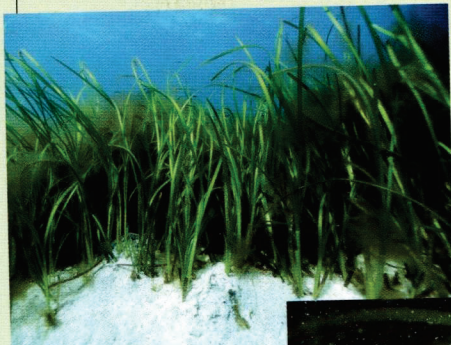


# SEAGRASS BEDS AND KELP FORESTS

SEAGRASS BEDS AND KELP FORESTS are very different habitats, but both are highly productive and contribute significantly to the total primary production of inshore waters. Seagrasses are the only fully marine flowering plants. They thrive in shallow, sunlit water on sheltered, sandy seabeds, primarily in warm water. Kelps are large brown seaweeds that grow as dense forests on rocks of the lower shore and subtidal zone, preferring cold water. Both of these ecosystems have a complex structure and provide shelter for a wide range of associated animals and seaweeds, some of them found nowhere else.

## COLD-WATER KELP

Kelps are large brown seaweeds that live mainly in shallow subtidal zones.



## SEAGRASS MEADOWS

Seagrass meadows help to protect shallow sandy seabeds against erosion.

## NATURAL CAMOUFLAGE

This greater pipefish's elongated shape and drab color make it hard to spot among seagrass leaves.



## SEAGRASS BEDS

Seagrasses are the only flowering plants (angiosperms) that live entirely in the sea, and they grow best in shallow, sandy lagoons or enclosed bays, where the water clarity is good. They are also tolerant of variable salinity. Unlike seaweeds, seagrasses have roots, which they use to absorb nutrients from within the sediments, thus recycling nutrients that would otherwise be locked up below the surface. Their intertwined rhizomes and roots help to stabilize the sand, protecting against erosion and encouraging the buildup of sediments. The productivity and

complex physical structure of seagrasses attract a considerable diversity of associated species, some of which are only found in seagrass beds. A variety of seaweeds and sedentary animals, including species of hydroids, bryozoans, and ascidians, grow on the leaves. Seagrasses are also a critically important food for animals such as manatees, dugongs, green turtles, and many aquatic birds.

## HUMAN IMPACT

### ENDANGERED GRAZERS

Seagrasses are the primary food of green turtles, and the only food of manatees and dugongs. Globally, these animals are now endangered or vulnerable, threatened by the destruction of their feeding grounds. The coastal areas in which seagrass beds are found are often vulnerable to pollution. Runoff of nutrients and sediments from land affects water clarity, and is probably the biggest threat worldwide.



## KELP FORESTS

The term "kelp" was originally used to refer to the residue resulting from burning brown seaweeds, which was used in soap-making. It is now used more generally to refer to the many kinds of large brown seaweeds of the order Laminariales. Kelp forests grow best in colder waters, on shallow rocks with good water movement. The top edge of some kelp beds is visible at the lowest tides. Kelps grow densely on rock slopes down to around 30–70 ft (10–20 m) deep, depending on water clarity. In deeper water, there is less light for photosynthesis and kelps grow more sparsely; in most coastal waters they cannot survive below 80 ft (25 m). In exceptionally clear water, kelps can grow at 160 ft (50 m).

Many kelp species have gas-filled floats, which hold the fronds up to the light and away from grazers. Within the kelp forest, waves are subdued and many organisms live in its shelter. Although kelp habitats support rich marine communities, only about 10 percent of kelp is eaten directly by animals; the rest enters the food chain as detritus or dissolved organic matter.

## COASTAL DEFENSES

A band of giant kelp can help to protect coasts from severe storms by absorbing wave energy.

## DISTRIBUTION MAP

Seagrass beds flourish in the tropics, while kelp forests thrive in cold, nutrient-rich waters, extending into the polar regions.

■ kelp forests  
■ seagrass beds

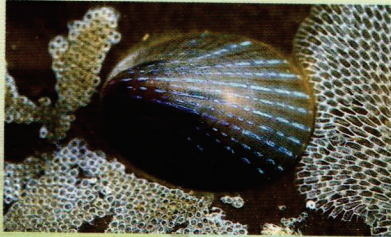




## KELP COMMUNITIES

Many kelps are treelike in shape, with a branched holdfast for attachment and a long stem (stipe), sometimes with floats, supporting a palmlike frond. This makes a kelp forest a multilayered environment in which different organisms live at different levels. Small spaces in the holdfast can harbor hundreds of small animals from predators. Some kelps have rough stipes covered with red seaweeds, although sea urchins and limpets may graze these in calm weather and in deeper water.

Actively growing kelp fronds exude slime, which deters most animals from settling, but as growth slows later in the season, the fronds may become covered with a few species, particularly bryozoans, hydroids, and tube worms. These animals reduce the light reaching the fronds, and some kelps shed their fronds to get rid of unwanted settlers before growing new ones. The sea floor beneath the kelps may be covered with marine growth, or relatively barren if heavily grazed by sea urchins.



### BLUE-RAYED LIMPET

At the end of the growing season, these limpets move down into the holdfast to avoid being discarded with the old frond.



### KELP ANEMONE

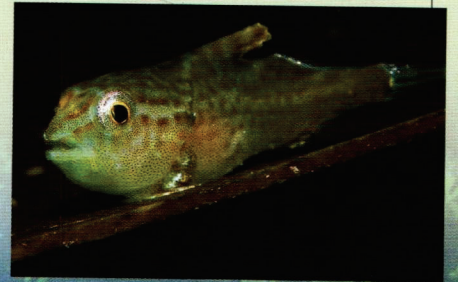
This large anemone is unusually mobile, and crawls or drifts up onto seaweed fronds to catch floating prey.

## NURSERIES AND REFUGES

Seagrass beds and kelp forests are important refuges for young fish that need to hide from predators until they reach maturity. Many fish, such as the lumpsucker and swell shark, do not live among seagrasses or kelps as adults, but come into these habitats to spawn, giving their young a greater chance of survival. Small fish need small prey, and they find an abundance of food in the form of tiny worms, crustaceans, and mollusks among the seagrasses and in the sediment beneath, or in the undergrowth of kelp forests. These young fish are often unlike their parents, usually camouflaged in shades of green and brown to avoid detection. Some herbivorous fish from surrounding reefs come into seagrass beds only at night. Seagrass beds are important nurseries for some commercial invertebrates, including shrimp and cuttlefish.

### LUMPSUCKER

This baby lumpsucker is very vulnerable. However, it is well camouflaged on kelp fronds, to which it attaches itself with a sucker.



### DENSE KELP FOREST

Giant kelp is the world's biggest seaweed. Its stipes can be more than 100 ft (30 m) long, and it can grow as fast as 20 in (50 cm) per day.