Abstract. Todos Santos Island is situated 6 km off the northwestern coast of Baja California near Ensenada. The island has a Mediterranean climate with a mean annual precipitation of about 255 mm. A total of 142 native and naturalized vascular plant taxa are known from Todos Santos, representing 37 families and 104 genera. Although none are restricted to the island, 1 is endemic to the California Islands (Eschscholzia ramosa) and a number of Baja California endemics are found there. Maritime scrub vegetation, dominated by drought-resistant shrubs and cacti, covers most of the island. Some areas are dominated by native perennial grasses and by nonnative grasses and herbs. The vegetation has repeatedly been disturbed by human activities, as well as by nonnative animals and plants, periodic fires, and nesting seabird colonies. Introduced burros, goats, and rabbits are serious threats to the terrestrial ecosystem.

Keywords: Todos Santos Island; Las Islas de Todos Santos; Punta Banda; California Islands; Baja California; Mexico; vegetation.

Introduction

Within sight of the popular tourist town of Ensenada are 2 picturesque islets which support a rich mixture of showy flowering shrubs, herbaceous perennials, cacti, and annual plants. The composition of the flora of these islets has changed significantly during the last 40 yr, primarily because of disturbance and the introduction of nonnative plants. This paper describes current conditions on Todos Santos Island and includes (1) an introduction to the geography and vegetation, (2) a short history of botanical collecting, (3) a description of historical changes, and (4) an annotated list of the vascular plants.

Physical Environment

Eight islands lie off the west coast of Baja California between the United States/Mexico border and Punta Eugenia, 775 km (557 mi) south of the international border. Ranging in size from 0.4 to 348 km² (0.2 to 134 mi²), 7 of the islands are on the continental shelf, 6 of them within 23 km (14 mi) of the coastline. San Benito Island is 66 km (41 mi) from the peninsula but only 27 km (17 mi) west of Cedros Island. Guadalupe, however, is a truly oceanic island, 252 km (157 mi) off the Baja California peninsula.

Todos Santos Island is centered near latitude 31° 48' N, longitude 116° 48' W, about 90 km (56 mi) south of the boundary between the United States and Mexico. This island is 6 km (4 mi) off the tip of Punta Banda, just west of the Bay of Todos Santos (Fig. 1), and includes 2 islets with a combined area of 1.2 km² (0.5 mi²) (Fig. 2). The southern islet (Isla del Sur) is larger and topographically more diverse than the northern islet (Isla del Norte). Isla del Sur is 96 m (313 ft) high and has several hills and swales besides a main peak near the middle. Isla del Norte is relatively flat with limited topographic diversity and a maximum elevation of about 17 m (55 ft).

The geologic substrate of Todos Santos Island has been mapped as the Alisitos Formation of Lower Cretaceous (Aptian or Albian) age (Gastil et al. 1975), mainly andesitic pyroclastic rocks and immediately derived sedimentary rocks. There has been significant soil development on some gentle slopes of Todos Santos, but many parts of the island are very rocky with little soil cover. There are no large canyons and no dependable freshwater springs, but north-facing slopes have moist microhabitats.

Only short-term rainfall records are available for Todos Santos Island, from a station at an elevation of 60 m. Between 1934 and 1939, annual precipitation on the island ranged from 126.1 to 393.2 mm (5 to 15.5 in.) with a mean annual precipitation of 255.6 mm (10 in.) for the 6-yr period (Hastings 1964). Mean annual precipitation at an elevation of 24 m in nearby Ensenada was 283.3 mm (11.2 in.) for a discontinuous 47-yr period between 1894 and 1962. Summer is the driest season in the area. Weather records for Ensenada and for the island indicate that roughly 90% of the annual precipitation usually falls in the winter and spring, between November and April. Temperature data are not available for the island, but the climate must be similar to stations at Ensenada and La Mision on the adjacent peninsula. Mulroy et al. (1979)...
Seventy species of plants were collected, and doubtless more would have been found two weeks later, for the vegetation was not much advanced in the early part of March. The most common plants were *Calandrinia maritima*, *Cereus Emoryi* (*Bergerocactus*), *Mesembryanthemum crystallinum*, *Leptosyne maritima* (*Coreopsis*), *Encelia California* (*sic*), *Euphorbia misera* and *Brodiaea capitata* (*Dichelostemma*), all maritime plants abundant in the spring of 1897, A. W. Anthony and several other naturalists visited the islands off the west coast of Baja California on his schooner *Wahlberg* (Brandegee 1900; Moran 1950, 1952). Anthony and Townshend S. Brandegee collected plants from Todos Santos Island on 6-7 March and 9-10 March 1897, and Anthony sold duplicates to various herbaria. T. S. Brandegee reported that they found 70 plant taxa on the island, listed 22 of the taxa seen (20 native and 2 introduced plants), and described the plant life (Brandegee 1900):...
Botanical collecting on Todos Santos Island has continued during the 1990s and 2000s. On 15 March 1980, Robert F. Thorne of Rancho Santa Ana Botanic Garden explored Isla del Sur with a number of other botanists, including David Michener and Walter Wissler. They saw at least 77 plant taxa and made a number of very significant collections. After the trip, Thorne (1980) published a list of 31 additions and 1 correction to Moran’s previous list. Ralph Philbrick and Steve Junak collected specimens on both islets on 20-21 April 1985, and on 11 March 1988, Junak returned to Isla del Sur on 24 March 1987. Thorne and Junak (1988) published a revised checklist for Todos Santos Island, which included 140 taxa. Since the beginning of the 1990s, Junak has made 1 additional trip to Isla del Sur, on 18 March 1991.

