The Fourth California Islands Symposium: Update on the Status of Resources
Edited by W. L. Halvorson and G. J. Maender. 1994. Santa Barbara Museum of Natural History, Santa Barbara, CA.

The Vascular Plants of Todos Santos Island, Baja California, Mexico

Steven A. Junak[1] and Ralph Philbrick[2]

[1]Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105
Tel. (805) 682-4726; Fax (805) 563-0352
[2]29 San Marcos Trout Club, Santa Barbara, CA 93105
Tel. (805) 967-0875

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, 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, 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)

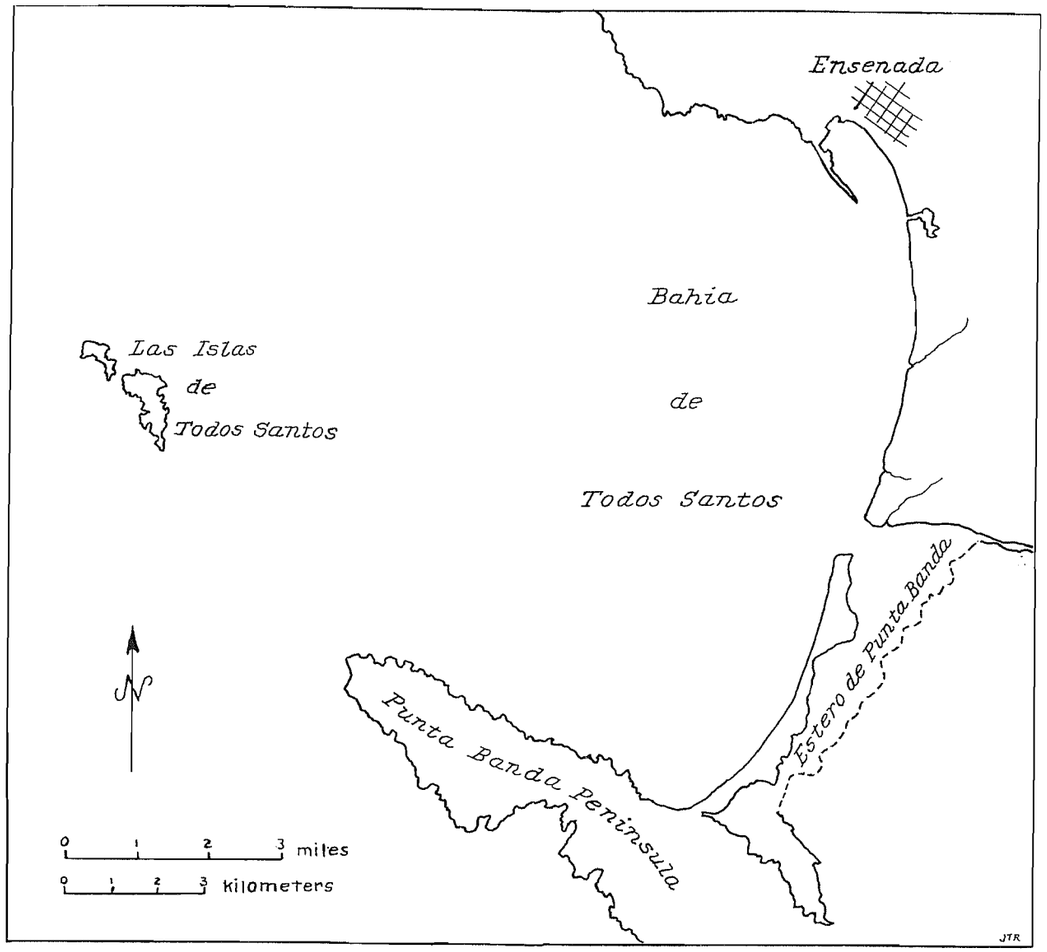

Figure 1. Map of Todos Santos Island and vicinity. (Scale is approximate.)

wrote that the mesoclimatic regimes at Punta Banda and Todos Santos Island were very different from those at Ensenada. Mulroy et al. observed that cold-water upwelling on the southern side of the Punta Banda Peninsula came into contact with warmer coastal water near the tip, producing frequent marine fogs. During their studies, summer temperatures were much higher at Ensenada than at Punta Banda, presumably because of the lack of fog and protection from strong winds. They concluded that La Mision, 50 km to the north, was the station most comparable to the Punta Banda area. Mean annual temperature at La Mision was 15.2° C (59.4° F), 1.5° lower than at Ensenada. Mean monthly temperatures at La Mision are generally 1–2° C lower than those at Ensenada for every month of the year (Hastings 1964). At La Mision, the coldest month is typically January, with a mean monthly temperature of 11.7° C (53° F). The warmest months at La Mision are typically July, August, and September, when mean monthly temperatures exceed 18.4° C (65° F).

On Isla del Sur, people periodically live in 1 or 2 seasonal fish camps located on the east side of the islet (Fig. 2). The main settlement is near the southern tip of the islet, at South Fish Camp. North Fish Camp is much smaller; it is reportedly involved with abalone culture at the present time (S. Staats 1994, pers. comm. to R. Philbrick). There is an unmanned, and usually nonfunctional, navigation light near the south end of Isla del Sur.

On Isla del Norte, there are 2 lighthouses at the northern end and a few houses and outbuildings at the southeastern end, above a boat landing area. An unpaved road connects the lighthouses and landing site. An abandoned lighthouse has been refurbished to provide accommodations for surfers from the United States since at least 1988. From October through March, a tour company in Newport Beach, California arranges regular trips to the island (S. Staats 1994, pers. comm. to R. Philbrick). Both islets have unimproved landings on their east sides and get regular visitors.

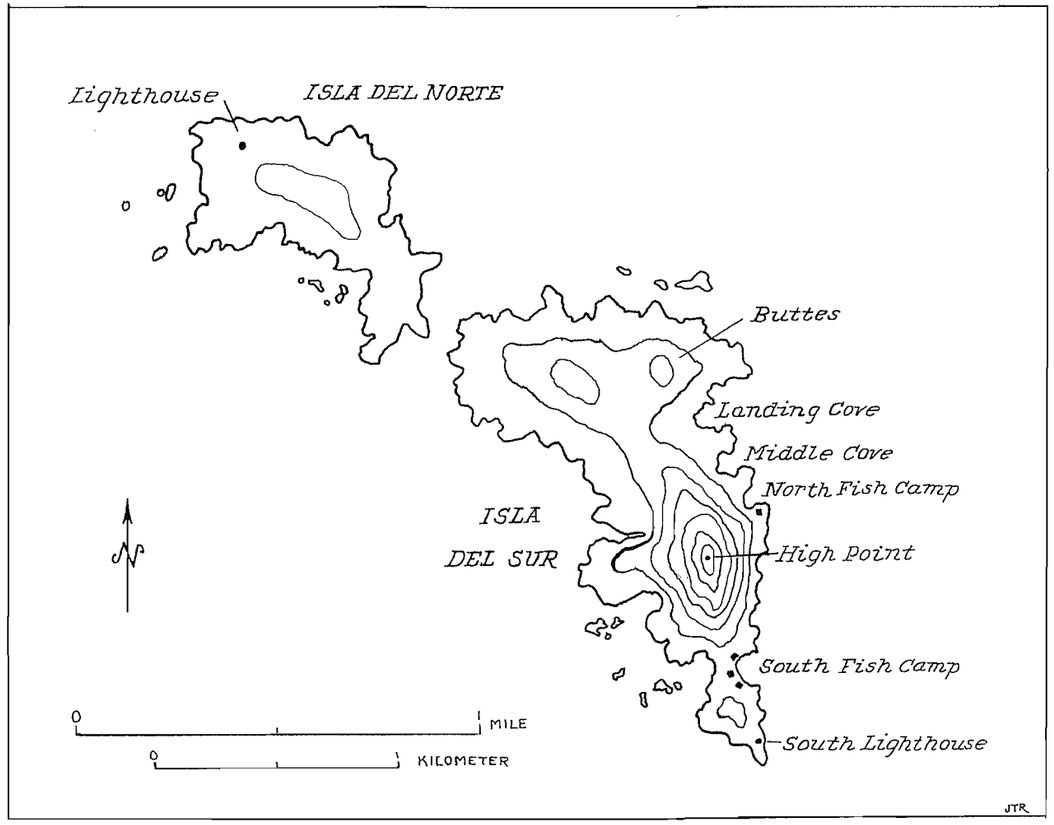

Figure 2. Map of Todos Santos Island. (Scale and topographic features are approximate. Contour interval = 50 ft and only the main place names are shown.)

