

A SUITE OF NEW PLANT RECORDS FROM THE
SIERRA DE SAN PEDRO MÁRTIR, BAJA CALIFORNIA, MEXICO

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ABSTRACT

Ninety-two southernmost plant distribution records were documented on an expedition in 2016 to a remote meadow at the southern end of the Sierra de San Pedro Mártir, the highest mountain range in Baja California, Mexico. Among these new records, there are 12 additions to the known high elevation flora. Noteworthy new populations were documented for 14 regionally endemic plants, and several collections of rare or rarely collected taxa were also significant. Our findings suggest that the Santa Rosa Meadow should be targeted for biodiversity conservation efforts, with an emphasis on managed grazing, to support the recovery of rare meadow-endemic taxa.

RESUMEN

Se documentaron noventa y dos registros de distribución de las plantas más meridionales en una expedición en 2016 a una pradera remota en el extremo sur de la Sierra de San Pedro Mártir, la cordillera más alta de Baja California, México. Entre estos nuevos registros, hay 12 adiciones a la flora conocida de alta elevación. Se documentaron nuevas poblaciones dignas de mención para 14 plantas regionales endémicas, y también fueron significativas varias colecciones de taxones raros o raramente colectados. Nuestros hallazgos sugieren que la pradera de Santa Rosa debe ser el objetivo de los esfuerzos de conservación de la biodiversidad. Como anécdota, nuestras colecciones también sugieren que una reducción en el pastoreo apoya la recuperación de taxones raros y endémicos de praderas.

INTRODUCTION

The Sierra de San Pedro Mártir (SSPM) is the highest mountain range on the peninsula of Baja California, Mexico, with the high peak Pichacho del Diablo reaching 3095 m in elevation. The Sierra de San Pedro Mártir National Park (which includes the high peaks of the SSPM) consists of 650 km² of protected habitat and is one of the oldest national parks in Mexico (Bojórquez et al. 2004). It was declared a National Forest Reserve in 1923 and a National Park by presidential decree in 1951 (Diario Oficial de la Federación México). It was originally founded to protect the important source of wood in a region where trees are particularly scarce. Land management conflicts in the national park have centered on grazing in the high elevation meadows, which is thought to have heavily impacted the native flora.

The first non-native settlement in the area was the Mission San Pedro Mártir de Verona, on the southwestern slopes of the SSPM. It seems to have been active from about 1794–1806, and subsisted mostly on cattle ranching (Kurillo 1997). By 1848, large numbers of grazing animals were being maintained along the coast and seasonally driven into the mountains; numbers are estimated to be 200,000 sheep and 60,000 cattle and over 10,000 equines (Taylor 1869). In the 20th century, about 9,000 cattle and as many sheep were found across the entire SSPM (Flores & Gonzalez, Jr. 1913; Henderson 1960).

History of botanical collecting

The SSPM has been of interest to botanists for many decades. The earliest extensive collections were made by Ira Wiggins in 1930 (see Bajaflora.org to search herbarium specimens in the Baja California Botanical Consortium). Since then, many prominent collectors in Baja California have visited and documented plants in the SSPM, including Reid Moran, Robert Thorne, Jose Delgadillo, and the first author.

Thorne et al. (2010) published “Vascular plants of the High Sierra San Pedro Mártir, Baja California,

Mexico: An annotated checklist.” This paper was the first floristic compilation for the area and includes a comprehensive checklist of vascular plants found at high altitude: above 1800 m elevation. The published flora includes 487 species with 251 genera in 78 families, including 24 taxa endemic to the high sierra (23 species and one variety).

A subsequent review (Vanderplank et al. 2017) which includes a larger area and elevational gradient, demonstrates 907 plant taxa for the SSPM region, 849 of which were native (94%), with 64 state endemics, 24 of which are micro-endemics known only from the SSPM. Fifteen species protected by the Mexican Government on the NOM-059 SEMARNAT-2012 (Norma Oficial Mexicana) are also found in this mountain range.

