



PO Box 37263  
Stokes Valley  
LOWER HUTT 6340

Telephone: (04) 934 0559  
Fax: (04) 934 0557  
Mobile: (027) 222 2100  
Email: info@kiwiherbs.com  
Website: www.kiwiherbs.com

## New Zealand Seaweeds

Acknowledgements: Te Ara – The Encyclopaedia of New Zealand - <http://www.teara.govt.nz>

### Types of seaweed



Green seaweeds



Brown seaweeds



Red seaweeds

### Green seaweeds

Green seaweeds are usually found in the intertidal zone (between the high and low water marks) and in shallow water where there is plenty of sunlight. About 140 species have been recorded around the coast. One of the easiest to recognise is sea lettuce (*Ulva lactuca*), which forms bright green sheets up to 30 centimetres in diameter. As its common name suggests, it is edible, although prolific growth often indicates sewage pollution. Sea lettuce can become a problem when large quantities are washed ashore and begin to rot, giving off an offensive sulfurous smell. Gut weed (*Enteromorpha intestinalis*), a tubular green seaweed, also favours high-nutrient sites. Another common green seaweed is sea rimu (*Caulerpa brownii*), also edible, and looking very much like the foliage of the large tree rimu.

### Brown seaweeds

These medium to giant-sized seaweeds typically grow at depths below the greens and above the reds. Neptune's necklace (*Hormosira banksii*) is well known to most people who have visited the rocky shore. Its branching chains of water-filled bladders help it withstand periods of exposure when the tide goes out. Many seaweeds produce mucilage or slime to protect against drying out. Of the brown group, Gummy weed (*Splachnidium rugosum*) takes mucilage production to the extreme – its swollen tubes ooze profuse quantities of sticky slime when touched. The largest brown seaweeds are known as kelps, and are prominent in the cooler coastal waters of southern New Zealand.

### Red seaweeds

There are 550 species of red seaweed, making them the largest group. In the clear waters around the Kermadec Islands red seaweeds may be found at depths greater than 200 metres. In the nutrient-rich coastal waters of New Zealand's main islands very few survive below 25 metres.

One of the best-known reds is the edible karengo (*Porphyra* species), which grows on rocks near high-tide level and resembles sheets of light purple cellophane. It is a close relative of the Japanese nori, used for sushi. Another familiar red is the fern-like agar weed (*Pterocladia lucida*) which has been harvested for agar production in New Zealand since 1943. The coralline seaweeds are a group of reds that deposit calcium carbonate in their cell walls, forming pink skeletons or paint-like crusts on coastal rocks. Scientists have discovered that some crust-forming seaweeds release chemicals that encourage pāua (abalone) larvae to settle and mature.





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## Kelp



Bladder-kelp forest



A kina barren



Bull kelp



Bull kelp's honeycombed structure



Wakame in soup

## Kelp forests

New Zealand's largest seaweeds are collectively called kelps and belong to the brown group. Because beds of kelp have such a complex structure and are able to modify their environments, Charles Darwin likened them to forests. Kelp forests may be over 20 metres tall, and support an understory of smaller brown and red seaweeds as well as rich populations of both grazing and immobile animals.

## Bladder kelp

The country's largest kelp is *Macrocystis pyrifera*, known as bladder kelp in New Zealand, but giant kelp elsewhere. It can grow to 50 metres in length and 100 kilograms in mass. Bladder kelp forms large forests in the deep sheltered waters of southern New Zealand, and is easily identified by the gas-filled floats at the base of each frond. These help to hold the kelp upright, maximising the amount of sunlight the blades receive.

## Common kelp

In northern waters common kelp (*Ecklonia radiata*) dominates marine forests. This seaweed is about 1 metre in length and has a bunch of fronds arising from a central supporting stem. It is the preferred food of the sea urchin, kina (*Evechinus chloroticus*), which sometimes mass together and munch through an entire forest. Following such large-scale habitat destruction, other seaweeds may dominate for a while, but in northern New Zealand, at least, common kelp grows rapidly and soon replaces itself.