In summary, about 15 botanists have collected specimens during at least 13 trips to Todos Santos Island. Possibly Mexican botanists have also visited the island, but we have seen no specimens. Most of the botanical collectors have spent only a few hours on the island during any one trip and have concentrated their efforts on Isla del Sur. Only a few collectors have visited Isla del Norte, presumably because larger areas were not permitted by the Mexican government during various time periods. More thorough surveys on both islands will probably yield new plant records.

Historical Changes

As noted by Thorne (1980), significant changes have taken place on Todos Santos Island since Moran (1950) published the first checklist of flowering plants for the island. The present vegetation of Todos Santos Island appears to reflect the history of disturbance described above and the natural vegetation on the adjacent mainland, as discussed by Shreve (1936). Shreve described the region around Todos Santos Bay as the transition zone between chaparral and desert vegetation in Baja California.

The present vegetation of Todos Santos Island appears to reflect the history of disturbance described above and the natural vegetation on the adjacent mainland, as discussed by Shreve (1936). Shreve described the region around Todos Santos Bay as the transition zone between chaparral and desert vegetation in Baja California.

Vegetation

Vegetation cover on the island is characterized by wide spaced, suffrutexcent or soft-woody shrubs with an aspect similar to some heavily disturbed portions of the adjacent Punta Banda area. While woody shrubs taller than 2 m are uncommon on Todos Santos Island, they are abundant on Isla del Norte. In general, the vegetation on much of the Punta Banda peninsula is woodland and denser than that of Todos Santos Island.

A mixture of shrubs, perennials, and annual plants is found on Todos Santos Island, and the 2 islets have a very different aspect. Isla del Sur has an undulating topography, with a main ridge and several outlying peaks and hills. There are several small drainages on the south islet and much of the island is surrounded by rocky cliffs. North-facing slopes provide moist microhabitats for succulent vegetation. Isla del Norte has little topographic diversity and has been heavily disturbed. It is a low mesa surrounded by cliffs.

The dominant plant community for much of Isla del Sur is maritime cactus scrub, with some areas dominated by native perennial grasses. Introduced annual grasses and herbs are common in disturbed sites. One of the tallest shrubs on Isla del Sur is Heterosorus arborescens, which is found mostly in sheltered sites and is not widespread. Shrubs and large perennials commonly on open slopes of Isla del Sur include Artemisia californica, Conocytis maritima, Eriogonum fasciculatum var. fuscofumatum, E. grande var. testudinum, Euphorbia misera, Hazardia berberidifolia, Helianthus greeneanus subsp. pendulum, Isocoma menziesii var. menziesii, Lotus watsontii, L. californicum, Malosma laurina, and Rhus integrifolia. Bergerocactus emoryi occurs in large thickets throughout; its pendulous stems are also common on coastal bluffs.

Flats near the northern end of Isla del Sur are dominated by a mixture of shrubs, herbaceous perennials, and a few annuals. Agriculture was common in this area in the 1800s and 1900s. Mediterranea, genus, many rare and unusual species are found on Isla del Sur. Some are native only to this island.

The present vegetation of Todos Santos Island appears to reflect the history of disturbance described above and the natural vegetation on the adjacent mainland, as discussed by Shreve (1936). Shreve described the region around Todos Santos Bay as the transition zone between chaparral and desert vegetation in Baja California.

Vegetation cover on the island is characterized by wide spaced, suffrutexcent or soft-woody shrubs with an aspect similar to some heavily disturbed portions of the adjacent Punta Banda area. While woody shrubs taller than 2 m are uncommon on Todos Santos Island, they are abundant on Isla del Norte. In general, the vegetation on much of the Punta Banda peninsula is woodland and denser than that of Todos Santos Island.

A mixture of shrubs, perennials, and annual plants is found on Todos Santos Island, and the 2 islets have a very different aspect. Isla del Sur has an undulating topography, with a main ridge and several outlying peaks and hills. There are several small drainages on the south islet and much of the island is surrounded by rocky cliffs. North-facing slopes provide moist microhabitats for succulent vegetation. Isla del Norte has little topographic diversity and has been heavily disturbed. It is a low mesa surrounded by cliffs.

The dominant plant community for much of Isla del Sur is maritime cactus scrub, with some areas dominated by native perennial grasses. Introduced annual grasses and herbs are common in disturbed sites. One of the tallest shrubs on Isla del Sur is Heterosorus arborescens, which is found mostly in sheltered sites and is not widespread. Shrubs and large perennials commonly on open slopes of Isla del Sur include Artemisia californica, Conocytis maritima, Eriogonum fasciculatum var. fuscofumatum, E. grande var. testudinum, Euphorbia misera, Hazardia berberidifolia, Helianthus greeneanus subsp. pendulum, Isocoma menziesii var. menziesii, Lotus watsontii, L. californicum, Malosma laurina, and Rhus integrifolia. Bergerocactus emoryi occurs in large thickets throughout; its pendulous stems are also common on coastal bluffs.

Flats near the northern end of Isla del Sur are dominated by a mixture of shrubs, herbaceous perennials, and a few annuals. Agriculture was common in this area in the 1800s and 1900s. Mediterranea, genus, many rare and unusual species are found on Isla del Sur. Some are native only to this island.
At least 34 native taxa in 26 genera and 11 native and nonnative species have been introduced to Todos Santos Island and have spread into natural habitats, primarily since the 1950s. These introductions represent almost 24% of the island's total flora. By comparison, known percentages of non-native plants on the other islands off the west coast of Baja California range from about 9% (Natividad Island) to about 50% (San Geronimo Island). The plant families with the highest number of nonnative taxa on Todos Santos Island are the Poaceae (11 taxa) and the Asteraceae (6 taxa). Bromus is the largest genus, represented by 3 nonnative taxa. Most of the island's nonnative plants have been introduced from Europe, with a few taxa from South Africa and 1 species native to Australia. On Todos Santos Island, all of the introduced plant taxa are herbaceous; 4 species are perennials and the rest are annuals.