History of Botanical Exploration

Moran (1950) listed the early botanical collectors on Todos Santos Island. The first may have been Miss Fannie E. Fish, who "lived at Sauzal on Todos Santos Bay in the early 1880s and collected for Dr. C. C. Parry." We are not sure whether plants collected during a trip in 1882, and at least one other in 1888, are from Todos Santos Island or from Todos Santos Bay on the peninsula.

Edward L. Greene reportedly visited Todos Santos Island in the spring of 1885 (Nelson 1921), but we have seen no specimens from his visit.

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):

> 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 e.*], *Mesembryanthemum crystallinum*, *Leptosyne maritima* [*Coreopsis m.*], *Encelia California* [sic], *Euphorbia misera* and *Brodiaea capitata* [*Dichelostemma c.*], all maritime plants abun-

dant along the coast between San Diego and Ensenada. *Hosackia watsoni* [*Lotus w.*], *Verbesina dissita*, *Solanum palmeri*, and *Physalis greenei* [*P. crassifolia*] were the representatives of recently described and uncommon species. *Hemizonia greeneana* was described from specimens collected on Guadalupe Island, which until now has been its only known habitat, and it was interesting to find this frutescent *Hemizonia* growing so plentifully over the larger of the Todos Santos Islands. The only other representatives of the insular flora found, and these not in abundance, were *Eschscholzia ramosa*, an inhabitant of many other islands also and a *Perityle*. A few plants deserving of mention were *Malvastrum exile*, *Aplopappus berberidis* [*Hazardia b.*], *Franseria chenopodifolia* [*Ambrosia c.*], *Sonchus tenerrimus*, *Phacelia ixodes*, [and] *Atriplex julacea*. No trees grow upon these islands, and the only bushes of any size were *Rhus laurina* [*Malosma l.*] and *R. integrifolia*, generally alluded to in the publications of the coast surveys as "scrub oak."

Apparently, very few botanical trips were made to Todos Santos Island during the first half of the twentieth century. Although several scientific expeditions visited many of the islands off the west coast of Baja California between 1900 and the 1940s, they did not stop at Todos Santos (Nelson 1921; Moran 1950). One of the first botanical trips during this era was made by W. M. Pierce, who collected plants on Todos Santos Island on 29 May 1926. On 7 April and again on 6 May 1948, Reid V. Moran and George E. Lindsay collected plants on Isla del Sur and found a total of 60 species (Moran and Lindsay 1949; Moran 1950). On 24–25 February 1949, George Lindsay, Paul C. Silva, John H. Thomas, and Ira L. Wiggins also visited Isla del Sur and found 27 species of land plants (Moran 1950); they were aboard the research vessel *Orca* on an expedition sponsored by the Sefton Foundation. Reid Moran (1950) published the first plant list for the Todos Santos Islands, listing 70 species of flowering plants.

During the 1960s and 1970s, several additional botanists visited Todos Santos Island. Ralph N. Philbrick, E. R. Blakley, and Michael R. Benedict of the Santa Barbara Botanic Garden visited the island on 24 October 1965. Philbrick and Benedict collected on both islets, while Blakley collected on Isla del Sur. Philbrick and Benedict returned to Isla del Sur on 24–25 August 1968, and Reid Moran collected on Isla del Sur on 23 June 1969. On 28–29 April 1978, Ralph Philbrick and Steven A. Junak observed or collected at least 75 plant taxa on Isla del Sur after exceptional winter rains. Reid Moran made extensive collections on Isla del Sur on 11 May 1979.

Botanical collecting on Todos Santos Island has continued during the 1980s and 1990s. 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 Wisura. 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 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 15 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 landing there was not permitted by the Mexican government during various time periods. More thorough surveys on both islets 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 vegetation has been disturbed by human activities, introduced animals, periodic fires, and large, fluctuating colonies of nesting seagulls. Also, a number of nonnative plant species have reached the island during the last 40 yr, and some of these are still spreading.

Introduced animals that have either been reported by island residents or seen at various times by us include burros, cats, dogs, and goats on Isla del Norte, and cats and rabbits on Isla del Sur. We saw feral cats and rabbits on Isla del Sur in April 1978. Moran (1979) noted that "Belgian hares" had been introduced to Isla del Sur between 1969 and 1979. In March 1987, residents on Isla del Sur reported (pers. comm. to M. Daily and S. Junak) that rabbits and cats were present on that islet and that burros and goats had been introduced on Isla del Norte. Ralph Philbrick saw a single goat on Isla del Norte in October 1965. More than 12 goats, 3 burros, and 2 dogs are on Isla del Norte at present (S. Staats 1994, pers. comm. to R. Philbrick); at least 2 feral cats were also seen as recently as 1992–1993. At this time, the primary threats to the native vegetation and terrestrial ecosystem are probably the goats and burros on Isla del Norte and the rabbits on Isla del Sur.

Nesting seagulls disturb the native vegetation on the island, and their impacts are especially noticeable at the lower elevations around the perimeter of the island. In a natural ecosystem, native plants would presumably recover from this disturbance. Now, however, areas frequently disturbed by gulls are dominated by aggressive nonnative plants, and native species are rarely seen.

Brush fires, set intentionally or accidently, occasionally burn parts of the island and, at least in the short term, can affect the composition of the flora. In August 1968, Ralph Philbrick and Michael Benedict observed a fire burning slowly in a band north of Landing Cove on Isla del Sur, and they also saw fire scars at various locations in the eastern portion of the southern islet. Ralph Philbrick and Steve Junak saw recently burned stumps and branches of woody plants on Isla del Sur in April 1985, on slopes west of the swale near North Fish Camp and at the northeastern end of the islet. In March 1987, Steve Junak saw burned stumps on terraces southeast of the High Point on Isla del Sur. One small fire occurred on each of the islets during 1993 (S. Staats 1994, pers. comm. to R. Philbrick).

Introduced plants compete with natives for limited habitats, pollinators, soil nutrients, and moisture. These nonnative plants, especially annual grasses, have a profound effect on the island's natural ecosystem. Many new weeds have reached Todos Santos Island since 1950. Moran (1950) found only 9 introduced taxa and now there are at least 34. Many of these new introductions are aggressive annual grasses that have spread rapidly and now dominate disturbed sites. Moran found only 2 nonnative species of grasses on the island in the late 1940s. A total of 11 nonnative grass taxa have now been documented for Todos Santos Island.

Vegetation

The present vegetation of Todos Santos Island appears to reflect the history of disturbance described above and the varied sources of native plants 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.

Vegetative cover on the island is characterized by widely spaced, suffrutescent 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 Punta Banda. In general, the vegetation on much of the Punta Banda peninsula is woodier 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 swales and flats on the south islet, and much of the islet is surrounded by rocky bluffs. North-facing slopes provide moist microhabitats for mesic vegetation. Isla del Norte has little topographic diversity and has been heavily disturbed. It is a low mesa surrounded by bluffs.

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 *Heteromeles arbutifolia*, 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*, *Coreopsis maritima*, *Encelia californica*, *Eriogonum fasciculatum* var. *fasciculatum*, *E. grande* var. *testudinum*, *Euphorbia misera*, *Hazardia berberidis*, *Hemizonia greeneana* subsp. *peninsularis*, *Isocoma menziesii* var. *menziesii*, *Lycium brevipes*, *L. californicum*, *Malosma laurina*, and *Rhus integrifolia*. *Bergerocactus emoryi* occurs in large thickets throughout; its pendulous stems are also conspicuous 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. Aspect dominants in this area include *Atriplex julacea*, *Bergerocactus emoryi*, *Encelia californica*, *Euphorbia misera*, *Isocoma menziesii*, and *Lycium californicum*. *Atriplex californica*, *Atriplex semibaccata*, *Calystegia macrostegia*, *Dichelostemma capitatum*, *Lotus watsonii*, *Marah macrocarpus*, *Mirabilis californica*, and *Phacelia distans* occur between the larger scattered shrubs. Open sites, especially those frequently disturbed by seagulls, are dominated by nonnative annuals, including *Avena* species, *Bromus madritensis* subsp. *rubens*, *Chenopodium murale*, *Hordeum murinum*, *Malva parviflora*, and *Mesembryanthemum crystallinum*.

