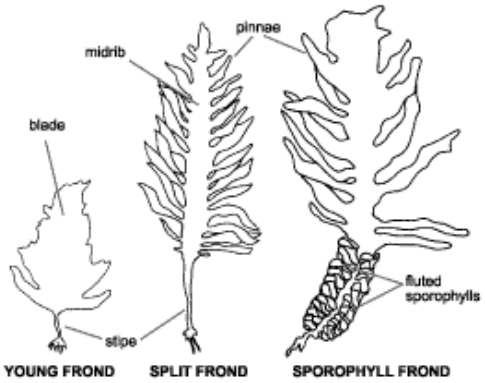
Undaria pinnatifida Information Sheet

TAXONOMY
Division: Phaephyta
Class: Phaeophyceae
Order: Laminariales
Family: Alariaceae
Species: *Undaria pinnatifida*
Common Name/Nickname: Wakame; Asian kelp



NATIVE DISTRIBUTION
Japan, Korea, and China.

DESCRIPTION
Undaria pinnatifida is a brown seaweed that can reach an overall length of about 0.5-3 m (1.6-10 ft). Young plants have an undivided, wide flat blade, while mature plants are distinguished by pinnate or "fingers" dividing the blade, and a fluted, ruffled, spiraling reproductive structure called the sporophyll that forms around the main stem or stipe near the holdfast of the kelp. This sporophyll is not found in native kelp populations. Both the young and mature plants have a midrib, which is not present in most native kelp. The combination of the color, shape, midrib and sporophyll, along with a crinkled texture, distinguish it from related native kelps.

U. pinnatifida forest

U. pinnatifida thallus

LIFE CYCLE
U. pinnatifida undergoes an annual heteromorphic life cycle alternating between a diploid (2N) macroscopic sporophyte and a haploid (1N) microscopic gametophyte.
The macroscopic sporophytes grow during winter and release spores as summer approaches. These spores which are microscopic disperse and settle down to germinate into gametophytes, when conditions are favorable these gametophytes produce sperms and eggs which fertilize and grow into the plant, i.e. the sporophyte.

HABITAT AND CONDITIONS

It is an annual species with two separate life stages: a macroscopic diploid stage (the sporophyte), usually present through the late winter to early summer months, and a microscopic haploid stage (the gametophyte), present during the remaining months. *U. pinnatifida* grows at depths of 20-25 m (65.6-82 ft) and can colonize on any hard surface, including artificial substrate such as ropes, pylons, buoys, the hulls of vessels, bottles, floating pontoons and plastic. On natural hard substrate, it inhabits stable rocky reefs, mobile cobble habitats, and mudstone. *U. pinnatifida* can also grow on seagrass (as small sporophytes), the shells of abalone, bivalves and other invertebrates, and epiphytically on seaweeds. The sporophytes can maintain populations under salinities of 20-34 ‰ and temperatures ranging from 0 to 27 °C, although its temperature tolerances vary in different geographic locations. Polluted waters do not seem to limit the spread of this alga but may even be an advantage, because it can colonize sewage-influenced habitats.

INVASION AND DISTRIBUTION

Aside from its native range, *Undaria pinnatifida* occupies the Mediterranean Sea, England, Atlantic Europe, New Zealand, Australia, Argentina, Baja California in Mexico, and California, USA. It appeared outside of its native northwestern Pacific in 1971 when it was introduced to Thau Lagoon in the Mediterranean Sea with the importation of Japanese oysters.

It was then intentionally introduced along the coast of Brittany, France, for aquaculture purposes due to its potential economic value (it is cultivated and commercially sold for its food value. Uses include addition to soups such as miso soup). *Undaria pinnatifida* has since spread rapidly into previously unoccupied temperate waters along the Atlantic and Mediterranean coasts of Europe.

U. pinnatifida was first found growing in Los Angeles Harbor in Spring 2000 and is now found in numerous California Harbors: from Button Shell Cove on leeward Santa Catalina Island, Santa Barbara Harbor, Monterey Bay Harbor, San Francisco Marina, South Beach Harbor Marina, Hyde Street Harbor. In 2016, it was found on the north side of Anacapa Island and may have spread to other open-coast reefs in the area.

Although *U. pinnatifida* was introduced accidentally with oysters and intentionally for cultivation purposes, it also has been dispersed unintentionally by shipping activity. The original source of *U. pinnatifida* in Californian waters is unknown, but its occurrence almost exclusively in harbor environments and its ability to grow on fouled ship hulls suggest that it was and is being transported by shipping activities.

Undaria pinnatifida is considered a highly invasive species and is listed as one of the world's 100 worst invasive alien species by the International Union for the Conservation of Nature (IUCN).

Divers should use caution not to disturb *Undaria pinnatifida* if they find it because disturbing a reproductive plant can easily trigger it to release its spores and cause the population persist and spread. Please help track the spread of *Undaria pinnatifida* by reporting observations at marineinvasives.org.