

Sonoran Maritime Strand and Submergent Communities

Both the Baja California and Sonora coasts of the Gulf of California possess tide flat, beach dune, beach rubble, and sea cliff habitats. The mud substrates of the quieter waters may be inhabited by tide-influenced communities of Iodine Bush (*Allenrolfea occidentalis*), Seepweed, Sea-lavender (*Limonium californicum*), saltbushes (*Atriplex barclayana*, and others), Batis (*Batis maritima*), alkali-heath (*Frankenia* spp.), Ice Plant, glassworts (*Salicornia* spp.), Saltgrass, and other halophytes (e.g., *Tricerma phyllanthoides*). The plant cover varies from almost nil to open to relatively dense tidalscrub, and is dependent on frequency of inundation and edaphic conditions (Felger and Lowe, 1976). The upper, inland associations commonly grade into desertscrub and there may be much intermingling of the two, both in aspect and composition. Beach dunes are normally thinly vegetated, if at all, by deep-rooted, mat-like, or otherwise short-statured forbs, grasses being poorly represented on these subtropical beaches (Fig. 193). Examples given by Felger and Lowe (1976) of strand vegetation on dunes along the Sonora coast are: *Abronia maritima*, *A. villosa*, *Astragalus magdalenae*, *Dicoria canescens*, *Euphorbia leucophylla*, *Monanthochlœ littoralis*, *Jouvea pilosa*, *Helianthus niveus*, and *Croton californicus*. As elsewhere, the lateral dunes closer to the sea are more subject to wind and spray and so, possess less vegetative cover. The beaches themselves are essentially free of vegetation.

Even harsher environments for plants are rock rubble and sea cliff shores. The vegetation on these sites is typically extremely sparse and may be composed of nonvascular species, annuals and/or the hardier cliff-dwelling desertscrub and thornscrub perennials found inland. Examples, again from Felger and Lowe (1976), are: *Amaranthus watsonii*, *Nicotiana trigonophylla*, *Ficus petiolaris*, *F. palmeri*, *Hofmeisteria crassifolia*, *H. fasciculata*, *Eucnide rupestris*, *Pleurocoronis laphamoides*, and the Sweet Mangle (*Maytenus phyllanthoides*).

Rocky coastal environments are sometimes the hauling sites for large herds of California Sea Lions. While the sand "hauling" beaches used by Green Sea Turtle are now rare, sandy beaches and mud flats provide winter feeding habitats for migrating curlew, sandpipers, dowitchers, phalaropes, and other shore birds. Nesting species using these habitats are often restricted to islands (e.g., Isla Raza) and some of the less disturbed mainland beaches. These include the Royal Tern (*Thalasseus maximus*), Elegant Tern (*T. elegans*), Least Tern, Snowy Plover, and Wilson's Plover (*Charadrius wilsonia*). Rocks and sea cliffs, especially on offshore islands, often host such colonial nesting pelagic and shore foraging birds as the Manx Shearwater (*Puffinus puffinis*), Western Gull (*Larus occidentalis*), Heermann's Gull (*L. heermanni*), Laughing Gull (*L. atricilla*), Brown Booby (*Sula leucogaster*), Blue-footed Booby (*S. nebouxii*), Blue-faced Booby (*S. dactylatra*), Least Storm Petrel (*Halocryptena microsoma*), Black Storm Petrel (*Oceanodroma melania*), Brown Pelican (*Pelecanus occidentalis*), Double-crested Cormorant, Black Skimmer (*Rynchops nigra*), and Red-billed Tropicbird (*Phaethon aethereus*). Other more solitary and habitat specific nesting species include the American Oyster Catcher (*Haematopus pallitus*) (rock rubble), and Osprey (*Pandion haliaetus*) (pinnacle or other elevated structure).

Fish communities of the intertidal (littoral) zone of the Gulf of California have recently been discussed by Thomson et al. (1979). In the upper Gulf, above the "midriff" islands of



Figure 193. Sonoran maritime strand just north of Cruz Piedra, Sonora, Mexico, looking toward Empalme. An open "beach" strand of Sandverbena (*Abronia maritima*), Beach Sunflower (*Helianthus niveus*) and Pickleweed (*Salicornia* spp.).