Flats north of the High Point on Isla del Sur are dominated by *Artemisia californica*, *Bergerocactus emoryi*, *Encelia californica*, *Euphorbia misera*, *Opuntia oricola*, and *Stipa diegoensis*, with scattered shrubs of *Rhus integrifolia*. Between the larger shrubs are scattered plants of *Hazardia berberidis*, *Lotus watsonii*, and *Mirabilis californica*. Common annual grasses on the flats include *Bromus madritensis* subsp. *rubens* and *Muhlenbergia microsperma*. *Dichelostemma capitatum* is widespread on flats throughout much of the island. At the base of the High Point, *Delphinium parryi* and *Piperia unalascensis* are found in mesic microhabitats. The rocky north face of the High Point is dominated by *Coreopsis maritima*, *Dichelostemma capitatum*, *Hazardia berberidis*, *Hordeum murinum*, and *Marah macrocarpus*. *Dudleya anomala* and *Hesperocnide tenella* are also common on this north-facing slope.

Vegetation on the northwestern flanks of the High Point on Isla del Sur is an open disturbed grassland with scattered shrubs. Dominants include *Atriplex julacea*, *Encelia californica*, *Hordeum murinum*, *Malva parviflora*, and *Salsola tragus*. The north rim of the High Point is heavily disturbed by seagulls; introduced plants (including *Hordeum murinum*, *Malva parviflora*, and *Mesembryanthemum crystallinum*) dominate large areas. Common shrubs near the High Point include *Bergerocactus emoryi*, *Eriogonum grande* var. *testudinum*, *Hazardia berberidis*, and *Hemizonia greeneana* subsp. *peninsularis*. On terraces and slopes south of the High Point are thickets of *Artemisia californica*, *Bergerocactus emoryi*, *Encelia californica*, *Euphorbia misera*, *Isocoma menziesii* var. *menziesii*, and *Lycium brevipes*. The low flats near South Fish Camp are dominated by *Atriplex julacea*. *Encelia californica* and *Lycium brevipes* are common on the hills south of South Fish Camp, along with numerous nonnative annuals.

In rocky intertidal and subtidal habitats around the island, *Phyllospadix torreyi* grows in a surf-grass community.

Flora

The known flora of Todos Santos Island includes 142 native and naturalized vascular taxa representing 37 families and 104 genera (see Appendix). Two additional nonnative species have been planted at human settlements but have not become naturalized. Only 1 fern species has been collected on the island and there are no native trees. The largest families are the Asteraceae (26 taxa) and Poaceae (18 taxa). Five families (Brassicaceae, Chenopodiaceae, Fabaceae, Hydrophyllaceae, and Solanaceae) are each represented by 7 taxa on the island. The following genera have 3 or more native and nonnative species on the island: *Atriplex*, *Bromus*, *Dudleya*, *Opuntia*, and *Phacelia*.

A total of 108 native plant taxa have been found on Todos Santos Island to date. The plant family with the highest number of native taxa is the Asteraceae (20 taxa). The Fabaceae, Hydrophyllaceae, and Poaceae are each represented by 7 native taxa. The largest genera are *Dudleya* and *Phacelia*, each with 4 native taxa. More than 86% of the island's native taxa are found in the Punta Banda area on the adjacent mainland (based on Mulroy et al. 1979), but several families (Onagraceae, Pteridaceae, and Rhamnaceae) with 3 or more taxa at Punta Banda are not represented on the island. At least 8 of the native taxa found on the island are endemic to Baja California and several (*Dudleya anomala*, *Eriogonum grande* var. *testudinum*, *Hemizonia greeneana* var. *peninsularis*) are narrow endemics restricted to the immediate area. Only 1 plant found on Todos Santos (*Eschscholzia ramosa*) is restricted to the California Islands.

At least 34 plant taxa in 26 genera and 11 families 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 nonnative 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 is 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-DS, GH, ND-G, RSA-POM, SD, UC, and US. Funding for field trips was provided by the Santa Barbara Botanic Garden, and Joann Tanner Rounds drew the maps. We especially thank Alva 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

Abrams, L. 1923–1960. Illustrated flora of the Pacific states: Washington, Oregon, and California. Stanford University Press, Stanford, California. 4 volumes. 2771 pp.

Beauchamp, R. M. 1986. A flora of San Diego County, California. Sweetwater River Press, National City, California. 241 pp.

Brandegee, T. S. 1900. Voyage of the *Wahlberg*. Zoe 5(2):19–28.

Brummitt, R. K., and C. E. Powell (editors). 1992. Authors of plant names. Royal Botanic Gardens, Kew, Great Britain. 732 pp.

Coyle, J., and N. C. Roberts. 1975. A field guide to the common and interesting plants of Baja California. Natural History Publishing Company, La Jolla, California. 206 pp.

Gastil, R. G., R. P. Phillips, and E. C. Allison. 1975. Reconnaissance geology of the state of Baja California. Geological Society of America Memoir 140:1–170.

Gould, F. W., and R. Moran. 1981. The grasses of Baja California, Mexico. San Diego Society of Natural History Memoir Number 12. 140 pp.

Hastings, J. R. 1964. Climatological data for Baja California. Technical Reports on the Meteorology and Climatology of Arid Regions Number 14. Institute of Atmospheric Physics, The University of Arizona, Tucson, Arizona. 132 pp.

Hickman, J. C. (editor). 1993. The Jepson manual: higher plants of California. University of California Press, Berkeley, Los Angeles, and London. 1400 pp.

Holmgren, P. K., N. H. Holmgren, and L. C. Barnett. 1990. Index Herbariorum, Part I: The herbaria of the world. Eighth edition. Regnum Vegetabile 120:1–693. New York Botanical Garden, Bronx, New York.

Martinez, M. 1979. Catalogo de nombres vulgares y cientificos de plantas mexicanas. Fondo de Cultura Economica, Mexico, D.F. 1,220 pp.

Moran, R., and G. E. Lindsay. 1949. Desert islands of Baja California: cruise of the *Marviento*. Desert Plant Life 22:125–128.

Moran, R. 1950. Plants of the Todos Santos Islands, Baja California. Leaflets of Western Botany 6(2):53–56.

Moran, R. V. 1951. A revision of *Dudleya* (Crassulaceae). Unpublished Ph.D. dissertation, University of California, Berkeley, California. 295 pp.

Moran, R. 1952. The Mexican itineraries of T. S. Brandegee. Madroño 11(6):221–252.

Moran, R. 1969. Twelve new dicots from Baja California, Mexico. Transactions of the San Diego Society of Natural History 15(17):265–295.

Moran, R. 1979. Field notes for 11 May 1979. Unpublished manuscript on file in the library, San Diego Museum of Natural History, San Diego, California. 5 pp.

Mulroy, T. W., P. W. Rundel, and P. A. Bowler. 1979. The vascular flora of Punta Banda, Baja California Norte, Mexico. Madroño 26(2):69–90.

Nelson, E. W. 1921. Lower California and its natural resources. Memoirs of the National Academy of Sciences 16:1–194.

Philbrick, R. 1980. Distribution and evolution of endemic plants of the California Islands. In: The California Islands: Proceedings of a Multidisciplinary Symposium (edited by D. M. Power), Santa Barbara Museum of Natural History, Santa Barbara, California, pp. 173–187.

Shreve, F. 1936. The transition from desert to chaparral in Baja California. Madroño 3(7):257–264.

Thorne, R. F. 1980. Notes on the flora of the Todos Santos Islands. Crossosoma 6(1):1–2.

Thorne, R. F. and S. A. Junak. 1988. Vascular plants of Las Islas de Todos Santos, NW Baja California, Mexico. Crossosoma 14(6):4–7.

Wiggins, I. L. 1980. Flora of Baja California. Stanford University Press, Stanford, California. 1025 pp.

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 presumed to be introduced to Baja California and/or Todos Santos Island by human activities are preceded by an asterisk (*). For the most part, the list does not include plant taxa which have been planted on the island, unless they are particularly conspicuous or have naturalized there.