Acknowledgements. We gratefully acknowledge the help of Reid Moran, Robert Thorne, Jim Blakley, and Michael Benedict, who kindly shared information on their collections from Todos Santos Island. We thank the curators and staff of the following herbaria for their hospitality and for lending selected specimens: CAS-DIS, GH, ND-G, RSA-POM, SD, UC, and US. Funding for field trips was provided by the Santa Barbara Botanic Garden, and Joan Tanner Rounds drew the maps. We especially thank Alba Day, who identified the Gilia from Todos Santos Island, and Captain Kirk Connally, who organized several trips to the Mexican islands under the auspices of Terra Marine Research and Education.

Literature Cited


**APPENDIX**

Annotated Catalog of the Vascular Plants of Todos Santos Island

Plants listed in this appendix are arranged alphabetically by family within major plant groups (ferns, dicotyledonous flowering plants, and monocotyledonous flowering plants). The names of taxa proximate to being introduced to Baja California and/or Todos Santos Island by human activities precede by an asterisk (*). The list does not include plant taxa which have been planted on the island, unless they are particularly conspicuous or have naturalized there. Neomenclature primarily follows Wiggins (1980) or Hickman (1993). Abbreviations of author names mostly follow Brummitt and Powell (1992). Synonyms are only included for a few taxa. Common names are mostly according to Abrams (1923-1980) and Hickman (1983), with a few additions from Beauschamp (1986), Coyne and Roberts (1973), Gould and Moran (1981), and Martinez (1979).

Abundance ratings (rare, scarce, occasional, common, and abundant) and distribution descriptions are based on the observations of the authors. Descriptions of abundance and distribution will undoubtedly need refinement in the future.

Only some of the place names used by recent collectors are shown on the map in Figure 2. These place names have not been standardized, and nearly every collector has used different names. We cite a maximum of 3 voucher specimens for each taxon and these are arranged chronologically by date of collection. The following abbreviations are used: TS if list was not specified on original label, TSN for Isla del Norte, TSS for Isla del Sur. Compass directions are abbreviated to a single capital letter. Label data on most early collectors did not give specific localities.

We cite a maximum of 3 voucher specimens for each taxon and these are arranged chronologically by date of collection. The following abbreviations are used: TS if list was not specified on original label, TSN for Isla del Norte, TSS for Isla del Sur. Compass directions are abbreviated to a single capital letter. Label data on most early collectors did not give specific localities. Abundance ratings (rare, scarce, occasional, common, and abundant) and distribution descriptions are based on the observations of the authors. Descriptions of abundance and distribution will undoubtedly need refinement in the future.

**Ferns**

*Polygodaceae (Polyody Fern Family)*

_**Polypodium californicum** Frau. CALIFORNIA POLYPODY. Rare; N-facing rock face of High Point on TSS. TS, 15 Mar 1980, Thorne et al. 53560 (RSA-POM).

**Dicotyledonous flowering plants**

_Aizoaceae (Iceplant Family)*


_Crassulaceae (Crassulaceae)*

*Carraguel,* SE-A-PO. Occasional; especially on rocky slopes.

_Mesembryanthemum crystallinum* L. CRYSTALINE ICEPLANT. Abundant.


_Acanthaceae* (Succulent Family)*


_Apocynaceae (Celery Family)*

_Apianthus angustifolius* Nut. WILD CELERY. Occasional. Many populations seen, N Fish Camp, central eastern portion of TSS, 28-29 Apr 1978, Philbrick & Junak BS7-90; rare along trail, just S of fishing shack at NE end of TSS, elev. ca. 60 ft, 20 Apr 1985, Junak 2797; occasional, N slope of main hill on TSS, 21 Apr 1985, Junak 2900.

_Daucus parviflora* Michx. KATTLESMAKE WEAED. Rare. Plants at Middle Cove, TSS, 28-29 Apr 1978, Philbrick & Junak BS7-78; 1 of 2 populations seen during this trip, both in same portion of island, W of Landing Cove, TSS, 28 Apr 1978, Philbrick & Junak BS7-106; rare, grassy flats at NE end of TSS, E side of Lavaters Butte, elev. ca. 50 ft, 20 Apr 1985, Junak 2781.

_Asteraceae (Sunflower Family)*

_Amblyopappus parvulus* Hook. & Arn. PINEAPPLE WEAED. Occasional. TS, 29 May 1926, Pierce s.n. (POM 98722); common among small shrubs, in rocky clay on S slope, NE end of TSS, 24 Oct 1965, Blakley 6578; common, flats at SE end of TSS, 21 Apr 1985, Junak 2814a.

_Ambrosia chenopodioides* (Benth.) W. W. Payne. SAN DIEGO BUR-SAGE. Distribution on Todos Santos Island is unknown; not seen recently. Reported for Todos Santos by Brandegee (1900), but we have not seen a voucher specimen. This taxon is common at Punta Banda on the adjacent mainland (Mulroy et al. 1979).

_Acacia californica* Less. COASTAL SAGEBRUSH. Common; especially on E side of island.

