2005 and 4 January 2006 with Edward Gilbert, I was able to make contact with Mr. Romero, explain the project and its goals to him, and spend three days and one night on the island with him. Mr. Romero's knowledge of the island and its flora is deep and extremely important to the successful completion of this project. He knows the Seri names and uses for the island's flora, along with nearly every Latin name for these species. Even more exciting is his desire to learn more about the flora. This first trip, so crucial in establishing the basis for this project, was an immense success. Working with Mr. Romero as a collaborator on this project is of much significance. It adds a vast amount of knowledge that otherwise would not be available, incor-

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porates him into the project, and perhaps most significantly yields a direct link between this work and the Seris, whose land this project focuses on.

On this first trip, we visited multiple sites on the eastern side of the island, all in and around the islands largest mountain range, the Sierra Kunkaak. We visited and made many collections at a deep north-facing canyon, a significant water hole (Pazj Hax), the interior of, and high south slopes of the Sierra Kunkaak, and the lower bajada between the Sierra and the coast. This trip yielded three new records previously unknown to the island and many other important collections and discoveries.

A second trip to Isla Tiburón was completed between 16-19 March 2006 with Dave Bertelsen. a botanist from Tucson. Unfortunately we were unable to connect with Mr. Romero, however, we were still able to travel to Isla Tiburón and spend two days and one night. We went to the southern part of the island (Arroyo Sauzal), where we thoroughly explored and collected the majority of arroyo system and associated waterhole (Xapij, or Sauzal waterhole). From this trip I was able to obtain a substantial number of specimens, many not collected in the prior field trip, distributional data for the riparian invasive *Tamarix ramosissima,* and the experience of leading a field trip on the island.

On a trip to present this floristic project at the *Native Flora of Arid Lands Symposium* in Hermosillo, Mexico, I was able to travel for one day to Punta Chueca with botanist Ana Lilia Reina to meet with Mr. Romero. This was an important communication because it showed him that this was a serious project, as well as providing significant information about certain aspects of the islands flora.

The third and most recent trip to the island, was completed between 23-25 May 2006 with Dr. Richard Felger. This trip marked the first time Dr. Felger had been in the Seri region in over a decade and provided the opportunity for Mr. Romero to meet Dr. Felger, who's work Mr. Romero is exceedingly familiar with through the People of the Desert and Sea; Ethnobotany of the Seri Indians (Felger, R. S., and M. B. Moser. 1985. *People of the Desert and Sea: Ethnobotany of the Seri Indians.* University of Arizona Press, Tucson). This encounter was very successful and the trip of two days and one night on the island provided an amazing opportunity for the sharing of knowledge. In addition, significant collections were obtained of another invasive exotic, buffelgrass (*Pennisetum ciliare*), and multiple Cactaceae species for the Universidad de Sonora.

These four trips to the study region have been highly rewarding, and have created a strong platform from which future fieldwork can be mounted. Many of the gaps in the floristic record have been filled and valuable knowledge about the island floras has been gained from these trips. If sufficient summer rains are received in the study region, a larger collecting effort to the higher elevations of the Sierra Kunkaak will be completed in fall 2006.

FORTHCOMING PUBLICATIONS

Isla Tiburón and its satellites represent some of the most undisturbed extant habitat in the Sonoran Desert. In that respect, these islands offer an unparalleled opportunity to study ecological processes. The main focus of this work is to produce a comprehensive treatment of all plant species that occur on the islands, with a brief description, Seri, Spanish, and English common names, geographic ranges, and local distribution for each species. The sum of this effort will result in a thorough floristic treatment of the study area that will also provide enlightening background information.

Another paper of this project will be focusing on the distribution and importance of the native reed grass *Phragmities australis* that occurs at the waterholes on Isla Tiburón. *Phragmities australis* has decreased in abundance on the nearby mainland due to competition with the Old World reed grass *Arundo donax*. Thus, the *Phragmities* populations on Isla Tiburón serve as refuge for this aquatic species that was historically critical for the Seri people. This paper is currently being drafted.

Invasive species are one of the single-most significant threats to the Sonoran Desert. There no longer exists a remote locality where these invasives should not be expected. The invasive riparian species *Tamarix ramosissima* has been observed and recorded on a number of gulf islands, including Isla Tiburón. This species has great potential to alter the critical riparian habitats of the islands by outcompeting native species, and reducing the biodiversity found there. In conjunction with Drs. Richard Felger and Thomas Bowen, a paper addressing the ecological basis of this spread, risks and implications, and recommended actions is being drafted.