Nomenclature primarily follows Wiggins (1980) or Hickman (1993). Abbreviations of author names mostly follows Brummitt and Powell (1992). Synonyms are only included for a few taxa. Common names are mostly according to Abrams (1923–1960) and Hickman (1993), with a few additions from Beauchamp (1986), Coyle and Roberts (1975), 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. It is clear, however, that Middle Cove has also been called South Cove and that Landing Cove has been referred to as North Landing by some collectors. There are several conspicuous hills in the northeastern portion of Isla del Sur, collectively labelled as Buttes on the map in Figure 2. Philbrick and Benedict used the names North Butte and South Butte; North Butte has also been called Lavatera Butte. Some taxa are listed with no definite locality on the island, as 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 islet 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 voucher specimens have been edited for consistency. Specimens are in the herbarium at the Santa Barbara Botanic Garden (SBBG) unless otherwise indicated. Herbarium accession numbers are cited as needed. Herbarium abbreviations are those used in Holmgren et al. (1990).

FERNS

Polypodiaceae (Polypody Fern Family)

Polypodium californicum Kaulf. CALIFORNIA POLYPODY. Rare; N-facing rock face of High Point on TSS.
TS, 15 Mar 1980, *Thorne et al. 53950* (RSA-POM).

DICOTYLEDONOUS FLOWERING PLANTS

Aizoaceae (Iceplant Family)

**Carpobrotus chilensis* (Molina) N.E. Br. [*C. aequilaterus* (Haw.) N.E. Br. misapplied] SEA-FIG. Occasional; especially on high points.
Creeping over rocky slopes on the highest peak, near the center of TSS, elev. ca. 250 ft, 24 Oct 1965, *Blakley 6598a*; top of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-500*.

**Mesembryanthemum crystallinum* L. CRYSTALLINE ICEPLANT. Abundant.
NE shore, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1542*; forming dense mats over large areas, on S slopes of rocky clay, NE end of TSS, elev. 50 ft, 24 Oct 1965, *Blakley 6585*; terrace above N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-445*.

**Mesembryanthemum nodiflorum* L. SLENDER-LEAVED ICEPLANT, SMALL-FLOWERED ICEPLANT. Scarce.
Boat landing, E side of TSN, 24 Oct 1965, *Philbrick & Benedict B65-1539*; N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-451*; locally common, TSS, elev. ca. 15 m, 23 Jun 1969, *Moran 16225* (SD).

Anacardiaceae (Sumac Family)

Malosma laurina (Nutt.) Abrams [*Rhus l.* Nutt.] LAUREL SUMAC. Occasional.
Scattered on N slopes in protection of rocky outcroppings, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6606*; flats above S Cove, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-423*.

Rhus integrifolia (Nutt.) Brewer & S. Watson LEMONADE-BERRY. Occasional.
Scattered on the sides of rocky outcroppings with protection from wind, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6609*; N-central portion of TSS, between cone-shaped hill and N Butte, 25 Aug 1968, *Philbrick & Benedict B68-526*; E-facing bluff, ca. 0.3 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, *Philbrick & Benedict B65-1562*.

Apiaceae (Celery Family)

Apiastrum angustifolium Nutt. WILD CELERY. Occasional.
Many populations seen, N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-90*; rare along trail, just S of fishing shack at NE end of TSS, elev. ca. 60 ft, 20 Apr 1985, *Junak 2792*; occasional, N slope of main hill on TSS, 21 Apr 1985, *Junak 2800*.

Daucus pusillus Michaux RATTLESNAKE WEED. Rare.
Flats at Middle Cove, TSS, 28–29 Apr 1978, *Philbrick & Junak B78-78*; 1 of 2 populations seen during this trip, both in same portion of island, W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-106*; rare, grassy flats at NE end of TSS, E side of Lavatera Butte, elev. ca. 50 ft, 20 Apr 1985, *Junak 2781*.

Asteraceae (Sunflower Family)

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

Ambrosia chenopodifolia (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).

Artemisia californica Less. COASTAL SAGEBRUSH. Common; especially on E side of island.
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 B65-1579*; burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-488* (seedlings).

**Centaurea melitensis* L. TOCALOTE. Scarce; especially in disturbed areas.
Localized population of ca. 25 plants with numerous seedlings, flats at N Fish Camp, central eastern portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-68*; locally common, at fishing shack at NE end of TSS, elev. ca. 40 ft, 20 Apr 1985, *Junak 2790*.

**Chrysanthemum coronarium* L. GARLAND CHRYSANTHEMUM. Rare.
Rare, disturbed site between 2 shacks, low flats, N Fish Camp, central eastern portion of TSS, elev. ca. 50 ft, 28 Apr 1978, *Philbrick & Junak B78-72*; 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.) Hook. f. SEA-DAHLIA. Common.
TSS, 24 Feb 1949, *Wiggins 11985* (SD); crevices of a rocky cliff's N slope, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6600*; bluff, ca. 0.2 mi S of Landing Cove, NE portion of TSS, 24 Oct 1965, *Philbrick & Benedict B65-1557*.

Encelia californica Nutt. BUSH SUNFLOWER. Common.
E-facing slope, just S of isthmus between High Point of island and S Lighthouse, TSS, 25 Aug 1968, *Philbrick & Benedict B68-522*; abundant, TSS, 23 Jun 1969, *Moran 16228* (SD).

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*.

Gnaphalium beneolens Davidson FRAGRANT EVERLASTING. Scarce.
Occasional near S Landing, TSS, 11 May 1979, *Moran 27203* (SD).

Gnaphalium bicolor Bioletti BICOLORED EVERLASTING. Scarce.
Flats above S Cove, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-428*; terrace between S Cove and N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-441*.

Hazardia berberidis (A. Gray) Greene [*Haplopappus b.* A. Gray] Occasional; locally common in NE portion of TSS. Endemic to the northwestern part of Baja California.
Flats S of Landing Cove, NE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-415*; flats above Landing Cove, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-424*; scattered, flats just S of cove near extreme NE end of TSS, elev. ca. 60 ft, 24 Mar 1987, *Junak 3091*.

Hemizonia fasciculata (DC.) Torr. & A. Gray COMMON TARWEED. Scarce.
Terrace, S Anchorage, TSN, 21 Apr 1985, *Philbrick & Junak s.n.* (SBBG 103838).

Hemizonia greeneana subsp. *peninsularis* Moran Occasional. Endemic to TSS, Punta Banda, and 1 N-facing beach cliff 20 mi to the N, at the mouth of Rio San Miguel (Moran 1969). First collected on TSS by T. S. Brandegee in 1897.
Scattered on a N rocky slope of the highest peak of TSS, elev. ca. 250 ft, 24 Oct 1965, *Blakley 6598*; flats above S Cove, central onshore side of TSS, 24 Aug 1968, *Philbrick & Benedict B68-420*; common in rocky places, TSS, elev. ca. 25 m, 23 Jun 1969, *Moran 16210*.

**Hypochaeris glabra* L. SMOOTH CAT'S EAR. Rare.
Rare near bluff, Landing Cove, TSS, 28–29 Apr 1978, *Philbrick & Junak B78-71*; top of Cave Rock Butte, E central portion of TSS, 21 Apr 1985, *Philbrick s.n.* (SBBG 103835).

Isocoma menziesii (Hook. & Arn.) Nesom var. *menziesii* [*Haplopappus venetus* subsp. *oxyphyllus* (Greene) H.M. Hall] COASTAL GOLDENBUSH. Occasional.
N of E shore landing, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1546*; rare on rocky ridgetop, near center of TSS, elev. 300 ft, 24 Oct 1965, *Blakley 6593*; terrace between S Cove and N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-435b*.

Lasthenia californica Lindl. [*L. chrysostoma* (Fischer & C. Meyer) Greene] GOLDFIELDS. Rare; not seen recently.
TS, Mar–Jun 1897, *Anthony 208* (UC); TS, 10 Mar 1897, *Brandegee s.n.* (UC 135164).

Lasthenia coronaria (Nutt.) Ornduff GOLDFIELDS. Rare.
Only plant seen during this trip, terrace just N of N Fish Camp, TSS, 29 Apr 1978, *Philbrick & Junak B78-99*; rare in grassland, flats W of landing on E side of TSS, just N of main hill, elev. ca. 100 ft, 21 Apr 1985, *Junak 2797*.