Santa Rosa Meadow

Many of the most critical conservation issues in the SSPM are seen in the four large high elevation meadows of the Park (Minnich & Franco-Vizcaíno 1997; Delgadillo 2004). Our collecting trip was centered on Santa Rosa Meadow, the most southerly of these meadows. Santa Rosa Meadow, ~365 ha (905 ac), crossing the boundary of the National Park (Fig 1), extends to the top of the escarpment and is drained by two tributaries of the Río Santo Domingo at its western edge. In the form of a bowl, it can fill partially with water after wet winters and will dry out completely during the summer (Nelson 1921; Longinos Martínez 1961; Minnich & Franco-Vizcaíno 1998). It was relatively inaccessible until very recently, with a new road being blazed around 2014 (Rolando Arce, pers. comm. 2016). Local people reported steady grazing of approximately 300 cattle in the meadow area in recent years (Aidé Martorell, pers. comm.). At the time of our visit, grazing seemed to be less intense, with no more than 100 cattle seen in the Santa Rosa Meadow. Reduced populations of native plants and animals have been attributed to overgrazing in other meadows in the SSPM (Harper et al. 2017 and references therein).

MATERIALS AND METHODS

The 2016 Expedition

In June 2016, an expedition was undertaken to the Santa Rosa Meadow and surrounding areas, using pack animals to carry gear (and occasionally researchers). The expedition took place over 7 days, 3 of which were spent in the meadow and surrounding peaks. Participants included researchers from the San Diego Natural History Museum, the Botanical Research Institute of Texas, Conservación de Fauna del Noroeste (FAUNO) A.C., and Terra Peninsular A.C. It was possible to drive to the edge of the Santa Rosa Meadow, which had not been previously accessible, and we were able to conduct a thorough survey of the meadow. We made 190 herbarium specimen collections of reproductive plants, recording habitat and general abundance or rarity.

RESULTS AND DISCUSSION

Significant botanical findings

Of the botanical specimen collections of 190 different taxa made during the expedition (Table 1), almost half (92) are southernmost distribution records for that taxon. Twelve taxa are new records to the SSPM flora above 1800 m elevation and additions to the known flora of the region published by Thorne et al. (2010) (Table 1); one additional SSPM-endemic taxon collected here (*Calyptridium parryi* var. *martirensis*) was referred to in Thorne et al. (2010) as *C. parryi* ssp. *nevadense*, but was subsequently described as a narrowly endemic taxon (Simpson et al. 2016). Many additional plant specimens are new records from this area of the sierra, but they are not included here as new records to the flora because they were collected below 1800 m, the altitudinal cut-off for the Thorne et al. (2010) flora.

Noteworthy collections of regional endemics

Many of the collections are new populations of highly restricted, narrowly endemic taxa, which are noteworthy extensions of their known distribution and important to their conservation. For example, *Stenotus pulvinatus* (Asteraceae) is a small perennial plant that grows in rock crevices, previously only known from