In the case of the islands of the Gulf of California, given their protection and absence of major disturbance, it is significant to document the biodiversity found within. Especially in light of the earliest stages of invasion by potentially noxious weeds that is occurring in the region at large. This work will provide the basis for studies that will be able to focus on vegetative change over time at sites with a history absent of disturbance, quadrate monitoring and eradication efforts for invasive species, and other potential projects. Moreover, this work provides an exceptional training opportunity in terms of field botany and island and desert ecology, which will lead to more question-oriented work.

Appendix 1. *Plant species collected from Isla Tiburón since Jan 1, 2006 by Benjamin T. Wilder. # = New species for the island; * = Non-native species.*

Family	Species	Trip
Acanthaceae	*Justicia californica*	Winter 2006
Acanthaceae	*J. candicans*	Winter 2006
Acanthaceae	*J. longii*	Winter 2006
Acanthaceae	*Ruellia californica*	Winter 2006
Acanthaceae	*Tetramerium fruticosum* #	Winter 2006
Agavaceae	*Agave chrysoglossa*	Winter 2006
Aizoaceae	*Sesuvium portulacastrum*	Summer 2006
Amaranthaceae	*Amaranthus palmeri*	Spring 2006
Asclepiadaceae	*Asclepias albicans*	Spring 2006
Asclepiadaceae	*Funastrum cynanchoides* var. *hartweggii*	Winter 2006
Asclepiadaceae	*Marsdenia edulis*	Winter 2006
Asteraceae	*Ambrosia carduacea* #	Winter 2006
Asteraceae	*A. divaricata*	Winter 2006
Asteraceae	*Brickellia coulteri var. coulteri*	Winter 2006
Asteraceae	*Coreocarpus sonoranus var. sonoranus*	Spring 2006
Asteraceae	*Heliopsis anomala* #	Winter 2006
Asteraceae	*Hofmeisteria fasciculata*	Spring 2006
Asteraceae	*Perityle emoryi*	Spring 2006
Asteraceae	*Pleurocoronis laphamioides*	Spring 2006
Asteraceae	*Porophyllum crassifolium*	Spring 2006
Asteraceae	*P. gracile*	Winter 2006
Asteraceae	*Trixis californica*	Spring 2006
Bataceae	*Batis maritima*	Winter 2006
Boraginaceae	*Heliotroium curassavicum*	Summer 2006
Burseraceae	*Bursera hindsiana*	Spring 2006
Burseraceae	*B. microphylla*	Winter 2006
Cactaceae	*Cylindropuntia leptocaulis*	Summer 2006
Cactaceae	*Ferocactus tiburonensis*	Summer 2006
Cactaceae	*Lophocereus schottii*	Summer 2006
Cactaceae	*Mammillaria grahamii*	Winter 2006
Cactaceae	*Stenocereus gummosus*	Spring 2006
Capparaceae	*Atamisquea emarginata*	Summer 2006
Celastraceae	*Maytenus phyllanthoides*	Winter 2006
Chenopodiaceae	*Allenrolfea occidentalis*	Winter 2006
Chenopodiaceae	*Atriplex barclayana*	Winter 2006
Chenopodiaceae	*Suaeda nigra*	Winter 2006
Convolvulaceae	*Evolvulus alsinoides*	Winter 2006
Convolvulaceae	*Jacquemontia abutiloides*	Winter 2006
Cucurbitaceae	*Vaseyanthus insularis*	Spring 2006
Cyperaceae	*Cyperus elegans*	Winter 2006
Cyperaceae	*Eleocharis geniculata*	Winter 2006
Euphorbiaceae	*Acalypha californica*	Winter 2006
Euphorbiaceae	*Croton californicus var. californicus*	Summer 2006
Euphorbiaceae	*C. magdalenae*	Winter 2006
Euphorbiaceae	*C. sonorae*	Winter 2006
Euphorbiaceae	*Ditaxis lanceolata*	Winter 2006
Euphorbiaceae	*D. neomexicana*	Spring 2006
Euphorbiaceae	*Euphorbia arizonica*	Winter 2006
Euphorbiaceae	*E. leucophylla* ssp. *comcaacorum*	Summer 2006
Euphorbiaceae	*E. pediculifera* var. *pediculifera*	Spring 2006