## Marine invaders

Seaweeds have been stowaways to New Zealand on the bottom of vessels or in ballast water for years. A few arrived with sealers and whalers in the late 18th and early 19th centuries, but did not pose a threat to native marine life. The situation changed when *Undaria* arrived. At two months of age it can release millions of spores into the sea. Germinating spores will colonise any firm surface – ropes, buoys, vessel hulls, floating plastic as well as rocky reefs – and grow rapidly, displacing native seaweeds.

## Bull kelp

Bull kelp or rimurapa (*Durvillaea* species) is the most striking seaweed of the exposed coasts. Its tough, flexible fronds are secured to intertidal rocks by a solid disc-shaped holdfast capable of withstanding tremendous forces when storm waves crash onto reefs and cliffs. The seaweed grows to 10 metres in length and can live for 10 years. Bull kelp forests are highly productive systems, contributing vast quantities of organic matter and nutrients to coastal food chains.





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Four species of bull kelp are found around New Zealand, and the most common, *Durvillaea antarctica*, also grows around the subantarctic islands and southern coasts of South America. In northern New Zealand it grows only on very exposed headlands and becomes more common in the cooler waters south of Cook Strait. Fronds of *Durvillaea antarctica* have an internal honeycomb-like tissue, full of air, which keeps the blade buoyant. The form of the frond differs according to conditions: the more exposed the site, the more divided the fronds.

## **Asian kelp**

Asian kelp (*Undaria pinnatifida*) arrived in New Zealand waters in the 1980s and quickly made itself at home in sheltered harbours. Although it is farmed and eaten in Japan, where it is known as wakame, this fast-growing, 2-metre-tall kelp is unwelcome in New Zealand as it can change the structure and composition of native marine communities.

## **Traditional Use**

Māori traditionally used a few species of red and green seaweed as food, and bull kelp or rimurapa, with its inflatable blades, for storage. Karengo (*Porphyra* species), the most commonly eaten seaweed, is fairly tasteless when fresh but has a distinctive fishy taste when dried. It is pulled from tidal rocks in winter and spring and usually air-dried before use. Karengo was an important supplement to the winter diet of Māori because of its high nutritional value – up to 30% protein, and rich in vitamins and iodine. It reconstitutes readily in water and may be boiled or fried in fat. Dried karengo was sent to members of the Māori Battalion in the Middle East during the Second World War.

## **Cooking karengo**

The following cooking suggestions are taken from Gwen Skinner's book *Simply living*:

Take a handful of dried karengo and steam it for about an hour. Add 2–3 cups of boiling stock and a knob of butter, then simmer.

Alternatively, wash and crush freshly gathered karengo, then add 2–3 cups of boiling water, salt and butter, and boil for 20–30 minutes. You can also cook it with corned beef or bacon.

## **Pōhā – kelp bags**

The southern Māori tribe Ngāi Tahu had various uses for bull kelp, or rimurapa: the narrow stalk, connecting the holdfast to the blade, was fashioned into a flute; the blade was roasted and chewed; and wide blades were used as bags for preserving food. Māori made bags called pōhā by splitting open the blades and inflating them. They produced the bags in large quantities during summer in preparation for the muttonbirding season. Inflated blades were hung up to dry for several days, then deflated and rolled up.

In autumn the bags were taken to the islands around Stewart Island where muttonbirds, or tītī, were caught. They were filled with muttonbird chicks; an average-sized pōhā could hold up to 50 birds. When the bag was full, hot fat was poured over the birds and the top tied off to exclude air. Birds have been preserved for up to six years with this method.

Although not widely practised today, customary harvest of some seaweed species by Māori has continued and is recognised in legislation. The Ngai Tahu Claims Settlement Act 1998 protects bull kelp and karengo from commercial harvesting within the tribe's traditional seaweed-gathering grounds.





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## **Modern uses and future prospects**

### **Agar**

Agar is a by-product of some red seaweeds. An agar industry developed in New Zealand during the Second World War, when supplies from Japan dwindled. Agar was needed as a culture medium for growing bacteria and other micro-organisms, and also as a jelly for preserving the canned meat sent to soldiers overseas. In 1941 a young botanist, Lucy Moore, was directed by the Department of Scientific and Industrial Research to search for agar-producing seaweeds. She found vast quantities of *Pterocladia lucida* on the east coast of the North Island, and arranged for local children to collect and dry the seaweed. After hours of boiling in water, agar dissolved out of the fronds.