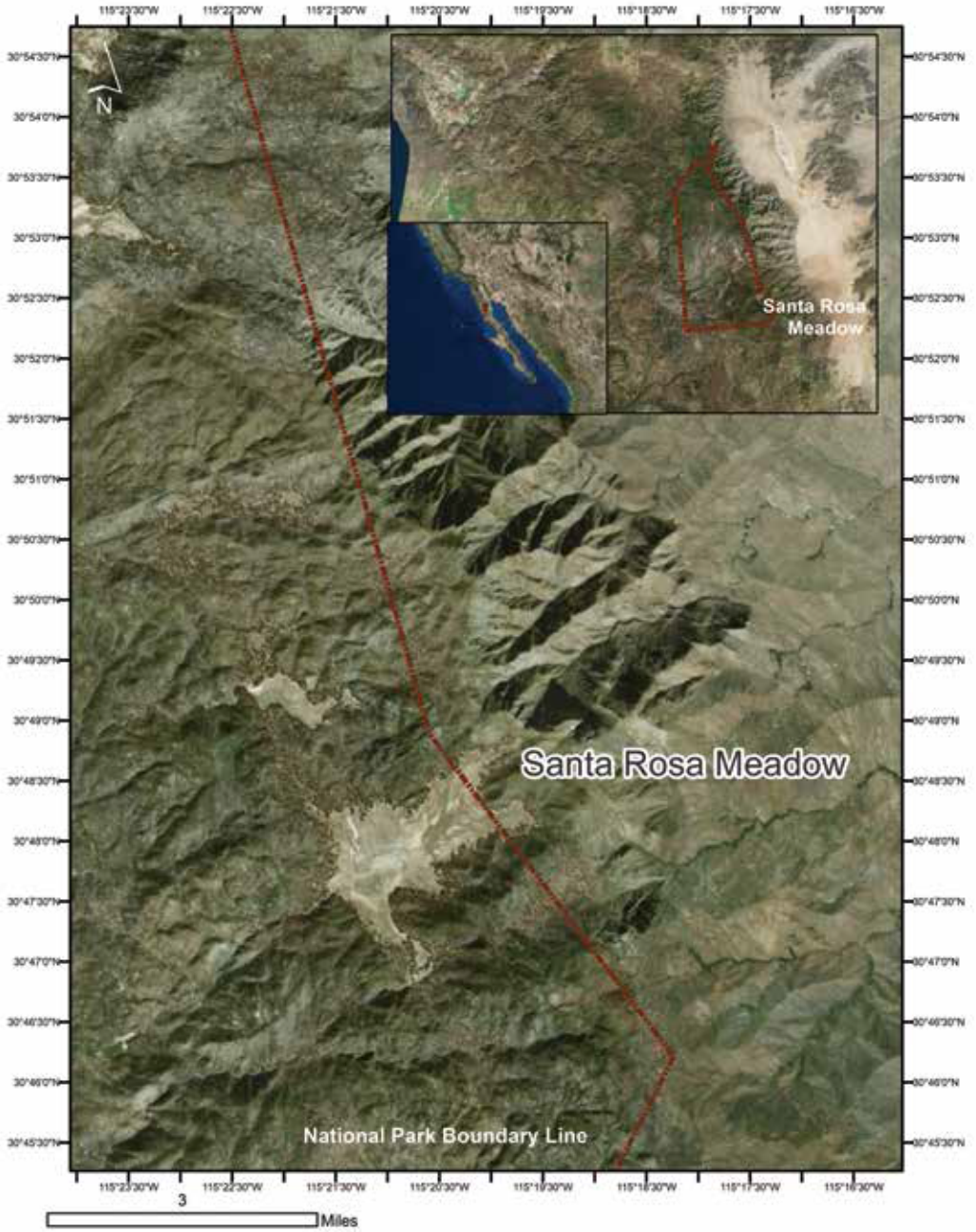


Fig. 1. Location of the Santa Rosa Meadow in the Sierra San Pedro Mártir and the boundary of the National Park.

TABLE 1. Plants collected in the Santa Rosa Meadow during the 2016 expedition. Collections numbers are for Jon P. Rebman. §= new Sierra de San Pedro Mártir record. # = not previously recognized in Thorne's flora.

