

## **Undaria Pinnatifida – a brown Macro-Alga from Asia**

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*Undaria Pinnatifida* is a brown macro-alga from Japan, China and Korea where it is grown on ropes, harvested and eaten for food. Its botanical name comes from the Latin *unda* meaning “wave” and *pinnatifida*, which means “in the shape of a feather”.

Synonyms: Wakame, *Alaria pinnatifida*, *Alaria amplexicaulis*, *Ulopteryx pinnatifida*



# BOTANY

Botanical family: Brown alga of the *Alariaceae* family

*Undaria pinnatifida* is a **large brown alga** which can grow up to 2 to 3 m long. Its average length in the Mediterranean is between 0.5 and 1.2 m.

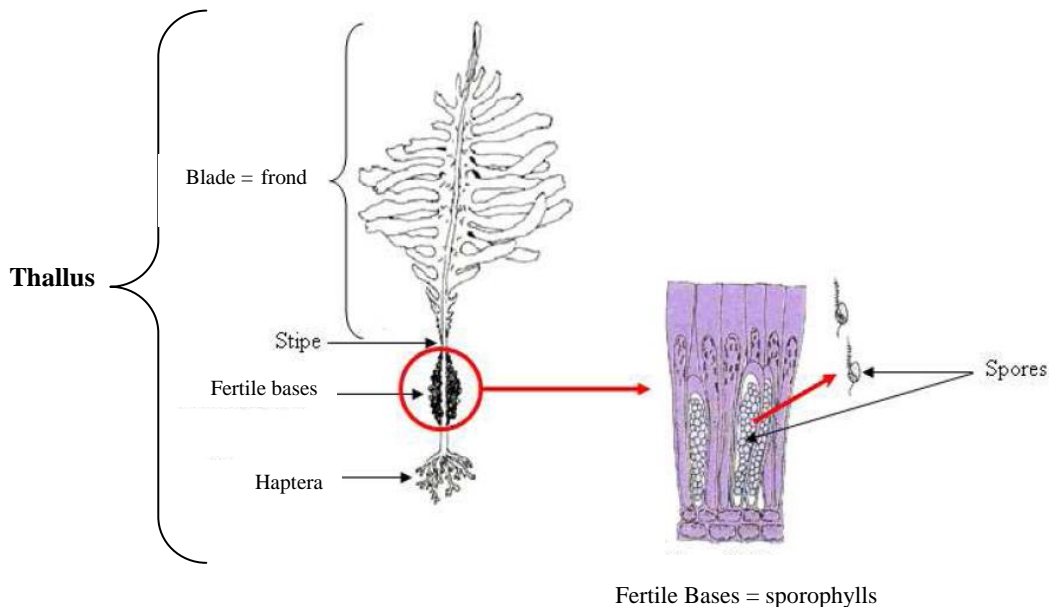
Its thallus (which is the vegetative tissue of lower plants that do not have leaves, roots and a stem) is made of three parts: the fronds, the stipe and the tendrils or haptera which the alga uses to fix itself to a substrate.

The frond is a foliated blade, straighter towards its tip, with a clearly defined, brown-green translucent medial nerve. The edges are strongly denticulated and lobed, particularly towards the base. In the juvenile phase the frond is completely straight with no denticulation. At maturity it becomes triangular with transverse lobes.

The stipe is 10 to 20 cm long, 0.5 to 1 cm wide, thick and flat with denticulated edges. At maturity wavy folded projections form towards the base called sporophylls. These contain the fertile structures.

The shape of the alga changes over time. The young thallus is elongated and ribbon like. On approaching maturity it becomes wider and lobed. At the end of the cycle the sporophylls develop and the upper part of the frond dies off. The shape in the adult state can vary with the frond denticulated to a greater or lesser degree, a long or stubby stipe and wide or narrow sporophylls.

Reproduction: spores are produced by the stipe. These new tissues called fertile bases or Mekabu contain the reproductive cells by which the species reproduces. When released into the sea, the reproductive cells swim to a rocky substrate where they attach themselves and germinate to create a new alga. The fertile bases alone represent a concentration of life that ensures the alga will continue to reproduce across the centuries.



## BIOTOPE

*Undaria pinnatifida* is cold temperate water alga which colonises the upper reaches of the shore, most frequently in sites with strong currents but which are not subject to buffeting, i.e. in areas where waves do not crash onto the shore. It cannot withstand being out of the water for long periods of time. Wakame attaches itself to all sorts of solid substrates. These can be natural such as rocks, abalone shells and so on or artificial such as port constructions, hulls of ships, posts, anchor chains, ropes, shellfish tables, channels etc.

It can form dense forests which compete with native species for space and light, often dominating them, especially where there are no large indigenous algae.

This ease with which it colonises various habitats is one of the reasons for the success in introducing it. In its native habitat and where it is introduced, wakame is highly tolerant to a wide variety of environmental conditions in terms of temperature and salinity.

This would partly explain its wide geographic distribution in Europe from the Mediterranean to the North Sea.

