Nearshore Marine Plant Resources: Overview

A bounty of marine algae flourishes along the coast of California, providing habitats and food for invertebrates, fishes and marine mammals in nearshore communities rivaling the richness and diversity of coral reefs. Our state's marine flora includes over 700 species and varieties of seaweeds: filamentous and fleshy red algae, as well as animal-like corallines; brown algae, including the distinctive, leathery kelps; delicate green algae and a few sea grasses. The undersea vegetation is sustained by our nutrient-rich coastal waters. The diversity of undersea life is enhanced by the variety of living conditions, and the range of wave exposures and substrates available from protected, muddy inlets to granitic outcrops exposed to crashing, open ocean waves.

California seaweeds have been collected from the wild since the mid-19th century when they were dried and shipped to San Francisco and China. In some cases, intertidal rocks were charred with gasoline torches or burning wood to clear off herbivores and less desirable seaweeds and allow better recruitment and growth of edible red algae, such as nori (*Porphyra*). A variety of species has been collected on a small scale for commercial sale or home use: wakame (*Alaria*), kombu (*Laminaria*), sea palm (*Postelsia*), bladderwrack (*Fucus*), bull kelp (*Nereocystis*), and the green sea lettuce (*Ulva*.) The giant kelp, *Macrocystis pyrifera*, an important source of the gelling compound alginate for industrial uses, has been harvested mechanically by commercial harvesting ships. The giant kelp has also been hand-harvested for aquacultural use as abalone food. As pharmaceutical research for new medicines targeted marine organisms for testing, several varieties of seaweeds were collected for screening as sources of antibiotic and anticancer compounds.

The value of nearshore seaweeds in recreational settings has more recently gained public attention as a consequence, in part, of increased participation in ocean sports and underwater photography, as well as the successful cultivation and display of seaweeds in public aquariums. Popular books, magazine articles and television programs on marine topics reinforced the heightened awareness. And, as coastal residents and visitors have come to appreciate seaweeds aesthetically and for their role of providing food and habitats for invertebrates and fishes, conflicts have developed over the perceived environmental and aesthetic impacts of harvesting and appropriate uses of these resources.

Plans for protection of our seaweeds and nearshore habitats are complicated by the very diversity of California's marine flora. Never a case of one-size-fits-all, effective management of these resources requires consideration of each species' cycle of life in each habitat. Is the species an annual (such as the sea palm, *Postelsia*) or perennial (such as the giant kelp, *Macrocystis*)? How abundant is the species? When and where does it grow best? What parts of the seaweed and how much could be harvested and still sustain a healthy wild population? Where does new growth occur: is it restricted to meristems at the tips or is cell division diffuse along the length of the whole structure? How fast can it recover from being trimmed? Should specific reproductive structures (such as the sea palm's topknot of blades) be restricted from harvesters? The seasonal weather patterns and seasonal cycles of growth and reproduction affect plants in the sea, just as they do on farmlands. But, as with crops on land, it is rarely one sole factor that sets the stage.

Biological interactions (such as diseases or over-grazing by sea urchins), pollution, catastrophic storms, and oceanographic conditions, such as El Niño and La Niña cause changes in the distribution and abundance of seaweeds. Warmer, nutrient-stressed El Niño conditions can deter growth of giant kelp and the full development of its canopy. With less canopy on the sea surface, more sunlight penetrates to the understory kelps (such as the winged kelp *Pterygophora*) which may grow and persist in spite of lower nutrients. In contrast, the cold, nutrient-rich La Niña conditions can lead to exceptional growth of giant kelp and an extensive, shady canopy that can inhibit some of the understory seaweeds.

There is some evidence that people, even nature lovers, can have negative effects on seaweed and animal communities. Researchers found that intertidal rocks in less accessible coastal sites near Santa Cruz had greater diversity and abundance than sites with more human visitors. And the state continues to attract additional human visitors and residents, with a population increase of 571,000 in 1999 alone. Our three largest cities (Los Angeles, San Diego and San Jose) collectively gained 98,000 additional residents that year. As California's population continues to increase, the state will harbor an estimated 41 million residents by 2010. If tourism and coastal recreational activities (such as tidepooling, kayaking, and surfing) also increase, the incidence of intertidal trampling and casual collecting in popular beach locations will heighten. The undersea vegetation that attracts so much recreational, educational and commercial interest warrants thoughtful management to ensure its continued richness and abundance along the coast of California.

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