Name	Coll. no.	Elevation	Range extensions
<i>Achillea millefolium</i>	31795	1750	
<i>Acmispon americanus</i> var. <i>americanus</i>	31811	1750	
<i>Acmispon argyraeus</i>	31753a	2085	southernmost
<i>Acmispon glaber</i> var. <i>brevialatus</i>	31670	1290	
<i>Acmispon nevadensis</i>	31682	1785	southernmost
<i>Acmispon utahensis</i>	31743	2020	southernmost
<i>Adenostoma fasciculatum</i>	31847	1750	
<i>Agave moranii</i>	31728a	2065	
<i>Agoseris heterophylla</i> var. <i>heterophylla</i>	31791	1750	southernmost
<i>Agrostis exarata</i>	31821	1750	southernmost
<i>Amorpha californica</i>	31690	2085	
<i>Anemopsis californica</i>	31776	1750	
<i>Antirrhinum coulterianum</i>	31735	2065	southernmost
<i>Apocynum cannabinum</i>	31878	1805	
<i>Aquilegia formosa</i>	31824	1750	southernmost
<i>Arceuthobium campylopodum</i>	31687	1785	southernmost
<i>Arctostaphylos peninsularis</i> ssp. <i>peninsularis</i>	31864	2183	
<i>Argemone munita</i>	31853	1750	
§ <i>Aristida purpurea</i> var. <i>fendleriana</i>	31707	2065	southernmost
<i>Artemisia dracunculus</i>	31859	2183	
<i>Artemisia tridentata</i>	31855	1750	
<i>Astragalus circumdatus</i>	31736	2020	southernmost
<i>Astragalus douglasii</i> var. <i>glaberrimus</i>	31681	1785	
<i>Astragalus gruinus</i>	31725	2065	southernmost
<i>Astragalus prorifer</i>	31676	1290	
<i>Baileya pleniradiata</i>	31668	1290	
<i>Berula erecta</i>	31875	1805	southernmost
<i>Boechea perennans</i>	31695	2085	
<i>Bromus carinatus</i>	31720	2065	
<i>Bromus madritensis</i> ssp. <i>rubens</i>	31829	1750	
<i>Bromus tectorum</i>	31714	2065	southernmost
§ <i>Calochortus splendens</i>	31872	1805	
<i>Calyptidium monandrum</i>	31773	1750	
# <i>Calyptidium parryi</i> var. <i>martirensis</i>	31748	2020	southernmost
<i>Camissonia strigulosa</i>	31677	1785	southernmost
<i>Camissoniopsis confusa</i>	31675	1290	southernmost
<i>Carex alma</i>	31798	1750	southernmost
<i>Carex hassei</i>	31770	1750	southernmost
<i>Castilleja applegatei</i> ssp. <i>martinii</i>	31693	2085	
<i>Castilleja minor</i> ssp. <i>spiralis</i>	31876	1805	
<i>Ceanothus cordulatus</i>	31755a	2085	southernmost
<i>Ceanothus leucodermis</i>	31698	2085	
<i>Ceanothus pauciflorus</i>	31700	2085	
<i>Chaenactis parishii</i>	31860	2183	southernmost
<i>Chorizanthe fimbriata</i> var. <i>fimbriata</i>	31669	1290	
<i>Cirsium occidentale</i> var. <i>californicum</i>	31732	2065	
<i>Cirsium scariosum</i> var. <i>americanum</i>	31746	2020	southernmost
<i>Cryptantha muricata</i> var. <i>jonesii</i>	31816	1750	
<i>Descurainia adenophora</i>	31750	2020	southernmost
<i>Descurainia obtusa</i>	31814	1750	southernmost
<i>Echinocereus mombergerianus</i>	31729	2065	southernmost
<i>Eleocharis parishii</i>	31794	1750	
<i>Elymus elymoides</i> var. <i>brevifolius</i>	31704	2065	
<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	31786	1750	southernmost
<i>Equisetum laevigatum</i>	31880	1805	southernmost
<i>Eremocarya lepida</i>	31708	2065	
<i>Eremocarya micrantha</i> var. <i>pseudolepida</i>	31680	1785	
<i>Ericameria martirensis</i>	31867	2285	southernmost
<i>Ericameria parishii</i> var. <i>peninsularis</i>	31861	2183	southernmost

TABLE 1. cont.