_Coastal sagebrushes* are common in protected areas of deeper clay soil, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6581; ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict BS6-1370; burned NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict BS6-448 (seedlings).

_Coastal sagebrushes* are common in protected areas of deeper clay soil, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6581; ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict BS6-1370; burned NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict BS6-448 (seedlings).

_Coastal sagebrushes* are common in protected areas of deeper clay soil, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6581; ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict BS6-1370; burned NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict BS6-448 (seedlings).

_Coastal sagebrushes* are common in protected areas of deeper clay soil, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6581; ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict BS6-1370; burned NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict BS6-448 (seedlings).

_Coastal sagebrushes* are common in protected areas of deeper clay soil, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6581; ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict BS6-1370; burned NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict BS6-448 (seedlings).
Disturbed site between 2 shacks, low flats, N Fish Camp, central eastern portion of TSS, elev. ca. 50 ft, 28 Apr 1978, Philbrick & Junak B76-77; single plant in grassland, flats W of N Fish Camp, just N of main hill, E side of TSS, elev. ca. 100 ft, 21 Apr 1985, Junak 2798.

Coreopsis maritima (Nutt.) Hoek. & E. Sea-Darblie. Common.

TSS, 24 Feb 1949, Wiggins 11895 (SD); crevices of a rocky cliff's N slope, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6606; bluffs, ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, Philbrick & Benedict B65-1557.

Daucus californico Nutt. BUSH SUNFLOWER. Common.


Filago californica Nutt. CALIFORNIA FILAGO. Rare.

Rare on E-facing slope, along trail on E side of TSS, near N Fish Camp, elev. ca. 50 ft, 28 Apr 1978, Philbrick & Junak B78-85.

Graptolebium baccatum Div. FRAGRANT EVERLASTING, Scarce.

Occasional near S Landing, TSS, 11 May 1979, Moran 27203 (SD).

Graptolebium bicolor Blaisd. BICOLORED EVERLASTING. Scarce.


Hazardia berberidis (A. Gray) Greene [Haplopappus b. A. Gray] Occasional; locally common in NE portion of TSS. Endemic to the northeastern part of Baja California.


Hemioniscus fascicolatus (DC.) Torr. & A. Grey COMMON TAWEDDE. Scarce.

Terrace, S Anchorage, TSS, 21 Apr 1985, Philbrick & Junak s.n. (SBBC 10383).

Hemioniscus gramineus subsp. pinnatispinus Moran Occasional. Endemic to TSS, Punta Banda, and NE-facing slope at base of Lavatera Butte, NE end of TSS, elev. ca. 50 ft, 20 Apr 1985, Junak 2780.

*Hypochaeris glabra* (L.) C. J. Mayer GOLDFIELDS. Rare.


Rupicola californica Nutt. CALIFORNIA CHICORY. Occasional; grassy sites.

Common on onshore portion of island, terrace just N of N Fish Camp, central eastern portion of TSS, 29 Apr 1978, Philbrick & Junak B78-100; common on N end of TSS, 21 Apr 1985, Junak 2793; rare, top of bluffs as SE side of TSS, elev. ca. 75 ft, 21 Apr 1985, Junak 2810.

*Sonchus aleraceus* L. COMMON SOW-THISTLE. Scarce; especially in grasslands on E side of island.


*Sonchus tenuiramis* L. SLINDER SOW-THISTLE. Scarce.

TS, 10 Mar 1897, Brandegee s.n. (UC 9293); scarce, TSS, elev. ca. 10 m, 23 Jun 1969, Moran 16217 (SD).

Stephanoenora digenesis Gottlieb SAN DIEGO MILK-THISTLE. Occasional.


Only plants seen during this trip, W of Landing Cove, TSS, 28 Apr 1978, Philbrick & Junak B78-105; locally common, E side of Lavatera Butte, NE end of TSS, elev. ca. 50 ft, 20 Apr 1985, Junak 2780.

Verbesina dixtia A. Grey CROWWEED. Scarce.


Viguiera lacunata A. Grey SAN DIEGO SUNFLOWER. Scarce; localized on E side of Island near N Fish Camp. Locally common, restricted to this area, E-facing slope, N Fish Camp, central eastern portion of TSS, 28 Apr 1978, Philbrick & Junak B78-87; locally common at N Fish Camp, E side of TSS, 21 Apr 1985, Junak 2803.
**Boraginaceae (Borage Family)**

Anasakia menziesii var. insana var. (Fischer & C. Meyer) Gardens *COMMON FIDDLENECK*. Rare; not seen recently. Occasional at NE end, TSS, 7 Apr 1948, Moram 2688 (UC).

**Caryophyllaceae (Pink Family)**

- Silene antirrhina (Hook. & Am.) Greene *SLEEPY CATCHFLY*. Rare.
- Silene gallica (L.) C.L. Hitchc., L. LONDON ROCKET. Occasional.
- *Silene nitida* Torrey var. nitidum (Hook. & Am.) Greene *CALIFORNIA MUSTARD*. Rare; not seen recently.
- *Silene insularis* Torrey & A. Gray var. insularis (Hook. & Am.) Greene *COASTAL CHILOMA*. Distribution on Todos Santos is unknown.

- Caryopteris incana (Engelm.) Cockerell *COASTAL PRICKLY PEAR*. Scarce.

**Cactaceae (Cactus Family)**

Bærodiva emoryi (Engelm.) Britton & Rose *SNAKE CACTUS, GOLDEN-SPIINED CEREUS*. Common; forming large thickets in several areas.