New Zealand agar proved to be of very high quality and has been commercially produced since 1943. Today most of the seaweed is collected from south Wairarapa and then sent to Ōpōtiki where the agar is extracted.

### **Seaweeds and shellfish farms**

Washed-up seaweed that is covered in tiny young mussels (mussel spat) is collected from Ninety Mile Beach in Northland and sent to mussel farms. In the 2001–2 fishing year, 250 tonnes of seaweed was harvested and transported to mussel farms in the Marlborough Sounds, where it was transferred to cultivation ropes.

Marine farmers harvested 300 tonnes of beach-cast and free-floating giant kelp in 2001–2 in order to feed young pāua (abalone).

### **Karengo harvest**

Karengo has been sustainably harvested from the Kaikōura coast since the mid-1980s. At first it was just sold locally, but eventually it was air-dried and milled into flakes for food seasoning, and made available around New Zealand. An annual average of 2.5 tonnes of karengo was collected in the 10 years to 2002.

### **Future prospects**

Two other important seaweed products are carrageenans and alginates. Like agar, these are jelly-forming chemicals. Carrageenans are useful thickeners, used in the food industry in syrups, custards, chocolates and yogurts. They also appear in shampoos, toothpastes and body lotions. Alginates are used to make water-based products creamier, and are added to ice cream and other dairy products to stop ice crystals from forming. In dentistry, impressions of teeth are usually made on an alginate base. Alginates have applications in the paper and textile industries for coatings and dyeing.

Carrageenans and alginates are not commercially produced in New Zealand, although *Gigartina*, a carrageenan-producing seaweed, grows prolifically around the country, as does bull kelp, which has the highest alginate content of any seaweed.

With its long coastline and abundant seaweed resources, New Zealand has the potential for a thriving seaweed industry. However, the labour-intensive nature of harvesting and aquaculture has prevented the country from competing against bigger producers in Asia.

## **Indigenous People**

Seaweeds are collectively called rimu or rimurimu in the Maori language. Early Maori would have been familiar with a green alga now called *Caulerpa* which is common in tropical Polynesia. The New Zealand native rimu tree's hanging tresses looked very like the green seaweed *Caulerpa brownii* (sea rimu) which is found from Hawkes Bay south. The rimu tree was named after the seaweed and not vice versa.





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Human use of seaweeds has never been great in New Zealand. Unlike the Japanese, for whom seaweed is an important component of the diet, the immigrants to NZ both Maori and Pakeha, largely overlooked seaweed in favour of the fruits of the land.

Southern Maori did, however, harvest *Porphyra columbina*, which they named Karengo - this seaweed species is a traditional Maori delicacy. Karengo is a close relation of the most popular edible kelp in the world, the Japanese nori.

Karengo is picked off the rocks and dried immediately to stop it from going mouldy. It is delicious either:

1. broken into mouth sized pieces, soaked in water and rinsed. Put into a pot with a knob of butter, covered with water and simmered until tender. This could take up to an hour. It is rather like cooking pasta - the karengo is ready when it is *al dente* and it looks like a bowl of cooked spinach pasta too.
2. As karengo chips. Put dried karengo into a hot wok or pan with a little oil. Cook until crisp - great with a cold beer.
3. As a hot soup - Roast karengo under the grill and crumble it into a cup of hot water.
4. Maori & Welsh cultures come together in laver bread. Spread clean fronds of karengo on a plate sprinkled with oatmeal. Further layers of oatmeal and seaweed are laid on top, finishing with a layer of oatmeal. Roll the sheets into a wad, slice with a sharp knife and fry in bacon fat or butter.

Southern Maori also used the wide blades of *Durvillaea antarctica* or bull kelp, as storage bags or poha titi to store the mutton birds (titi) in their own fat - a method still used today.