Name	Coll. no.	Elevation	Range extensions
<i>Erigeron foliosus</i> var. <i>foliosus</i>	31827	1750	southernmost
§ <i>Erigeron multiceps</i>	31709	2065	southernmost
<i>Eriodictyon angustifolium</i>	31699	2085	southernmost
<i>Eriogonum davidsonii</i>	31830	1750	
<i>Eriogonum fasciculatum</i> var. <i>polifolium</i>	31848	1750	
<i>Eriogonum gracile</i> var. <i>incultum</i>	31672	1290	southernmost
<i>Eriogonum hastatum</i>	31740	2020	southernmost
<i>Eriogonum nudum</i> var. <i>pauciflorum</i>	31753b	2085	
<i>Eriogonum parishii</i>	31754	2085	southernmost
<i>Eriogonum thurberi</i>	31667	1290	
<i>Eriogonum wrightii</i> var. <i>oresbium</i>	31733b	2065	southernmost
<i>Erodium cicutarium</i>	31723	2065	
<i>Erythranthe exigua</i>	31800	1750	southernmost
<i>Erythranthe floribunda</i>	31809	1750	
<i>Erythranthe nasuta</i>	31835	1750	
<i>Erythranthe purpurea</i>	31802	1750	southernmost
<i>Erythranthe rubella</i>	31801	1750	
<i>Euphorbia lurida</i>	31686	1785	southernmost
<i>Festuca myuros</i>	31833	1750	southernmost
<i>Festuca octoflora</i>	31715	2065	
§ <i>Forestiera pubescens</i>	31863	2183	
<i>Frangula californica</i> var. <i>tomentella</i>	31841	1750	
<i>Frasera parryi</i>	31873	1805	
<i>Galium martirensense</i>	31799	1750	
<i>Galium wigginsii</i>	31862	2183	southernmost
<i>Garrya grisea</i>	31868	2285	
<i>Gayophytum diffusum</i> ssp. <i>parviflorum</i>	31812	1750	southernmost
<i>Gilia mexicana</i>	31758	1750	
§ <i>Glandularia gooddingii</i>	31879	1805	
<i>Gnaphalium palustre</i>	31807	1750	
<i>Hesperoyucca peninsularis</i>	31728b	2065	northernmost
<i>Heterotheca brandegei</i>	31697	2085	southernmost
<i>Heuchera rubescens</i> var. <i>versicolor</i>	31870	2025	
<i>Hirschfeldia incana</i>	31826	1750	
<i>Hordeum murinum</i> ssp. <i>glaucom</i>	31834	1750	
<i>Horkelia clevelandii</i> ssp. <i>brevibracteata</i>	31739	2020	southernmost
<i>Hosackia oblongifolia</i> var. <i>oblongifolia</i>	31679	1785	southernmost
<i>Hulsea mexicana</i>	31674	1290	
<i>Hymenopappus filifolius</i> var. <i>lugens</i>	31734	2065	
<i>Ipomopsis effusa</i>	31742	2020	
<i>Ipomopsis tenuifolia</i>	31759	1750	
<i>Juncus bufonius</i> var. <i>occidentalis</i>	31783	1750	southernmost
<i>Juncus mexicanus</i>	31763	1750	
<i>Juncus tiehmi</i>	31782	1750	southernmost
<i>Koeleria macrantha</i>	31710	2065	southernmost
§ <i>Lemna aequinoctialis</i>	31784	1750	
§ <i>Lepidium ramosissimum</i>	31724	2065	southernmost
<i>Lepidium virginicum</i>	31828	1750	southernmost
<i>Leptosiphon melingii</i>	31712	2065	
<i>Linum lewisii</i>	31721	2065	
<i>Lomatium lucidum</i>	31856	1750	southernmost
<i>Lupinus bicolor</i>	31738	2020	
<i>Lupinus excubitus</i> var. <i>austromontanus</i>	31877	1805	
<i>Lupinus hyacinthinus</i>	31741	2020	southernmost
<i>Malva parviflora</i>	31789	1750	
<i>Marina orcuttii</i> var. <i>orcuttii</i>	31726	2065	
<i>Marrubium vulgare</i>	31840	1750	
<i>Melilotus indicus</i>	31842	1750	
<i>Mimetanthe pilosa</i>	31808	1750	
§ <i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	31857	2183	

TABLE 1. cont.