- The Vascular Plants of Todos Santos Island -

Mammillaria dioica M.K. Brandegee *FISS-HOOK CACTUS*. Rare; just back from top of beach bluff, NE end of TSS, elev. 50 ft, 24 Oct 1965, Blakley 6587.

*Sedum speciosum* (L.) Miller *MISSION CACTUS, INDIAN-PEG*. Apparently planted near Lighthouse on TSN and at S Fish Camp on TSS, not spreading at present.

- Seem on TSN by R. Philbrick, 24 Oct 1965, and on TSS by S. Junak, 18 Mar 1991, but no specimens were collected.

Opuntia littoralis (Engelm.) Coker & Ell. *COASTAL PRICKLY PEAR*. Scarce.

- One of 2 or 3 clones in area, very few seen elsewhere on island, flats S of cone-shaped hill, NW portion of TSS, 25 Aug 1968, Philbrick & Benedict B66-354.

Opuntia arizola Philbrick *TALL PRICKLY PEAR*. Occasional.


Opuntia prostrata Engelm. *COASTAL CHOLLA*. Distribution on Todos Santos is unknown and taxonomy has not been verified. Reported by Thorne (1980) but we have seen no specimens.

**Chenopodiaceae (Goosefoot Family)**

Atriplex halimus Moq. ATRIPLEX. Scarce.

- Bluff edge, NW tip, TSS, 28 Apr 1978, Philbrick & Junak B78-122; rare, top of bluffs at SE side of TSS, elev. ca. 75 ft, 21 Apr 1985, Junak 3813; locally common on cliffs above gravel beach, W side of TSS, just W of fish camp near S end of islet, elev. ca. 40 ft, 24 Mar 1987, Junak 3111.


- Rare, NE side, TSS, elev. ca. 15 m, 23 Jun 1969, Moram 63329 (RSA-POM,SD); locally common, NE side of hill just S of S Fish Camp, TSS, elev. ca. 50 ft, 18 Mar 1991, Junak 4512.

Atriplex lutea L. *SALTWEED*. Endemic to Baja California.

between Sprengel 9596; 2815 (DC); TSS, 24 Feb 1949, 1'.;/oran
420 lunak, S. Crassula connata
Dudleya brittonii
Dudleya anomala
Dichondra occidentalis
*Chenopodium murale
Coronados, Todos Santos Islands, and Punta Banda on the peninsula.

to Baja California.

Calystegia macrostegia
Chenopodium californicum
*Atriplex semibaccata
Philbrick &: TS, Mar-Jun 1897,
24 Oct 1965,
Benedict B65-1546; Sa:
Moran 2807
Philbrick &: Benedict B68-256; RM
Benedict B68-422.

Scattered on N sides of rocky outcroppings, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965,
Philbrick & Benedict B65-1350; roo, S slope of highest island peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965
Philbrick & Benedict 65-1351; ron, S slope of highest island peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965
Philbrick & Benedict B65-1350; ron, S slope of highest island peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965
Philbrick & Benedict B65-1351; ron, S slope of highest island peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965

*Salalina tragia L. [S. Sprengel] Dudleya Britton
Russian-thistle, tumbleweed. Common; now spreading on the island.

Rare, rocky clay soil on S slope, at top of highest peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965,
Blakley 6601; E-facing slope between N and S fish camps, SE portion of TSS, 24 Aug 1968
Philbrick & Benedict B68-452; W-facing slope, terrace SW of High Point, SW portion of TSS, 25 Aug

Convolvulaceae (Morning-glory Family)

Calystegia amplexicaulis (Green.) Britton (Morning-glory) Occasional.

Dicksonia occidentalis House (Western Dickondoa) Occasional.
TS, Mar-Jun 1897, Anthony 191 (CAS-DS); slight E-facing slope, Middle Cove, TSS, 28-29 Apr 1978,
Philbrick & Junak B78-75; common in grassland, flats at N Fish Camp, E side of TSS, just N of main
hill, 21 Apr 1985, Junak 2804.

Crassulaceae (Stonecrop Family)

Found only at one spot on NE side, TSS, 7 Apr 1948, Moran 2807 (UC); scattered, next to bluffs at N Fish Camp, central eastern portion of TSS, 28 Apr 1978, Philbrick & Junak B78-69.

Dudleya anomala (Division) Morin Occasional; mostly on N-facing slopes and rockfaces. Endemic to Los Coronados, Todos Santos Island, and Punta Banda on the peninsula.

Scattered on N sides of rocky outcroppings, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965,
Blakley 6603; flats S of Landing Cove, NE portion of TSS, 24 Aug 1968, Philbrick & Benedict B65-617; common on rocks and cliffs, especially N-facing, TSS, elev. ca. 25 m, 23 Jun 1969, Moran 16237 (SD).

Dudleya attenuata subsp. arcuata (Ros.) Moran OSCURITY STYLOPHYLLINUM. Occasional; especially on flats.
Comm. in highly areas of deep clay loam soil, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965,
Blakley 6601; burn NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict B68-497; abundant on flats, often in grass, TSS, elev. ca. 10 m, 23 Jun 1969, Moran 16218.

Scattered on rocky cliffs and in flat areas of rocky soil, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965,

- The Vascular Plants of Todos Santos Island -

Dudleya x semilines (Rose) Moran Rare; especially on flats. This plant is apparently a recurrent natural hybrid between Dudleya attenuata subsp. arcuata and Dudleya brittonii (Morin 1951); hybrids also occur at Punta Banda on the mainland (Mulroy et al. 1979).
Scarce, TSS, elev. ca. 25 m, 23 Jun 1969, Moran 16337 (SD).