Malacothrix similis W. Davis & Raven Rare.
Occasional, TSS, 7 Apr 1948, *Moran 2804* (ND-G,UC); ca. 25 plants, only population seen during this trip, W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-104*.

Perityle emoryi Torr. EMORY'S ROCK DAISY. Occasional.
Scattered in crevices on top of rocky outcropping, NE end of TSS, elev. 50 ft, 24 Oct 1965, *Blakley 6599*; S Cove between N Fish Camp shack and Landing Cove, NE portion of TSS, 24 Oct 1965, *Philbrick & Benedict B65-1556*; E-facing slope between N and S fish camps, SE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-461*.

Rafinesquia 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 at SE side of TSN, elev. ca. 75 ft, 21 Apr 1985, *Junak 2810*;

**Sonchus oleraceus* L. COMMON SOW-THISTLE. Scarce; especially in grasslands on E side of island.
TSS, 7 Apr 1948, *Moran 2794* (UC); bluffs just S of N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-456*; TSS, 15 Mar 1980, *Thorne et al. 53966* (RSA-POM).

**Sonchus tenerrimus* L. SLENDER SOW-THISTLE. Scarce.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 92393); scarce, TSS, elev. ca. 10 m, 23 Jun 1969, *Moran 16217* (SD).

Stephanomeria diegensis Gottlieb SAN DIEGO MILK-THISTLE. Occasional.
Common locally in deep soil of flat areas, NE end of TSS, elev. 50 ft, 24 Oct 1965, *Blakley 6594*; S of Landing Cove, NE portion of TSS, 24 Oct 1965, *Philbrick & Benedict B65-1575*; terrace above N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-444*.

Uropappus lindleyi (DC.) Nutt. [*Microseris l.* (DC.) A. Gray] SILVER PUFFS. 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 dissita A. Gray CROWNBEARD. Scarce.
Just above beach N of N Fish Camp, NE portion of TSS, 24 Oct 1965, *Philbrick & Benedict B65-1569*; N-facing slope, at base of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-507*; N-facing slope at base of Lavatera Butte, NE end of TSS, 20 Apr 1985, *Junak 2779*.

Viguiera laciniata A. Gray 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 B78-67*; locally common at N Fish Camp, E side of TSS, 21 Apr 1985, *Junak 2803*.

Boraginaceae (Borage Family)

Amsinckia menziesii var. *intermedia* (Fischer & C. Meyer) Ganders COMMON FIDDLENECK. Rare; not seen recently.
Occasional at NE end, TSS, 7 Apr 1948, *Moran 2808* (UC).

Cryptantha clevelandii Greene COMMON CRYPTANTHA. Rare; not seen recently.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 78466); uncommon, TSS, 7 Apr 1948, *Moran 2821* (UC).

Cryptantha intermedia (A. Gray) Greene Scarce.
TS, Mar–Jun 1897, *Anthony 213* (RSA-POM,UC); at bluff, central offshore portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-157*; scattered, top of bluffs at SE end of TSN, elev. ca. 75 ft, 21 Apr 1985, *Junak 2806*.

Brassicaceae (Mustard Family)

**Cakile maritima* Scop. SEA ROCKET. Rare.
One of 2 plants seen, N-facing slope at top of bluff, NE end of TSS, 28 Apr 1978, *Philbrick & Junak B78-152*.

Descurainia pinnata subsp. *menziesii* (DC.) Detl. TANSY MUSTARD. Occasional.
On hill overlooking ocean, TSS, 25 Feb 1949, *Silva 4834* (RSA-POM); TSS, 25 Feb 1949, *Thomas 33* (CAS-DS); scattered in openings between shrubs, flats at N end of TSS, elev. ca. 100 ft, 24 Mar 1987, *Junak 3101*.

Guillenia lasiophylla (Hook. & Arn.) Greene [*Thelypodium l.* (Hook. & Arn.) Greene] CALIFORNIA MUSTARD. Rare.
Uncommon, TSS, 7 Apr 1948, *Moran 2817* (UC).

Lepidium nitidum Torrey & A. Gray var. *nitidum* SHINING PEPPERGRASS. Rare; not seen recently.
On hill overlooking ocean, TSS, 25 Feb 1949, *Silva 4837* (RSA-POM).

Lepidium oblongum var. *insulare* C.L. Hitchc. LENTEJILLA. Scarce.
Rare near fishing village at isthmus, S portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-165*; occasional near S Landing, TSS, 11 May 1979, *Moran 27205* (SD).

**Sisymbrium irio* L. LONDON ROCKET. Occasional.
Scattered on disturbed flats near Cistern Cove, central eastern portion of TSS, elev. ca. 50 ft, 28 Apr 1978, *Philbrick & Junak B78-73*; SW-facing slope, inland from NW tip of TSS, 28 Apr 1978, *Philbrick & Junak B78-126*; low bluff near N Landing, TSS, elev. ca. 4 m, 15 Mar 1980, *Thorne et al. 53911* (RSA-POM).

**Sisymbrium orientale* L. Scarce.
N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-74*; localized colony ca. 6 ft in diameter, N-facing slope above flats at NE end of TSS, elev. ca. 90 ft, 24 Mar 1987, *Junak 3095*.

Cactaceae (Cactus Family)

Bergerocactus emoryi (Engelm.) Britton & Rose SNAKE CACTUS, GOLDEN-SPINED CEREUS. Common; forming large thickets in several areas.
Flats S of Landing Cove, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-482a*; SW coast, TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103839).

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

**Opuntia ficus-indica* (L.) Miller MISSION CACTUS, INDIAN-FIG. Apparently planted near Lighthouse on TSN and at S Fish Camp on TSS; not spreading at present.
Seen 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.) Cockerell 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 B68-524*.

Opuntia oricola Philbrick TALL PRICKLY PEAR. Occasional.
Flats SW of northerly end of central ridge, NW portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-525*.

Opuntia prolifera 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.

Caryophyllaceae (Pink Family)

Polycarpon depressum Nutt. Rare.
Isthmus terrace at S Fish Camp, TSS, 28 Apr 1978, *Philbrick & Junak B78-163*; terrace near NE end of TSS, 28 Apr 1978, *Philbrick & Junak B78-175*.

Silene antirrhina L. SLEEPY CATCHFLY. Rare.
Rare, grassland at N end of TSS, elev. ca. 75 ft, 20 Apr 1985, *Junak 2777*; rare, dry, rocky E-facing slopes, W of N Fish Camp, N of main hill, TSS, elev. ca. 150 ft, 20 Apr 1985, *Junak 2786*.

**Silene gallica* L. WINDMILL PINK. Rare.
Rare along trail near N Fish Camp, central eastern portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-86*.

Chenopodiaceae (Goosefoot Family)

Aphanisma blitoides Moq. APHANISMA. Scarce.
Bluff edge, NW tip, TSS, 28 Apr 1978, *Philbrick & Junak B78-122*; rare, top of bluffs at SE side of TSN, elev. ca. 75 ft, 21 Apr 1985, *Junak 2813*; 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*.

Atriplex californica Moq. CALIFORNIA SALTBUSH. Occasional.
Scarce, TSS, elev. ca. 15 m, 23 Jun 1969, *Moran 16229* (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 julacea S. Watson Scarce. Endemic to Baja California.
350 yards W of boat landing, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1541*; rare on S slope of rocky clay, NE end of TSS, elev. 50 ft, 24 Oct 1965, *Blakley 6582*; narrow terrace offshore side of central range, SW portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-479*.

**Atriplex semibaccata* R. Br. AUSTRALIAN SALTBUSH. Occasional.
N shore, bluff E of Lighthouse, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1544*; common, forming mats at top of beach bluffs, NE end of TSS, elev. 50 ft, 24 Oct 1965, *Blakley 6584*; terrace between S Cove and N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-434*.

Chenopodium californicum (S. Watson) S. Watson SOAPROOT. Occasional; mostly on N-facing slopes.
Occasional, TSS, 7 Apr 1948, *Moran 2815* (UC); TSS, 24 Feb 1949, *Wiggins 11976* (RSA-POM,UC); near Indian Cave and *Lavatera*, terrace above Landing Cove, 28 Apr 1978, *Philbrick & Junak B78-136*.

