

# Knotted Wrack

*Ascophyllum nodosum*

Class: Phaeophyceae  
Order: Fucales  
Family: Fucaeeae  
Genus: Ascophyllum

## Distribution

Knotted Wrack is seaweed of the northern Atlantic extending as far north as the Arctic Ocean. Its southern distribution extends as far south as northern Portugal in the east and New Jersey on the west side of the Atlantic.

## Habitat

It is most abundant on sheltered rocky shores in the mid-intertidal zone (the area that is fully covered and uncovered each day)

## Reproduction

Knotted Wrack is dioecious; each plant is either male or female. The reproductive receptacles are on each separate plant.

## Development

Receptacles grow larger by spring. Gametes (eggs and sperm) are now ready to be released. Fertilization takes place externally and they become zygotes – fertilized eggs.



This is easily seen along the shoreline throughout the year

It is common on the north-western coast of Europe (from northern Norway to Portugal) as well as the east Greenland and the north-eastern coast of North America. It occurs in the Bay of Fundy, Nova Scotia, Prince Edward Island, Baffin Island, Hudson Strait, Labrador and Newfoundland. It has been recorded as an accidental introduction to San Francisco, California, and as a potentially invasive species eradicated. As well as Knotted Wrack it is known as Rockweed, Norwegian Kelp, Knotted Kelp, or Egg Wrack.

The species attaches itself to rocks and stones in the middle of the tidal region. It is found in a range of coastal habitats from sheltered estuaries to moderately exposed coasts. Often it dominates the inter-tidal zone. Sub-tidal populations are known to exist in very clear waters such as those of Rhode Island, USA. However, an intertidal habitat is more usual.

Receptacles begin to develop in response to seasonal variations in late spring and early summer. They are oval pods that are initially flat and become inflated, changing from olive green to orange or dark brown. One or more receptacles become visible on the main fronds in the fall. As they mature the sex can be determined. Mature male receptacles have little orange dots (sperm masses); whereas females have green dots (egg masses).

The zygote germinates rapidly, within ten days, putting out a primary rhizoid (root like filament). The tip exudes material which spreads out into an adhesive foot when contact is made with a solid substrate. It penetrates microscopic crevices. A holdfast or anchor is formed. Fronds grow upwards from this solid attachment. Growth is year round with no resting period however the rate of growth varies seasonally.



## Characteristics

A number of fronds grow from each basal holdfast. They do not have a mid-rib. Fronds, as they lengthen, develop air bladders. These bladders are egg-shaped and occur at regular intervals. Fronds can reach 2 metres in length and are olive-brown in colour.

## Adaptations

The large air bladders take it towards the light for maximum photosynthesis. Frond flexibility decreases possible breakage from strong wave action. Individual fronds can last 15 years before breakage and the plant regenerates new fronds from the base when one of the larger fronds is damaged.

## Ecological Aspects

It is an indicator of good water quality. It provides food, shelter, and spawning habitat for a variety of animals, including small crustaceans, juvenile mussels, snails, whelks, periwinkles, barnacles, limpets, sponges, and fish.

## Status/Threats

Wave action is a major source of mortality to recently settled zygotes

## Sightings in Nova Scotia

It is very common in and around Nova Scotian waters and shorelines.

The long fronds are flexible, thick and leathery. The large, sturdy, single bladders filled with air in the middle of the fronds look like large knots hence the name Knotted Wrack. Bladders keep plants suspended upright in the water during high tide. They hang downwards draping themselves over intertidal rocks in thick tangles during low tide. In areas where they are abundant incoming tides gradually refloat large groups of these plants creating an expansive swaying undersea forest.



The species grows slowly and can live to be decades old in wave-sheltered locations of temperate waters. It does have the capability to survive low temperatures. Rhizoid production continues for the life of the plant. These holdfasts (anchors) last for several years. In dense populations they frequently coalesce. Fronds which do break off from the base during storms form mats which float around on the surface. These can last for a long time. A unique attribute to *Ascophyllum* is it repeatedly sloughs its entire outer epidermis (outermost layer of cells), a phenomenon not exhibited by other related seaweeds.



All sorts of other seaweed species grow underneath knotted wrack, species that without protection would normally dry out during ebbing water. In providing shelter for small marine animals these in turn provide a food source for seabirds and shoreline birds. Large beds, in a sense becomes a marine habitat.

Biomass density in southwestern Nova Scotia is among the highest in the world. It is harvested by individuals (as a fertilizer) and commercially. It is used to produce liquid fertilizers, soil conditioners, nutritional supplements, skin and hair care products and for animal fodder etc.

Permits are issued to commercial enterprises and to individuals. Strategies are in place to ensure environmentally safe and sustainable harvesting of this provincial resource. Harvesting techniques have reverted back from being mechanical to gathering by hand using cutting tools and rakes. A benefit to this is providing employment for Nova Scotians as well as being less destructive to the Knotted Wrack beds. Refer to the Fisheries and Coastal Resources Act