Cucurbitaceae (Gourd Family)

Marah macrocarpus (Greene) Greene WILD-CUCUMBER. Common. Extremely variable on Todos Santos; needs further study.

Rare on N slopes, climbing over rocks and shrubs, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965,

Euphorbiaceae (Spurge Family)

Euphorbia crenulata Engelin. CHINESE CAPS. Rare.


Euphorbia muelleri Bentth. CLIFF SPURGE. Common.

Fabaceae (Pea Family)

TSS, 24 Feb 1949, Wiggins 11984 (RSA-POJ; TSS, 15 Mar 1980, Thoron et al. 39971 (RSA-POJ); scattered, large patches in grassy openings between shrubs at N end of TSS, elev. ca. 100 ft, 24 Mar 1987, Junak 3099.

Lotus strigosus (Nutt.) Greene subsp. strigosus BISHOPS LUTOS. Occasional.
TSS, 7 Apr 1948, Moran 2803 (UC).

Lotus watsonii (Vasey & Rose) Greene Occasional. Endemic to northwestern part of Baja California.
TS, Mar-Jun 1897, Anthony 198 (UC); scattered on S-facing slope near Indian Cave, NE portion of TSS, elev. ca. 100 ft, 19 Apr 1985, Junak 2772.

Lupinus truncatus Hook. & Am. TRUNCATE LUPINE. Rare.
TS, 10 Mar 1897, Bremdseger s.n. (UC 138049); TSS, 7 Apr 1948, Moran 2798 (UC); burn NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict B68-494.

Triodetum gracilestum Torr. & A. Gray PINPOINT CLOVER. Rare.

Triodetum villiiomiii Sprengel [T. tridentatum Lindl.] TOMCAT CLOVER. Rare.
Erodium moschatum

Phacelia hirtuosa

Ribes viburnifolium

Eucrypta chrysanthemifolia

A. Gray EVERGREEN CURRANT. Rare; known from a single collection.

N. Fish Camp, central eastern portion of TS8, elev. ca. 50 ft, 28 Apr 1978,


*Phacelia dis tans

* Lavenia assurgentiflora

Archonache exilis (A. Gray) Greene (Malastromium a. A. Gray) WHITE MALLOWS. Rarely seen or collected; can be common in certain years. Not reported for Todos Santos between 1897 and 1991.

Pholistoma auritum (L.) L'Her. FIESTA FLOWER. Rare; known from a single collection. Included here on the basis of a poor specimen annotated by R. Halse in 1992.

Te ffiarringa verna (Lindl.) Boc. JILJA FIESTA FLOWER. Rare; known from a single collection. Included here on the basis of a single questionable specimen possibly collected on Todos Santos Island.

Frankeniaceae (Frankenia Family)

Frankenia salina

* * Erpodium moschatum

* Erodium cicutarium

Ceratidiscus (L.) L'Her. REDSTEM FILAREE. Occasional.

Geraniaceae (Geranium Family)

* Lavadera exigua (A. Gray) Greene (Malvastrum a. A. Gray) MALA MALLOWS, ISLAND TREE MALLOW. Scarce; localized populations near NE end of TSS. Probably planted on Todos Santos (Philbrick 1980). Native populations of this subspecies are known from San Miguel and Anacapa islands.

The Vascular Plants of Todos Santos Island -

Phacelia leucotricha Kellogg ISLAND MERRY. Occasional; especially on E side of island. Endemic to the northwest part of Baja California. This species should be avoided as it can cause severe contact dermatitis.

Scattered in coves of rocky outcroppings, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, Blakley 6580; rare, grassy terrace below Lavatera, northernly of Landing Cove, TSS, 28 Apr 1978, Philbrick & Junak B78-130.

Phacelia exilis

Erpodium cicutarium (L.) L'Her. INDIAN HEATH. Scarce.

N. Fish Camp, central eastern portion of TS8, elev. ca. 50 ft, 24 Oct 1965, Blakley 6580; rare, grassy terrace below Lavatera, northernly of Landing Cove, TSS, 28 Apr 1978, Philbrick & Junak B78-130.

Occasional, TS8, 7 Apr 1948, Thorne et al. 55847 (RSA-POM).

Hydrophyllaceae (Waterleaf Family)

Euphrasia rosea

Euphrasia rostrata (A. Gray) J. Howell CATERPILLAR PHACELLA. Scarce.

TS, 10 Mar 1897, Brandegee s.n. (UC 107412); unknown, TSS, 7 Apr 1948, Moran 2793 (UC); Elev. ca. 150 ft, 24 Mar 1987, Junak 3113.

Phacelia ciliata var. hispida (A. Gray) J. Howell WILD HELIOTROPE. Occasional.

TS, Mar-Jun 1897, Anthony 193 (CAS-DS).

Phacelia hirtuosa A. Gray Rare. Endemic to Baja California. Uncommon, TSS, 7 Apr 1948, Moran 2793a (UC).

Phacelia hirtuosa A. Gray RARE. Endemic to Baja California. Uncommon, TSS, 7 Apr 1948, Moran 2793a (UC).
Eachrachisia ramosa Grove Island POPPY. Occasional. Endemic to Santa Rosa, Santa Cruz, Santa Barbara, San Nicolas, Santa Catalina, Santa Barbara, Sonoma, Santa Clara, Los Carquitos, Todos Santos, San Martin, Guadalupe, San Benito, Cedros, and Natividad Islands.