**Chenopodium murale* L. NETTLE-LEAF GOOSEFOOT. Occasional.
TSS, 7 Apr 1948, *Moran 2827* (UC); E shore, S of boat landing, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1550*; rare, S slope of highest island peak, near center of TSS, elev. ca. 300 ft, 24 Oct 1965, *Blakley 6591*.

**Salsola tragus* L. [*S. iberica* Sennen & Pau] 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 B68-462*; W-facing slope, terrace SW of High Point, SW portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-523*.

Convolvulaceae (Morning-glory Family)

Calystegia macrostegia (Greene) Brummitt MORNING-GLORY. Occasional.
S of S Cove, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-430*.

Dichondra occidentalis House WESTERN DICHONDRA. 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)

Crassula connata (Ruiz Lopez & Pavon) Berger [*C. erecta* (Hook. & Arn.) Berger] PYGMY WEED. Scarce.
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 (Davidson) Moran Occasional; mostly on N-facing slopes and rockfaces. Endemic to Los Coronados, Todos Santos Islands, 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 B68-412*; common on rocks and cliffs, especially N-facing, TSS, elev. ca. 25 m, 23 Jun 1969, *Moran 16211*.

Dudleya attenuata subsp. *orcuttii* (Rose) Moran ORCUTT'S STYLOPHYLLUM. Occasional; especially on flats.
Common in brushy areas of deep clay loam soil, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6610*; 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*.

Dudleya brittonii D.A. Johans. Occasional. Both gray- and green-leaved forms occur on Todos Santos. Endemic to Baja California.
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, *Blakley 6612*; flats S of Landing Cove, NE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-417*.

Dudleya x *semiteres* (Rose) Moran Rare; especially on flats. This plant is apparently a recurrent natural hybrid between *Dudleya attenuata* subsp. *orcuttii* and *Dudleya brittonii* (Moran 1951); hybrids also occur at Punta Banda on the mainland (Mulroy et al. 1979).
Scarce, TSS, elev. ca. 25 m, 23 Jun 1969, *Moran 16237* (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, *Blakley 6607*; flats S of Landing Cove, NE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-411*; NW-facing slope, N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-506*.

Euphorbiaceae (Spurge Family)

Euphorbia crenulata Engelm. CHINESE CAPS. Rare.
Only 2 plants seen, W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-112*.

Euphorbia misera Benth. CLIFF SPURGE. Common.
E shore of TSN, S of boat landing, 24 Oct 1965, *Philbrick & Benedict B65-1549*; common on N rocky slope, near center of TSS, elev. ca. 250 ft, 24 Oct 1965, *Blakley 6596*; flats above S Cove, central onshore side of TSS, 24 Aug 1968, *Philbrick & Benedict B68-422*.

Fabaceae (Pea Family)

Astragalus trichopodus var. *lonchus* (M.E. Jones) Barneby [*A. leucopsis* (Torr.) Torr. & A. Gray] SOUTHERN CALIFORNIA LOCOWEED. Occasional.
TSS, 24 Feb 1949, *Wiggins 11984* (RSA-POM); TSS, 15 Mar 1980, *Thorne et al. 53971* (RSA-POM); 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* BISHOP'S LOTUS. Occasional.
TSS, 7 Apr 1948, *Moran 2801* (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. & Arn. TRUNCATE LUPINE. Rare.
TS, 10 Mar 1897, *Brandegee 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*.

Trifolium gracilentum Torr. & A. Gray PINPOINT CLOVER. Rare.
Just N of N Fish Camp, central eastern portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-111*; grassy terrace below *Lavatera*, northerly of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-148*.

Trifolium willdenovii Sprengel [*T. tridentatum* Lindl.] TOMCAT CLOVER. Rare.
TS, Mar–Jun 1897, *Anthony 194* (SD,UC); N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-95*; just N of N Fish Camp, central eastern portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-107*.

Vicia hassei S. Watson Scarce.
TSS, 7 Apr 1948, *Moran 2799* (UC).

[*Vicia ludoviciana* Nutt. var. *ludoviciana* (*V. exigua* Nutt. var. *e.*) Distribution on Todos Santos is unknown. Included here on the basis of a single questionable specimen possibly collected on Todos Santos Island.
"Todas Santas," 1888, *Fanny E. Fish s.n.* (UC 16999).]

Frankeniaceae (Frankenia Family)

Frankenia salina (Molina) I.M. Johnst. [*F. grandifolia* Cham. & Schldl.] ALKALI-HEATH. Scarce.
Few among rocks at top of beach bluffs, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6580*; rare, grassy terrace below *Lavatera*, northerly of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-150.*

Geraniaceae (Geranium Family)

**Erodium cicutarium* (L.) L'Her. REDSTEM FILAREE. Occasional.
TSS, 7 Apr 1948, *Moran 2819* (UC); terrace just northerly of N Fish Camp, central eastern portion of TSS, 29 Apr 1978, *Philbrick & Junak B78-97.*

**Erodium moschatum* (L.) L'Her. WHITESTEM FILAREE. Common.
Occasional, TSS, 7 Apr 1948, *Moran 2810* (UC); rare in disturbed site at abandoned fishermen's shack, N Fish Camp, central onshore portion of TSS, elev. ca. 50 ft, 28 Apr 1978, *Philbrick & Junak B78-82*; TSS, 15 Mar 1980, *Thorne et al. 53961* (RSA-POM).

**Pelargonium* x *hortorum* L.H. Bailey GARDEN GERANIUM. Scarce; localized on NE flanks of main hill on TSS, near N Fish Camp.
Near abandoned fisherman's shack, also seen at several sea bluff locations nearby, Cistern Cove, TSS, 28–29 Apr 1978, *Philbrick & Junak B78-80*, *B78-81.*

Grossulariaceae (Gooseberry Family)

Ribes viburnifolium A. Gray EVERGREEN CURRANT. Rare; known from a single collection.
TSS, 15 Mar 1980, *Thorne et al. 53947* (RSA-POM).

Hydrophyllaceae (Waterleaf Family)

Eucrypta chrysanthemifolia (Benth.) Greene var. *chrysanthemifolia* Occasional.
Terrace just N of N Fish Camp, central eastern portion of TSS, 29 Apr 1978, *Philbrick & Junak B78-96*; N-facing slope, foot of NE flank of High Point, TSS, elev. ca. 150 ft, 24 Mar 1987, *Junak 3113.*

Phacelia cicutaria var. *hispida* (A. Gray) J. Howell CATERPILLAR PHACELIA. Scarce.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 107412); uncommon, TSS, 7 Apr 1948, *Moran 2793* (UC); E-facing slope, N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-512.*

Phacelia distans Benth. 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 ixodes Kellogg ISLAND MISERY. 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 crevices of rocky outcroppings, near Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6604*; NE portion of TSS, ca. 5 ft above beach, 24 Oct 1965, *Philbrick & Benedict B65-1573*; bluff, S of S Cove, central onshore side of TSS, 24 Aug 1968, *Philbrick & Benedict B68-431.*

Pholistoma auritum (Lindl.) Lilja FIESTA FLOWER. Rare; known from a single collection. Included here on the basis of a poor specimen annotated by R. Halse in 1992.
NE base of S Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-516.*

Pholistoma racemosum (Nutt.) Constance Occasional; especially on N-and E-facing slopes.
N-facing slope near Indian Cave, NE portion of TSS, elev. ca. 50 ft, 20 Apr 1985, *Junak 2770.*

Lamiaceae (Mint Family)

**Marrubium vulgare* L. HOREHOUND. Rare; known from a single collection.
Seen only near N landing, TSS, elev. ca. 7 m, 15 Mar 1980, *Thorne et al. 53912* (RSA-POM,SD).