Name	Coll. no.	Elevation	Range extensions
<i>Monardella macrantha</i> var. <i>macrantha</i>	31691	2085	southernmost
<i>Muhlenbergia repens</i>	31713	2065	southernmost
<i>Muilla maritima</i>	31778	1750	southernmost
<i>Myriopteris fendleri</i>	31696a	2085	southernmost
<i>Nasturtium officinale</i>	31785	1750	
<i>Navarretia hamata</i> ssp. <i>hamata</i>	31820	1750	southernmost
<i>Nemacladus longiflorus</i> var. <i>longiflorus</i>	31745	2020	southernmost
<i>Nicotiana attenuata</i>	31760	1750	southernmost
<i>Nolina palmeri</i>	31730	2065	
§ <i>Oenothera californica</i> ssp. <i>avita</i>	31717	2065	southernmost
<i>Paspalum distichum</i>	31837	1750	
<i>Pellaea mucronata</i> var. <i>mucronata</i>	31719	2065	
<i>Penstemon centranthifolius</i>	31852	1750	
<i>Penstemon eximius</i>	31671	1290	
<i>Penstemon labrosus</i>	31757	2005	southernmost
<i>Phacelia affinis</i>	31805	1750	
<i>Phacelia brachyloba</i>	31806	1750	
<i>Phacelia mutabilis</i>	31797	1750	southernmost
<i>Philadelphus microphyllus</i>	31865	2183	southernmost
<i>Phlox austromontana</i>	31733a	2065	
<i>Physaria peninsularis</i>	31716	2065	southernmost
<i>Pinus quadrifolia</i>	31854	1750	
<i>Plagiobothrys collinus</i> var. <i>fulvescens</i>	31803	1750	
§ <i>Plantago argyrea</i>	31722	2065	southernmost
<i>Plantago major</i>	31762	1750	
<i>Poa annua</i>	31822	1750	
<i>Poa bajaensis</i>	31688	2085	southernmost
<i>Poa pratensis</i> ssp. <i>pratensis</i>	31765	1750	southernmost
<i>Polypogon monspeliensis</i>	31831	1750	
<i>Polypogon viridis</i>	31838	1750	
<i>Populus tremuloides</i>	31871	2025	southernmost
<i>Potentilla luteosericea</i>	31744	2020	
<i>Potentilla rimicola</i>	31694	2085	southernmost
<i>Pseudognaphalium luteoalbum</i>	31836	1750	
<i>Pseudognaphalium stramineum</i>	31813	1750	
<i>Quercus chrysolepis</i>	31727	2065	
<i>Quercus peninsularis</i>	31731	2065	
<i>Ranunculus aquatilis</i> var. <i>diffusus</i>	31781	1750	southernmost
<i>Ranunculus cymbalaria</i>	31777	1750	southernmost
<i>Rumex californicus</i>	31825	1750	southernmost
<i>Rupertia rigida</i>	31685	1785	southernmost
<i>Salix lasiolepis</i>	31775	1750	
<i>Schismus barbatus</i>	31819	1750	
<i>Schoenoplectus acutus</i> var. <i>occidentalis</i>	31769	1750	
<i>Selaginella asprella</i>	31696b	2085	southernmost
<i>Sidalcea sparsifolia</i>	31771	1750	southernmost
<i>Sisymbrium irio</i>	31839	1750	
<i>Sisyrinchium idahoense</i>	31787	1750	southernmost
<i>Solanum umbelliferum</i>	31851	1750	
<i>Sonchus asper</i> ssp. <i>asper</i>	31843	1750	
<i>Stachys rigida</i> var. <i>rigida</i>	31788	1750	
<i>Stenotus pulvinatus</i>	31866	2285	southernmost
<i>Stephanomeria tenuifolia</i>	31849	1750	southernmost
<i>Stephanomeria virgata</i> ssp. <i>pleurocarpa</i>	31673	1290	
§ <i>Stipa comata</i>	31756	2005	southernmost
<i>Stipa coronata</i>	31858	2183	
§ <i>Stipa parishii</i>	31706	2065	southernmost
<i>Streptanthus campestris</i>	31796	1750	
<i>Symphoricarpos longiflorus</i>	31692	2085	southernmost
<i>Taraxacum erythrospermum</i>	31790	1750	southernmost

TABLE 1. *cont.*

Name	Coll. no.	Elevation	Range extensions
<i>Thalictrum fendleri</i> var. <i>quadrinervatum</i>	31689	2085	southernmost
<i>Trifolium microcephalum</i>	31832	1750	southernmost
<i>Trifolium variegatum</i> var. <i>variegatum</i>	31683	1785	southernmost
<i>Trifolium wigginsii</i>	31737	2020	southernmost
<i>Trifolium wormskioldii</i>	31678	1785	southernmost
<i>Urtica dioica</i> ssp. <i>holosericea</i>	31792	1750	southernmost
<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	31780	1750	southernmost
<i>Xanthisma wigginsii</i>	31747	2020	southernmost

approximately five locations near the observatory inside the SSPM National Park, and was documented during the expedition to be growing on the north-facing cliffs of the escarpment at the eastern end of the Santa Rosa Meadow.

Physaria peninsularis (Brassicaceae) is a rare perennial, meadow species, heavily impacted by grazing and previously considered to be questionably extant in the northern meadows of the SSPM, but thousands of individuals were seen at Santa Rosa Meadow, which is likely its largest population. Another rare meadow species documented was *Astragalus circumdatus* (Fabaceae), which was found scattered at the lower southwestern end of the meadow.