TS, Mar-Jan 1897, Anthony 209 (CAS-D5;GH;SBG); TS, 10 Mar 1897, Brandegee s.n. (UC 118503); plentiful in small areas of glossey, burned, gradual E-facing slope, jut of S Fish Camp, between High Point of island and S Light AL, SE portion of island, 23 Aug 1968, Philbrick & Benedict B68-519.

Sylomecon heterophyUa (Benth.) G.C. Taylor WIND POPPY. Not seen recently; known from a single collection.

TS, 10 Mar 1897, Brandegee s.n. (UC 11996).

Potomoniaeae (Phlox Family)


Polygonaceae (Buckwheat Family)


Eriogonum grandiflorum var. reidelii Brandegee Occasional. Endemic to Baja California.

TS, 10 Mar 1897, Brandegee s.n. (UC 77745); plentiful in small areas of glossey, burned, gradual E-facing slope, jut of S Fish Camp, between High Point of island and S Light AL, SE portion of island, 23 Aug 1968, Philbrick & Benedict B68-519.


Portulaceae (Purslane Family)

Calandrinia ciliata (Ruiz Lopez & Pavon) DC. [C. c. var. menziesii (Hook.) J.F. Macbr.] RED MARDI. Rare. Locally common on hill, TSS, 7 Apr 1948, Moran 2834 (UC).

Calandrinia maritima Nutt. [Castilleja maritima (Nutt.) Carolin] SEA KISSES, SEASIDE CALANDRINIA. Rarely seen in recent years; listed by Brandegee (1900) as one of the most common plants on Todos Santos. Locally common on hill, TSS, 7 Apr 1948, Moran 2832 (UC).

Clytostachys perforata subsp. mexicana (Ruiz) John M. Miller & K. Chambers MINER'S LETTUCE. Rare; especially on N-facing slopes. Rare on N-facing slope, N slope of main hill on TSS, elev. ca. 250 ft, 21 Apr 1985, Junak 2001.

Ranunculaceae (Buttercup Family)


Delphinium parryi subsp. martinum (Davidson) M.J. Warnock PARKY'S LARKSPUR. Scarce; localized near base of N-facing slope of High Point on TSS. W of Landing Cove, TSS, 23 Apr 1978, Philbrick & Junak B76-108; NE-facing slope above terrace and first cove S of Anchorage at NE end of TSS, N side of main hill, 20 Apr 1985, Philbrick s.n. (SBHG 8650); NE-facing flank of main peak, II side of TSS, elev. ca. 150 ft, 18 Mar 1991, Junak 4514.

Resedaceae (Mignonette Family)


Roraceae (Rose Family)

Heteromeris arborescens (Lindl.) Roemer TOYON, CHRISTMAS BERRY. Scarce; especially on N-facing slopes.


Scrophulariaceae (Figwort Family)

Antirrhinum undulatum subsp. subsectis (A. Gray) D. Thompson MULLTAN'S SNAPDRAGON. Abundance extremely variable from year to year. Burn NE of N Butte, NE portion of TSS, 25 Aug 1968, Philbrick & Benedict B68-499; very common all over island, occasionally forming nearly solid showy patches, terrace just N of N Fish Camp, central eastern portion of TSS, 29 Apr 1978, Philbrick & Junak B76-88; N base of main peak, TSS, elev. ca. 100 ft, 21 Apr 1985, Junak 2700.


N Fish Camp, central eastern portion of TSS, 28-29 Apr 1978, Philbrick & Junak B76-89; N base of main peak, TSS, elev. ca. 100 ft, 21 Apr 1985, Junak 2700.


Lavatera annulata (L.) Dum-Cours. BLUE TOADFLAX. Scarce; in grasslands.


Mimulus aurantiacus var. arizonacareus CURTIS MONKEYFLOWER. Included here on the basis of a single questionable specimen collected as M. puniceus from Panama. Fine specimen. The specimen has been seen but not studied carefully by the authors of this paper; flower color faded on the specimen.

"Todos Santos N.L. California", 15 May 1882, Fannie Pazl 4842 (RSA-POM); SE portion of TSS, 11 May 1979, Moran 27216 (SD).

Solanaceae (Nightshade Family)

Lycium brevicornis Benth. var. brevicornis FRUITILLA. Common; especially on E side of island. Hill overlooking ocean, TSS, 25 Feb 1949, Silva 4842 (RSA-POM); occasional on hillside near S end, TSS, 11 May 1979, Moran 27208 (SD); TSS, 15 Mar 1980, Thorne et al. 33960 (RSA-POM).
Lycium californicum Nutt. CALIFORNIA BONTHORN. Occasional.
Form TSS, elev. ca. 15 m, 23 Jun 1969, Moran 16231 (SD); near N landing, TSS, elev. ca. 15 m, 13 Mar 1980, Thorne et al. 53917 (RSA-POM).

*Lycoeropis esculentum L. TOMATO. Rare.
Single plant, 1 of 2 locations seen this trip, SW-facing slope, inland from NW tip of TSS, 28 Apr 1978, Philbrick & Junak B78-123.

Nicotiana californica A. Gray CLEVELANDS TOBACCO. Scarce.
TS, Mar-Jun 1897, Anon 197 (SBBG,SD); high terrace between N and S fish camps, SE portion of TSS, 24 Apr 1968, Philbrick & Benedict B65-142; scattered, NE of Laverita Butte, NE side of TSS, 20 Apr 1985, Junak 2786.

Physalis crassifolia Benth. var crassifolia [P. greenei Vasey & Rose] THICK-LEAF CHOLD-CHERRY. Not seen recently; known from a single collection.
TS, 10 Mar 1897, Braudegee s.n. (UC 104098).