Malvaceae (Mallow Family)

Eremalche exilis (A. Gray) Greene [*Malvastrum e.* A. Gray] WHITE MALLOW. Rarely seen or collected; can be common in certain years. Not reported for Todos Santos between 1897 and 1991.
TS, 10 Mar 1897, *Brandegee s.n.* (SD 3044, UC 174769); rare, E-facing slope in openings between shrubs, W side of meadow near center of TSS, elev. ca. 200 ft, 18 Mar 1991, *Junak 4507*; localized patches along trail and in openings between shrubs, on S-facing slope N of S Fish Camp, TSS, elev. ca. 180 ft, 18 Mar 1991, *Junak 4509.*

**Lavatera assurgentiflora* Kellogg subsp. *assurgentiflora* MALVA ROSA, ISLAND TREE MALLOW. Scarce; localized population near NE end of TSS. Presumably planted on Todos Santos (Philbrick 1980). Native populations of this subspecies are known from San Miguel and Anacapa islands.
One plant, base of high cliff above Landing Cove, TSS, 24 Oct 1965, *Philbrick & Benedict B65-1554*; single shrub, E-facing slope, N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-502*; 1 of at least 9 individuals on E-facing slope, terrace above Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-146.*

**Malva parviflora* L. CHEESEWEED. Common.
TSS, 7 Apr 1948, *Moran 2826* (UC); flats N of S Fish Camp, SE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-475.*

Nyctaginaceae (Four-O'Clock Family)

Mirabilis californica A. Gray WISHBONE BUSH. Occasional; especially in rocky sites.
High terrace between N and S fish camps, SE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-469*; burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-487*; near S tip of TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103875).

Papaveraceae (Poppy Family)

Eschscholzia californica Cham. CALIFORNIA POPPY. Scarce.
TS, Mar–Jun 1897, *Anthony 190* (RSA-POM,SBBG); burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-491*; at base of N side of Lavatera Butte, NE portion of TSS, elev. ca. 30 ft, 20 Apr 1985, *Junak 2778.*

Eschscholzia ramosa Greene ISLAND POPPY. Occasional. Endemic to Santa Rosa, Santa Cruz, Santa Barbara, San Nicolas, Santa Catalina, San Clemente, Los Coronados, Todos Santos, San Martin, Guadalupe, San Benito, Cedros, and Natividad islands.
TS, Mar–Jun 1897, *Anthony 209* (CAS-DS,GH,SBBG); TS, 10 Mar 1897, *Brandegee s.n.* (UC 118503); plentiful in small areas of grassy, burned, gradual S-facing slope, just N of S Fish Camp, between High Point of island and S Lighthouse, SE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-519*.

Stylomecon heterophylla (Benth.) G.C. Taylor WIND POPPY. Not seen recently; known from a single collection.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 117986).

Polemoniaceae (Phlox Family)

Gilia angelensis V.E. Grant Rare.
Grassy terrace below *Lavatera*, central onshore portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-115*; grassy terrace below *Lavatera*, northerly of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-147*.

Polygonaceae (Buckwheat Family)

Eriogonum fasciculatum Benth. var. *fasciculatum* CALIFORNIA BUCKWHEAT. Occasional.
Common on rocky outcroppings, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6588*; rare on rocky ridge, near the center of TSS, elev. ca. 250 ft, 24 Oct 1965, *Blakley 6595*; terrace above N Fish Camp, central onshore side of TSS, 24 Aug 1968, *Philbrick & Benedict B68-447*.

Eriogonum grande var. *testudinum* Reveal Occasional. Endemic to Baja California.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 77745); common in rock crevices on rocky outcroppings, near the NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6613*; flats above S Cove, central onshore side of TSS, 24 Aug 1968, *Philbrick & Benedict B68-429*.

Pterostegia drymarioides Fischer & C. Meyer FAIRY MIST. Occasional.
Burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-490*; scattered in grassland, N end of TSS, elev. ca. 75 ft, 20 Apr 1985, *Junak 2776*.

Portulacaceae (Purslane Family)

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

Calandrinia maritima Nutt. [*Cistanthe m.* (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).

Claytonia perfoliata subsp. *mexicana* (Rydb.) 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 2801*.

Ranunculaceae (Buttercup Family)

Clematis pauciflora Nutt. ROPEVINE. Occasional; especially on N-facing slopes.
E-facing slope, N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-513*; N of cave with small seep, N-facing slope of central ridge, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-518*.

Delphinium parryi subsp. *maritimum* (Davidson) M.J. Warnock PARRY'S LARKSPUR. Scarce; localized near base of N-facing slope of High Point on TSS.
W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-108*; 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.* (SBBG 86590); NE-facing flank of main peak, E side of TSS, elev. ca. 150 ft, 18 Mar 1991, *Junak 4514*.

Resedaceae (Mignonette Family)

Oligomeris linifolia (M. Vahl) J.F. Macbr. MIGNONETTE. Scarce.
Flats N of S Fish Camp, SE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-473*; scarce near S landing, TSS, 11 May 1979, *Moran 27214* (SD); SE portion of TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103837).

Rosaceae (Rose Family)

Heteromeles arbutifolia (Lindl.) Roemer TOYON, CHRISTMAS BERRY. Scarce; especially on N-facing slopes.
N side of rocky outcropping, Indian Cave area, NE end of TSS, elev. ca. 50 ft, 24 Oct 1965, *Blakley 6602*; NE base of S Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-515*.

Scrophulariaceae (Figwort Family)

Antirrhinum nuttallianum subsp. *subsessile* (A. Gray) D. Thompson NUTTALL'S SNAPDRAGON. Abundance extremely variable from year to year.
Burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-493*; 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 B78-98*; N base of main peak, TSS, elev. ca. 100 ft, 21 Apr 1985, *Junak 2796*.

Castilleja exserta (A. Heller) Chuang & Heckard subsp. *exserta* [*Orthocarpus purpurascens* Benth. var. *p.*] PURPLE OWL'S-CLOVER. Scarce; in grasslands.
N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-93*; W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-109*; scattered populations in grassland, flats W of N Fish Camp, central eastern portion of TSS, elev. ca. 80 ft, 20 Apr 1985, *Junak & Philbrick 2782*.

Castilleja subinclusa Greene subsp. *subinclusa* [*C. jepsonii* Bacig. & Heckard] Occasional; in grasslands.
W of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-110*; occasional on E side of TSS, 11 May 1979, *Moran 27216* (SD).

Linaria canadensis (L.) Dum.-Cours. BLUE TOADFLAX. Scarce; in grasslands.
Occasional on onshore side of TSS, 28 Apr 1978, *Philbrick & Junak B78-102*; grassy terrace below *Lavatera*, northerly of Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-151*.

[*Mimulus* aff. *aurantiacus* Curtis MONKEYFLOWER. Included here on the basis of a single questionable specimen collected as *M. puniceus* and possibly from Todos Santos Island. The specimen has been seen but not studied carefully by the authors of this paper; flower color faded on the specimen.
"Todas Santos N.L. California", 15 May 1882, *Fannie E. Fish 8090* (ND-G 50689).]

Solanaceae (Nightshade Family)

Lycium brevipes Benth. var. *brevipes* FRUTILLA. 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. 53960* (RSA-POM).

Lycium californicum Nutt. CALIFORNIA BOXTHORN. Occasional.
Occasional, TSS, elev. ca. 15 m, 23 Jun 1969, *Moran 16221* (SD); near N landing, TSS, elev. ca. 15 m, 15 Mar 1980, *Thorne et al. 53917* (RSA-POM).

**Lycopersicon 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 B78-125*.

Nicotiana clevelandii A. Gray CLEVELAND'S TOBACCO. Scarce.
TS, Mar–Jun 1897, *Anthony 197* (SBBG,SD); high terrace between N and S fish camps, SE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-468*; scattered, NE of Lavatera Butte, NE side of TSS, 20 Apr 1985, *Junak 2788*.

Physalis crassifolia Benth. var *crassifolia* [*P. greenei* Vasey & Rose] THICK-LEAF GROUND-CHERRY. Not seen recently; known from a single collection.
TS, 10 Mar 1897, *Brandegee s.n.* (UC 104090).

**Solanum americanum* Miller [*S. nodiflorum* Jacq.] WHITE NIGHTSHADE. Scarce.
Ca. 0.4 mi S of Landing Cove, half-way between E and W shore, TSS, 24 Oct 1965, *Philbrick & Benedict B65-1571*; E-facing slope, near Indian Cave and *Lavatera*, terrace above Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-137*; few on cliff near S end, TSS, 11 May 1979, *Moran 27206* (SBBG,SD).

Solanum palmeri Vasey & Rose PALMER'S NIGHTSHADE. Scarce. Endemic to the northwestern part of Baja California.
TS, Mar–Jun 1897, *Anthony 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 islet, elev. ca. 120 ft, 24 Mar 1987, *Junak 3106*.