Additional narrow endemics from the SSPM whose range extensions to the south are significant include *Astragalus gruinus* (Fabaceae), *Calyptridium parryi* var. *martirensis* (Montiaceae), *Echinocereus mombergerianus* (Cactaceae), *Ericameria martirensis* and *E. parishii* var. *peninsularis* (Asteraceae), *Eriogonum wrightii* var. *oresbium* (Polygonaceae), *Galium wigginsii* (Rubiaceae), *Heterotheca brandegeei* (Asteraceae), *Poa bajaensis* (Poaceae), *Trifolium wigginsii* (Fabaceae), and *Xanthisma wigginsii* (Asteraceae) (Fig. 2).

We also observed the SSPM endemic *Ivesia argyrocoma* var. *moranii* (Rosaceae) in the meadow, but did not collect it as it was not reproductive at the time.

Additional noteworthy collections

Although not narrowly endemic, additional significant plant collections include the following. *Populus tremuloides* (Salicaceae) was also documented as a range extension and southernmost occurrence. The southernmost population of the federally threatened *Trifolium wormskioldii* (Fabaceae; NOM-059) was recorded. The expedition specimens of *Forestiera pubescens* (Oleaceae) and *Lemna aequinoctialis* (Lemnaceae) document the continued presence of these poorly collected species in the state of Baja California.

The collection of *Trifolium variegatum* var. *variegatum* (Fabaceae) is also new to the flora of the state (see checklist in Rebman et al. 2016). The collection of *Hesperostipa comata* [syn. *Stipa comata*] (Poaceae) is a significant range extension, only previously known in Baja California from the Sierra de Juárez, approximately 150 km to the north. Also, the collection of *Stephanomeria* aff. *tenuifolia* is the second known collection of this taxon in Baja California.

Additional significant collections include the southernmost records of *Carex alma* and *C. hassei* (Cyperaceae), which were previously only known from a single collection in Baja California, and *Descurainia obtusa* (Brassicaceae), and *Muhlenbergia repens* (Poaceae), which were previously only rarely collected on the peninsula. The collection of *Eremocarya micrantha* var. *pseudolepida* is significant as it expands our distributional knowledge of this recently described taxon (Simpson et al. 2016).

Potential taxonomic issues

An unusual specimen of *Astragalus* was collected in the Santa Rosa Meadow. It looks similar but does not key exactly to the Baja California-endemic taxa *A. gruinus* or *A. douglasii* var. *glaberrimus*, and could perhaps be a hybrid between these species or a potential new taxon.



FIG. 2. Rare and endemic plants found in the Santa Rosa Meadow: (a) *Calyptidium parryi* var. *martense*, (b) *Physaria peninsularis*, (c) *Stenotus pulvinatus*, (d) *Potentilla lutescens*, (e) *Trifolium wigginsii*, (f) *Nemadadus longiflorus* var. *longiflorus*, (g) *Astragalus circumdatus*, (h) *Echinocereus mombbergerianus*, (i) *Xanthisma wigginsii*.

Conservation significance

The Santa Rosa Meadow and the north-facing escarpment cliffs at its eastern end are home to a wealth of locally endemic taxa, and this locality is the southernmost distribution for many plants that are restricted to this mountain range. Despite being edge populations, the lack of historical access (and perhaps lower impacts from grazing) have resulted in the conservation of remarkable populations of many species that are rare and severely impacted elsewhere in the mountain range. Of all the high-elevation meadows, the Santa Rosa Meadow appears to have the largest populations of the rare, SSPM-endemic species *Physaria peninsularis*, *Astragalus circumdatus*, and *Potentilla luteosericea*. This region appears to be an excellent choice of focus for biodiversity conservation efforts in the region. Our observations also corroborate the idea that the intensity of cattle grazing in the meadows could affect rare meadow-endemic taxa, e.g., if stocking levels are consistently lower in the Santa Rosa Meadow, perhaps the greater abundance of rare/endemic meadow taxa is a result of different management practices.

CONCLUSIONS

Even after more than 100 years of botanical collecting in the SSPM, we still do not know the full distribution of many, perhaps most, of the rarest and most narrowly endemic taxa in the SSPM. Grazing has been identified as an important threat to the endemic plants and animals of the SSPM. Further surveys and monitoring are needed to protect this extraordinarily diverse region and its endemic plants and animals. Similar conservation actions are likely necessary at the other three large meadows in the park. Additional floristic surveys at other times of the year will likely produce even more species discoveries and range extensions.

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