

You use seaweeds for that?

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The word seaweed is commonly used, yet to refer to these marine algae as 'weeds' is very far from the truth. Together with microscopic algae called phytoplankton and other photosynthetic organisms, seaweeds are responsible for all primary production in the oceans and therefore form the basis of the food chain in the sea. Although we often cannot smell or taste them, many ingredients in our foods and household products come from the sea and from seaweeds.

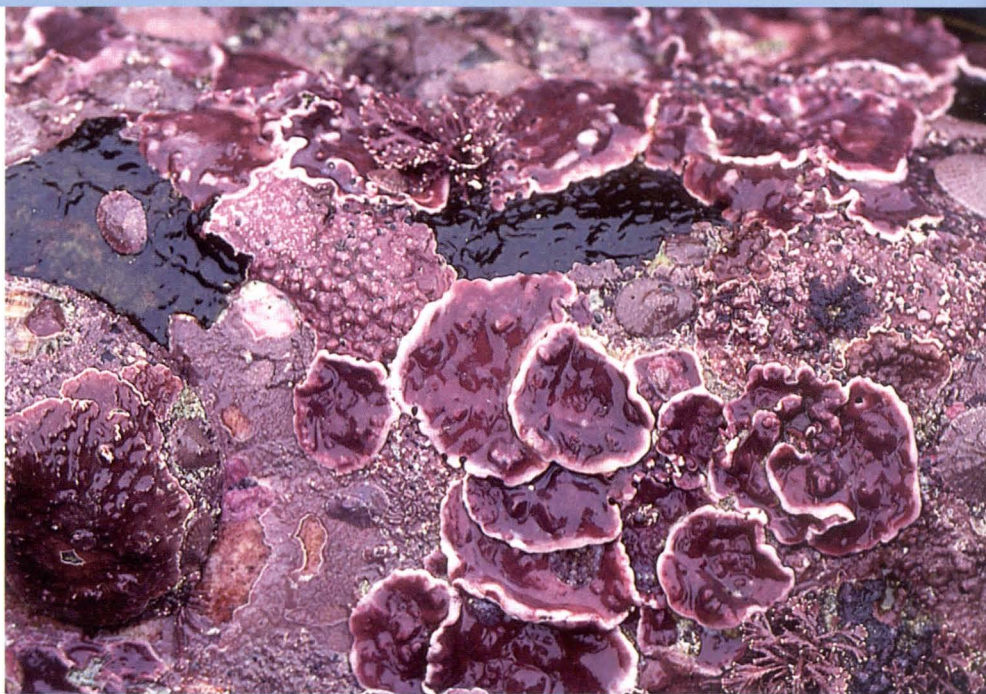
They are therefore both directly and indirectly valuable to humans. Seaweeds assimilate minerals directly from the sea and are thought to be the single most nutritious foods that you can eat. Rich in trace elements and vitamins, many of them may frequently contain more protein than meat and more calcium than milk.

Green seaweeds

Sea lettuce (*Ulva* species) as a whole plant has long been eaten in the Far East as a green vegetable in salads and soups. Rich in carotenoids (an antioxidant) of which beta-carotene is the most popular, green seaweeds are now believed to help in the prevention of cancer, heart disease and strokes. In fact, beta-carotene is being referred to as 'the age-fighting antioxidant.' Beta-carotene, as a natural pigment derived from green seaweeds, is often also used as a yellow-orange food colourant in cheese, coffee creamers, egg substitute, margarine, mayonnaise, multivitamins and salad dressings.

Brown seaweeds

A characteristic feature of brown seaweed is their cell wall which is made of cellulose strengthened by calcium alginate. Whole brown seaweeds (not granulated) such as kelp, for example, are considered excellent 'detoxifying' agents. The alginate in their tissues are said to bind with any toxins in the intestines and render them indigestible.



ABOVE: Encrusting coralline red seaweeds are important in the ecology of near-shore marine ecosystems and also present a number of economic benefits. Photo: Gavin Maneveldt.

Not many people will, however, readily eat whole kelp.

In South Africa, the seaweed industry is based largely on sea bamboo (*Ecklonia maxima*) and split-fan kelp (*Laminaria pallida*). Kelp is harvested extensively along our west and south-west coasts as feed for commercially farmed abalone and is even used as a nutritional supplement for farm animals in local agriculture. Kelp is widely used as a fertilizer and is even harvested on a large scale for the production of a very successful plant growth stimulant having been shown to be a great source of micronutrients and beneficial plant growth promoters.

Furthermore, alginate is a substance of considerable economic importance as it is used as a gelling and emulsifying agent in a number of industries. Surprisingly though, at present it is only the kelp that is harvested commercially in South Africa for alginate extraction. Perhaps it is because no other group of brown seaweed occurs in large enough biomass to be commercially viable. Internationally, however, a huge market exists for the harvesting of kelp and other brown seaweed for alginate production. In the food industry it makes water-based products thicker,

creamier and more stable over extremes in temperature, pH and time. For example, alginates prevent the formation of ice crystals in ice cream. Other products containing alginate include brownie mix, frozen foods, desserts, relishes, salad dressing, sauces, gravies and even beer foam. Similarly, in the cosmetics, pharmaceutical, paint, textile and welding industries, alginate aids in the suspension and stabilization of agents over ranges of temperature and pH. In the paper industry, for example, alginate is important as it enables sizing and polishing of the finished paper product. Did you know that alginate from kelp is even used to make fibres for high quality audio speakers?