*Solanum americanum Miller [S. nudiflorum Jeng.] WHITE NIGHTSHADE. Scare.

Solanum pahmi Vasey & Rose PALMER'S NIGHTSHADE. Scarce. Endemic to the northwestern part of Baja California.
TS, Mar-Jun 1897, Anon 210 (US); scarce, in small thickets, TSS, elev. ca. 15 m, 23 Jun 1969, Moran 16230 (RSA-POM,SD); rare in shrub thickets, W side of TSS near N end of inlet, elev. ca. 120 ft, 24 Mar 1987, Junak 3166.

Urticiaceae (Nettle Family)

Hesperocnide tenebricosa Torr. WESTERN NETTLE. Common; especially on N-facing slopes.
TSS, 24 Feb 1949, Wiggins 11975 (RSA-POM); locally common, N-facing slope, near Indian Cave, NE portion of TSS, elev. ca. 50 ft, 20 Apr 1985, Junak 2769; locally common, N-facing slope, foot of NE flank of High Point, TSS, elev. ca. 160 ft, 24 Mar 1978, Junak 3114.

Parisetia hexagona B.D. Hinton WESTERN PELLITORY. Common; especially on N-facing slopes.
Prostrate in crevices among rocks, TSS, 7 Apr 1948, Moran 2795 (UC); TSS, 24 Feb 1949, Wiggins 11977 (UC); N-facing slope, N Butte, NE portion of TSS, 23 Aug 1968, Philbrick & Benedict B66-510.

[ Urica urens L. DWARF NETTLE. Reported by Moran (1950) on the basis of a mis-identified specimen. Wiggins 11975 is Hesperocnide tenebricosa.]

MONOCOTYLEDONOUS FLOWERING PLANTS

Agavaceae (Agave Family)

*Agave aff. americana L. CENTURY PLANT. Planted at S Fish Camp on TSS. Plants were photographed but not collected by S. Junak on 18 Mar 1991.

Agave shawii Engelm. SHAW'S AGAVE. Rare; known from a single collection.
Introduction

Like several of the islands off the west coast of Baja California, San Martin is known for a spectacular spring-time flora. Following adequate rainfall, the volcanic slopes of this small island are ablaze with a colorful array of flowering shrubs, cacti, herbaceous perennials, and annuals. Interspersed with these flowering plants are rough lava rocks, many covered with conspicuous lichens.

In spite of the island’s small size and limited ecological diversity, its flora includes an endemic Goosefoot (Chenopodium flabellifolium). In addition, several plant species are known only from San Martin Island and the adjacent mainland near San Quintin. The most eye-catching of these restricted endemics is the San Quintin liveforever (Dudleya anthonyi), which has giant rosettes of powdery white leaves on sprawling trunks that can be up to 2 ft long.

Although many botanists have visited San Martin Island during the last 100 yr, surprisingly little specific information has been published about the plant life. In some cases, data were lost before observations could be published. Human visitation, for both scientific and recreational purposes, has increased dramatically in the last decade, raising the demand for information about the flora. We hope to spark further interest in this picturesque island by providing here: (1) an introduction to the island’s geography and vegetation, (2) a description of historical changes, (3) a short history of botanical exploration, and (4) an annotated checklist of the flowering plants.

Physical Environment

Eight islands lie off the west coast of Baja California between the United States/Mexico border and Punta Eugenia, 575 km (357 mi) south of the international border. Ranging in size from 0.4 to 348 km² (0.2 to 134 mi²), 7 of the islands are on the continental shelf and 6 lie within 23 km (14 mi) of the coastline. San Benito Island is 66 km (41 mi) from the nearest point on the peninsular mainland but only 27 km (17 mi) from neighboring Cedros Island. Goodhope, however, is a truly oceanic island situated 252 km (157 mi) off the Baja California coast.

San Martin is part of this loosely associated group of islands, with its center located near latitude 30° 29' N, longitude 116° 07' W, about 260 km (162 mi) south of the border between the United States and Mexico. Of the island group, San Martin lies the closest to the mainland (Fig. 1), only 5 km (3 mi) off the coast, just west of the Bay of San Quintin. Roughly circular with an area of 2.3 km² (0.7 mi²), the island is dominated by a 151-m (497-ft) tall volcanic peak.

The Fourth California Islands Symposium: Update on the Status of Resources


The Flowering Plants of San Martin Island, Baja California, Mexico

Steven A. Junak1 and Ralph Philbrick2

1Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105
Tel. (805) 682-4726; Fax (805) 563-8032

29 San Marcos Trout Club, Santa Barbara, CA 93105
Tel. (805) 967-8675

Abstract. San Martin Island is situated 5 km off the Baja California coast near San Quintin. The island’s climate is arid and a maritime scrub vegetation, dominated by drought-resistant shrubs and cacti, covers most of the rough lava substrate. There are also small areas dominated by coastal strand, coastal sand dune, alkali flat, and coastal salt marsh vegetation. A total of 80 native plant taxa have now been documented for the island, representing 27 families and 72 genera. Even though the island is only 5 km offshore, 3 plant taxa endemic to the California Islands occur there. One species (Chenopodium flabellifolium) is known only from San Martin Island. The vegetation has been disturbed by human activities, as well as by nomadic animal and plants, periodic fires, and breeding seabird colonies. Although more than 18% of the known flora on San Martin is introduced, most of the native plants are not widespread on the island.

Keywords: San Martin Island; Islas de San Martín; San Quintin; Islas de Baja California; Baja California; Mexico; flora; vegetation; botanical exploration.