Family	Species	Trip
Euphorbiaceae	*E. setiloba*	Winter 2006
Euphorbiaceae	*E. tomentulosa*	Winter 2006
Euphorbiaceae	*Sebastiania bilocularis*	Winter 2006
Euphorbiaceae	*Tragia jonesii*	Winter 2006
Fabaceae	*Acacia greggii*	Summer 2006
Fabaceae	*A. willardiana*	Winter 2006
Fabaceae	*Caesalpinia intricata*	Spring 2006
Fabaceae	*Coursetia glandulosa*	Winter 2006
Fabaceae	*Desmanthus fruticosus*	Winter 2006
Fabaceae	*Errazurizia megacarpa*	Spring 2006
Fabaceae	*Lysiloma divaricata*	Winter 2006
Fabaceae	*Marina parryi*	Spring 2006
Fabaceae	*Olneya tesota*	Summer 2006
Fabaceae	*Parkinsonia florida*	Spring 2006
Fabaceae	*Phaseolus filiformis*	Winter 2006
Fabaceae	*Tephrosia palmeri*	Winter 2006
Fabaceae	*T. vicioides*	Winter 2006
Frankeniaceae	*Frankenia palmeri*	Winter 2006
Krameriaceae	*Krameria erecta*	Winter 2006
Lamiaceae	*Hyptis emoryi*	Winter 2006
Loasaceae	*Eucnide rupestris*	Winter 2006
Loasaceae	*Mentzelia adhaerens*	Spring 2006
Loasaceae	*Petalonyx linearis*	Spring 2006
Malpighiaceae	*Callaeum macropterum*	Winter 2006
Malpighiaceae	*Janusia californica*	Winter 2006
Malpighiaceae	*J. gracilis*	Winter 2006
Malvaceae	*Abutilon californicum*	Winter 2006
Malvaceae	*A. incanum*	Winter 2006
Malvaceae	*A. palmeri*	Winter 2006
Malvaceae	*Hibiscus biseptus*	Winter 2006
Malvaceae	*H. denudatus*	Spring 2006
Malvaceae	*Horsfordia alata*	Spring 2006
Malvaceae	*H. newberryi*	Winter 2006
Moraceae	*Ficus palmeri*	Winter 2006
Nyctaginaceae	*Boerhavia erecta*	Winter 2006
Passifloraceae	*Passiflora arida*	Winter 2006
Passifloraceae	*P. foetida* var. *gossypifolia*	Winter 2006
Phytolaccaceae	*Ebenopsis confines*	Winter 2006
Phytolaccaceae	*Stegnosperma halimifolium*	Winter 2006
Poaceae	*Aristida adscensionis*	Winter 2006
Poaceae	*A. ternipes var. ternipes*	Winter 2006
Poaceae	*Bouteloua barbata*	Spring 2006
Poaceae	*Cenchrus palmeri*	Spring 2006
Poaceae	*Digitaria californica*	Spring 2006
Poaceae	*Heteropogon contortus*	Winter 2006
Poaceae	*Muhlenbergia microsperma*	Winter 2006
Poaceae	*Pennisetum ciliare* *	Summer 2006
Poaceae	*Phragmites australis*	Winter 2006
Poaceae	*Setaria macrostachya*	Spring 2006
Poaceae	*Sporobolus virginicus*	Winter 2006
Rhamnaceae	*Colubrina glabra*	Winter 2006
Rhamnaceae	*C. viridis*	Winter 2006
Rhamnaceae	*Ziziphus obtusifolia var. canescens*	Winter 2006
Rubiaceae	*Randia thurberi*	Winter 2006

Family	Species	Trip
Sapindaceae	*Cardiospermum corindum*	Winter 2006
Sapindaceae	*Dodonaea viscosa*	Winter 2006
Sapotaceae	*Sideroxylon occidentale*	Winter 2006
Scrophulariaceae	*Stemodia durantifolia*	Winter 2006
Simaroubaceae	*Castela polyandra*	Summer 2006
Simmondsiaceae	*Simmondsia chinensis*	Summer 2006
Solanaceae	*Lycium andersonii*	Winter 2006
Solanaceae	*Nicotiana obtusifolia*	Spring 2006
Solanaceae	*Physalis crassifolia var. versicolor*	Spring 2006
Solanaceae	*P. pubescens*	Winter 2006
Solanaceae	*Solanum hindsianum*	Winter 2006
Sterculiaceae	*Melochia tomentosa*	Winter 2006
Tamaricaceae	*Tamarix aphylla* *	Summer 2006
Tamaricaceae	*T. ramosissima* *	Spring 2006
Theophrastaceae	*Jacquinia macrocarpa ssp. pungens*	Winter 2006
Typhaceae	*Typha latifolia*	Spring 2006
Ulmaceae	*Celtis pallida ssp. pallida*	Winter 2006
Verbenaceae	*Avicennia germinans*	Winter 2006
Viscaceae	*Phoradendron californicum*	Summer 2006
Viscaceae	*P. diguetianum*	Winter 2006
Zosteraceae	*Zostera marina* #	Summer 2006
Zygophyllaceae	*Fagonia californica*	Winter 2006
Zygophyllaceae	*Guajacum coulteri*	Winter 2006
Zygophyllaceae	*Viscainoa geniculata var. geniculata*	Winter 2006