Kelp is especially important to the medical industry. Alginate is used to encapsulate many things such as tablets in powder form, fracture castings and moulds, and even organs for transplant. Kelp also contains an astonishing amount of vitamins and minerals, the most important of these being iodine. Iodine has a normalizing effect on the thyroid gland (which controls the body's growth and development). In Namibia, scientists are looking into the use of kelp as a treatment of goitre

and prevention or reduction in the occurrence of cretinism in southern Africa. Similarly, because iodine feeds the thyroid, kelp is even used in weight-loss formulas.

Red seaweeds (fleshy)

While the seaweed industry in the Western world is based mainly on seaweed extracts, in the East seaweeds are cultivated in huge volumes for human consumption; much of this industry being based on red seaweeds. The genus *Porphyra* (purple laver) in particular, constitutes at least 80% of all seaweed harvested all over the world. In Asia, *Porphyra* (known as nori) is eaten as a whole seaweed either dried or in soups, and globally as a tasty wrapping for sushi. The iodine and high vitamin and protein content of nori makes it attractive, as does the relative simplicity of its mariculture (sea farming), which began more than 300 years ago in Japan.

Beside food for direct consumption, red seaweeds are also important for their phycocolloid extracts. Phycocolloids are seaweed derivatives that cause

particles to remain suspended in solution and are therefore excellent as stabilizing and gelling agents. The main phycocolloids derived from red seaweeds are carrageenan and agar.

Carrageenan is highly sought after in western societies where it is especially important in the dairy industry. Milkshakes, cheese, yoghurts, powdered milk (including baby formula), all possess red seaweed carrageenan extracts. Believe it or not, carrageenan is even used in toothpaste, cosmetics, shampoos, paints and pet food. A number of carrageenophyte seaweeds are being investigated in South Africa. These include *Hypnea spicifera* (green tips), and various species of *Gigartina* (tongue weed), *Sarcothalia* (twisted gigartina) and *Aeodes* (slippery orbits).

Agar on the other hand, has its most important use as a medium on which to culture fungi and bacteria in microbiological and medical pathological research. In food for human consumption, however, agar can be found in baking and confectionary products and is also widely used to clarify wine, juice and vinegars because of its excellent

protein binding properties. In larger industries, agar is used to make adhesives and capsules for tablets. South African agarophytes include species of seaweed from the genera *Gracilaria* (which is harvested extensively in Saldanha Bay) and especially *Gelidium*.

Red seaweeds (calcified)

Encrusting coralline (made of lime deposits) red seaweeds are important in the ecology of near-shore marine ecosystems where they serve as food and shelter for many marine animals. Because of their hard, calcified nature, they have a number of economic uses. In modern medical science coralline algae are used in the preparation of dental bone implants. Coralline rubble known as maerl is used in calcium mineral supplements, as soil pH conditioners, in the filtration of acidic drinking water and even as food additives for livestock. Coralline algae are commonly used as 'live rock' in the marine aquarium industry and did you know that in many tropical communities, coralline rock is used as building stones?

The commercial use of seaweeds in South Africa comprises but a small industry utilizing mostly brown and fleshy red seaweeds. The increasing use of local representatives of seaweeds has resulted in a state policy to ensure the sustainable use of these commercial resources and this awareness has greatly facilitated research on local seaweeds and considerably increased our knowledge of most of the species. It is only with this increased awareness that we've been able to bring to you the knowledge that we've gained regarding this fascinating group of marine organisms. 🌿



ABOVE LEFT: Ecologically, kelp provides an important complex, three-dimensional habitat for thousands of species of fish, invertebrates and other seaweeds. Kelp is also economically valuable to South African industries.

ABOVE RIGHT: The sea lettuce *Ulva* is rich in beta-carotene, a natural antioxidant and cancer-fighting agent.

BELOW: Looking like wrinkled cellophane, *Porphyra* species are extremely low in calories and contain lots of iodine, which is good for healthy thyroid function. Photos: Gavin Maneveldt.



What does that mean?

Antioxidant A compound (vitamins A [which is converted from beta-carotene], C and E, selenium [a mineral], and carotenoids) that protects against cell damage caused by molecules called oxygen-free radicals (oxidation) that are a major cause of disease and ageing.

Cretinism A type of mental and physical retardation caused by severe, uncorrected thyroid deficiency in infancy and early childhood.

Goitre An enlargement of the thyroid gland quite often due to a lack of iodine in the diet.

Primary production The production of organic matter (plant tissue) from carbon dioxide, water and sunlight through photosynthesis.