Ángel de la Guarda and Tiburón, communities consist of relatively few species that show great seasonal population fluctuations. About 60 species of fishes occupy this zone near Puerto Peñasco, Sonora. The most abundant kind is the Panamic Sargeant Major (*Abudefduf troscheli*) followed by the Gulf Opaleye (*Girella simplicidens*), two clinid blennies (*Paraclinus sini*, *Malacoctenus gigas*), and the Sonoran Goby (*Gobisoma chiquita*). The strand inhabiting clingfishes (e.g., *Tomicodon humeralis*, *Gobiesox pinniger*, etc.) are also common, rarely occurring below mid-tidal zones, and daily exist for a period of hours above the level of the sea. A major piscivore is the Spotted Sand Bass (*Paralabrax maculatofasciatus*). Over the long term, warm-temperate species dominate the community in numbers and biomass—Gulf Opaleye, Spotted Sand Bass, Rock Wrasse (*Halichoeres semicinctus*), Sargo (*Anisotremus davidsoni*), and Bay Blenny (*Hypsoblennius gentilis*). These are cold-tolerant species able to survive occasional low sea temperatures that decimate several tropical species in this region, especially Panamic Sargeant Major (Thomson and Lehner, 1976).

The central Gulf has about twice as many species as the upper portion and they are far more colorful than the drab, cryptic fishes characterizing upper-gulf shorelines. Warm-temperate species so common nearer the Colorado Delta are absent or uncommon here. The Panamic Sargeant Major remains abundant, but the Cortez Damsel (*Eupomacentrus rectifraenum*) becomes one of the more conspicuous forms. A dominant piscivore is the Leopard Cabrilla (*Mycteroperca rosacea*) (Hobson, 1968). Angelfishes (*Pomacanthus zonipectus* and *Holacanthus passer*) and butterfly-fishes (*Chaetodon humeralis* and *Heniochus nigriristris*) are frequent, as are several species of wrasses (*Halichoeres nicholsi*, *H. dispilus*, *Bodianus diplotaenia*, *Thalassoma lucasanum*). Larger prey items are taken by Baja Grouper (*Mycteroperca jordani*), while

Spotted Sand Bass is replaced by Flag Cabrilla (*Epinephelus labriformes*) as a major predator on smaller species. Moray eels (*Gymnothorax castaneus* and *Muraena lentiginosa*) become common, occupying the predatory niche at night. Bumphead Parrotfish (*Scarus perrico*) and Yellowtail Surgeonfish (*Prionurus punctatus*) are common herbivores in the system, and schools of grunts (*Microlepidotus inornatus* and *Haemulon sexfasciatum*) cruise over reefs and feed on sandy areas nearby. Further south, out of the area, species of Indo-west Pacific origins have become established, and on the peninsula side of the Gulf, the shoreline fauna is equally as rich as any in that region (Thomson et al., 1979).

Numerous other small shore fishes, related to those discussed for the California coast, also occur in profusion in the Sea of Cortez. Soft bottoms are occupied by about half the known fauna of ca. 30 species of gobies. Especially characteristic are the estuarine Guaymas Goby (*Quietula guaymasiae*) and Longtail Goby (*Gobionellus sagittula*). Mulletts (*Mugil cephalus*, *M. curema*) feed on detrital materials associated with muds, and in shallows fall prey to nets of local fishermen. Mojarras (*Gerres cinereus*, *Diapterus peruvianus*, *Eucinostomus* spp.) also are abundant. The Longjaw Mudsucker, shared by both Gulf and California coasts, can use atmospheric oxygen when stranded by low tides (Todd and Ebeling, 1966). And, an important counterpart of the Californian Grunion is the strand-spawning Gulf Grunion (*Leuresthes sardina*), the young of which migrate to soft- or sand-bottomed areas for food and shelter. Muds grade into sandy substrates, where Stingrays (*Urolophus halleri*), mojarras, mullets, Grunts (*Pomadasyss branicki*), various croakers (*Cynoscion parvipinnis*, *Bairdiella icistius*), Bonefish (*Albula vulpes*), and some flounders (*Etropus crossotus*, *Achirus mazatlanus*, *Symphurus melanorum*, and others), hold forth (Thomson, 1973, Thomson et al., 1979).