Its distribution can range from the bottom of the foreshore (the part of the shore between the highest and lowest known waterlines) down to a maximum depth of less than 18 m depending on the turbidity of the water, i.e. its ability to diffuse or absorb ambient light. For instance, in the clear waters of Ouessant, an island situated off the coast of Brittany in France, it can be found down to 18 m while in the turbid waters off St Malo, it does not go below a depth of 13 m. In the Mediterranean it generally grows at less than 1.5 m depth from autumn to the end of spring.

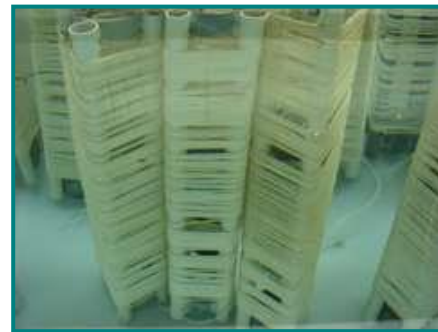
## OUR GROWING AREAS

To prevent using natural resources, Codif R&N has set up an *Undaria Pinnatifida* growing program in conjunction with a local partner. It is located on a 70 ha marine concession in a protected area near the mouth of the Rance River, in Brittany, France.

Reproductive cells from algae, first of all collected in small quantities from a natural source, are placed in a hatchery where they produce small algae which are then transferred to the open sea on a network of submerged ropes. A year after starting off in the hatchery, the algae are harvested for extraction.



System of ropes



Hatcheries

## HISTORICAL AND GEOGRAPHICAL DISTRIBUTION

Originally from Japan where it has traditionally been grown for several decades, the alga was introduced to France by accident at the beginning of the Seventies with Japanese oyster spat. It took hold in Lake Thau (in the Hérault region).

In 1983 it was deliberately introduced into Brittany for cultivation tests. These took place in the Bay of Lampaul (Ouessant), the Isle of Groix, the Isle of Sein and in the Rance estuary (St Malo).



Spontaneously seeded colonies have since been found in the Channel, from Ouessant to the Netherlands and on the English coast. Colonies have also taken hold on the Atlantic Coast of France, in the temperate Pacific Ocean, the temperate South East Indian Ocean, the Mediterranean (except the south and east), and in Spain in Asturias and in Galicia.

*Undaria pinnatifida* has also been accidentally introduced into the Southern Hemisphere, first in New Zealand and then in Tasmania and Australia.

It has also colonised the American continent along the Atlantic coast, in Argentina in 1992 and more recently in south Patagonia. Colonies have taken root on the Pacific coast in California since 2001 and in Mexico since 2003.

## MEDICINAL USES

### Principal components of the plant

- Soluble fibre, rich in alginates and fucoidan (a complex polysaccharide).
- High calcium content (1300 mg/ 100 g) which is more than ten times higher than milk.
- Free amino acids (thiamine, niacin).
- Vitamin B12.
- Iodine.

In Oriental medicine, *Undaria Pinnatifida* is used for purifying the blood, alimentary canal health, skin and hair care and regulating the menstrual cycle. The whole alga is used in phytotherapy (plant based medicine) against cancer, particularly of the blood, and its essential oil is used in aromatherapy.

*Undaria Pinnatifida* is used against:

- Anaemia
- Osteoporosis
- Arterial hypertension
- Chronic fatigue
- Cardio vascular diseases
- Digestive problems.

In addition *Undaria Pinnatifida* strengthens the human immune system. Fucoidan, the polysaccharide found in the alga, stimulates the cells of the immune system (source: <http://fr.wikipedia.org/wiki/Wakame>). Finally, it is of great interest for vegetarians and vegans since it is the alga with the highest Vitamin B12 content, which vegetarians and particularly vegans may lack.

## DIETARY USES

The dietary qualities of *Undaria Pinnatifida*, also called Wakame when used as food, make the alga of high commercial value. It is the third most widely cultivated or harvested alga in the world for human consumption and is very popular in Japanese and Korean cuisine. It is also used to feed cultivated abalone in Asia. It has been on the list of algae species approved for human consumption since the beginning of the Nineties.

*Undaria Pinnatifida* is generally sold cut and dried. It has to be soaked in water for a few minute which makes it increase in volume by a factor of three. It must be cooked for only a short period of time to maintain its colour and nutritional goodness. In France and Europe, Wakame from Brittany is also sold fresh, preserved in salt in small containers and sold in health food shops. A more recent product, cut wakame, has considerably increased shelf life up to 8 months to a year. A particular process produces algae in the form of small granules which can be re-hydrated to produce pieces of algae with the same taste, colour and texture as the original.

*Undaria Pinnatifida* has a very delicate taste and a very pleasant texture to the palate. It can be incorporated into all sorts of dishes.

Taste: Delicate taste, absolutely delicious, with notes of oysters and a light meaty aroma. Only slightly iodised.

Aroma: Sweetly smoked and delicately iodised

Colour: Brown-green highlights

Consistency: Very tender, melts in the mouth