Urticaceae (Nettle Family)

Hesperocnide tenella Torr. WESTERN NETTLE. Common; especially on N-facing slopes.
TSS, 24 Feb 1949, *Wiggins 11978* (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 1987, *Junak 3114*.

Parietaria hespera 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, 25 Aug 1968, *Philbrick & Benedict B68-510*.

[*Urtica urens* L. DWARF NETTLE. Reported by Moran (1950) on the basis of a mis-identified specimen. *Wiggins 11978* is *Hesperocnide tenella*.]

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.
Only one plant seen, bluff above E shore landing, TSN, 24 Oct 1965, *Philbrick & Benedict B65-1548*.

Alliaceae (Onion Family)

Dichelostemma capitatum (Benth.) A.W. Wood [*D. pulchellum* (Salisb.) A. Heller] BLUE DICKS. Common; especially on flats.
Flats S of Landing Cove, NE portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-410*; burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-492*; SW coast, TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103840).

Orchidaceae (Orchid Family)

Piperia unalascensis (Sprengel) Rydb. [*Habenaria u.* (Sprengel) S. Watson] REIN ORCHID. Rare; restricted to mesic sites at base of N-facing flank of High Point on TSS.
Only one seen, in grass on flat, TSS, elev. ca. 25 m, 23 Jun 1969, *Moran 16235* (SD); rare, base of N-facing slope below High Point, W of N Fish Camp, TSS, elev. ca. 100 ft, 20 Apr 1985, *Junak 2783*.

Poaceae (Grass Family)

**Avena barbata* Link SLENDER WILD OATS. Occasional.
Common, NE slope of main hill, TSS, elev. ca. 25 m, 15 Mar 1980, *Thorne et al. 53916* (RSA-POM).

**Avena fatua* L. WILD OATS. Occasional.
Common on rocky slopes, TSS, 11 May 1979, *Moran 27213* (SD); common near N Landing, TSS, elev. ca. 4 m, 15 Mar 1980, *Thorne et al. 53915* (RSA-POM).

Bromus carinatus Hook. & Arn. CALIFORNIA BROME. Occasional.
S-facing slope, N of Isthmus, northerly of S Fish Camp, TSS, 28 Apr 1978, *Philbrick & Junak B78-158*; rare, rocky N-facing slope, N side of High Point, TSS, elev. ca. 250 ft, 21 Apr 1985, *Junak 2802*.

**Bromus diandrus* Roth RIPGUT BROME. Scarce.
This taxon was seen by S. Junak near the Indian Cave in the NE portion of TSS on 19 Apr 1985, but no specimen was collected.

**Bromus hordeaceus* L. [*B. mollis* L.] SOFT CHESS, SOFT BROME. Occasional.
Common on flat at S Landing, TSS, 11 May 1979, *Moran 27198*; locally abundant in a few areas of island, N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-91*; NE of Lavatera Butte, NE portion of TSS, elev. ca. 60 ft, 20 Apr 1985, *Junak 2789*.

**Bromus madritensis* subsp. *rubens* (L.) Husnot [*B. rubens* L.] RED BROME, FOXTAIL BROME. Occasional.
Terrace above N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-450*; burn NE of N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-485*; abundant, near N Landing, elev. ca. 15 m, 15 Mar 1980, *Thorne et al. 53918* (RSA-POM).

**Hordeum murinum* subsp. *glaucum* (Steud.) Tzvelev [*H. g.* Steud.] SUMMER FOXTAIL, GLAUCOUS BARLEY. Occasional.
Abundant on flat at S Landing, TSS, 11 May 1979, *Moran 27199* (RSA-POM,SD).

**Hordeum murinum* subsp. *leporinum* (Link) Arcang. [*H. l.* Link] WINTER FOXTAIL, HARE BARLEY. Occasional.
Common, near N Landing, TSS, elev. ca. 15 m, 15 Mar 1980, *Thorne et al. 53919* (RSA-POM).

**Lamarckia aurea* (L.) Moench GOLDENTOP. Occasional.
W-facing slope, N Butte, NE portion of TSS, 25 Aug 1968, *Philbrick & Benedict B68-505*; common about S Landing, TSS, 11 May 1979, *Moran 27201* (SD); TSS, 15 Mar 1980, *Thorne et al. 53954* (RSA-POM).

Leymus condensatus (C. Presl) A. Love [*Elymus c.* C. Presl] GIANT RYE. Scarce.
Locally common on NE slope, E side of TSS, 11 May 1979, *Moran 27221* (SD); TSS, 15 Mar 1980, *Thorne et al. 53948* (RSA-POM).

Melica imperfecta Trin. COAST RANGE MELIC. Common.
TS, Mar–Jun 1897, *Anthony 203* (RSA-POM); terrace between S Cove and N Fish Camp, central onshore portion of TSS, 24 Aug 1968, *Philbrick & Benedict B68-432*; TSS, 15 Mar 1980, *Thorne et al. 53936* (RSA-POM).

Muhlenbergia microsperma (DC.) Kunth LITTLESEED MUHLY. Occasional.
TS, Mar–Jun 1897, *Anthony 195*; abundant in portions of island, N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-89*; above Landing Cove, TSS, 28 Apr 1978, *Philbrick & Junak B78-101*.

**Phalaris minor* Retz. MEDITERRANEAN CANARY GRASS. Scarce.
TS, 29 May 1926, *Pierce s.n.* (POM 98721); local on grassy flat, E side of TSS, 11 May 1979, *Moran 27226* (RSA-POM,SD); rocky ocean bluff, extreme S end of N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-77*.

Poa secunda J.S. Presl subsp. *secunda* [*P. scabrella* (Thurb.) Vasey] ONE-SIDED BLUEGRASS. Scarce.
Only near N Landing, TSS, elev. ca. 20 m, 15 Mar 1980, *Thorne et al. 53921* (RSA-POM).

**Polypogon monspeliensis* (L.) Desf. RABBITSFOOT GRASS. Scarce.
S-facing slope of main ridge, SW portion of TSS, 28 Apr 1978, *Philbrick & Junak B78-131*; occasional near S Landing, TSS, 11 May 1979, *Moran 27204* (SD).

Stipa diegoensis Swallen [*Achnatherum d.* (Swallen) Barkworth] SAN DIEGO COUNTY NEEDLEGRASS. Common.
N Fish Camp, central eastern portion of TSS, 28–29 Apr 1978, *Philbrick & Junak B78-92*; TSS, 15 Mar 1980, *Thorne et al. 53945* (RSA-POM); SE shore, TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103833).

**Vulpia myuros* var. *hirsuta* (Hackel) Asch. & Graebner [*Festuca megalura* Nutt.] FOXTAIL FESCUE. Occasional.
Common, TSS, 7 Apr 1948, *Moran 2820* (UC).

Vulpia octoflora (Walter) Rydb. var. *octoflora* SIX-WEEKS FESCUE.
Reported for Todos Santos by Gould and Moran (1981), but we have seen no specimen.

Zosteraceae (Eel-Grass Family)

Phyllospadix torreyi S. Watson SURF-GRASS. Abundance on Todos Santos not known; needs further study.
SE anchorage, TSN, 21 Apr 1985, *Philbrick s.n.* (SBBG 103836).

The Fourth California Islands Symposium: Update on the Status of Resources
Edited by W. L. Halvorson and G. J. Maender. 1994. Santa Barbara Museum of Natural History, Santa Barbara, CA.

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

Steven A. Junak[1] and Ralph Philbrick[2]

[1]Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105
Tel. (805) 682-4726; Fax (805) 563-0352

[2]29 San Marcos Trout Club, Santa Barbara, CA 93105
Tel. (805) 967-0875

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 nonnative 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 nonnative plants are not widespread on the island.

Keywords: San Martin Island; Isla San Martin; San Quintin; Bahia de San Quintin; California Islands; Baja California; Mexico; flora; vegetation; botanical exploration.

Introduction

Like several of the islands off the west coast of Baja California, San Martin is known for a spectacular springtime 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 live-forever (*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. Guadalupe, 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 30º 29' N, longitude 116º 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 (0.9 mi²), the island is dominated by a 151-m (497-ft) cinder cone and crater located near the center of the island