

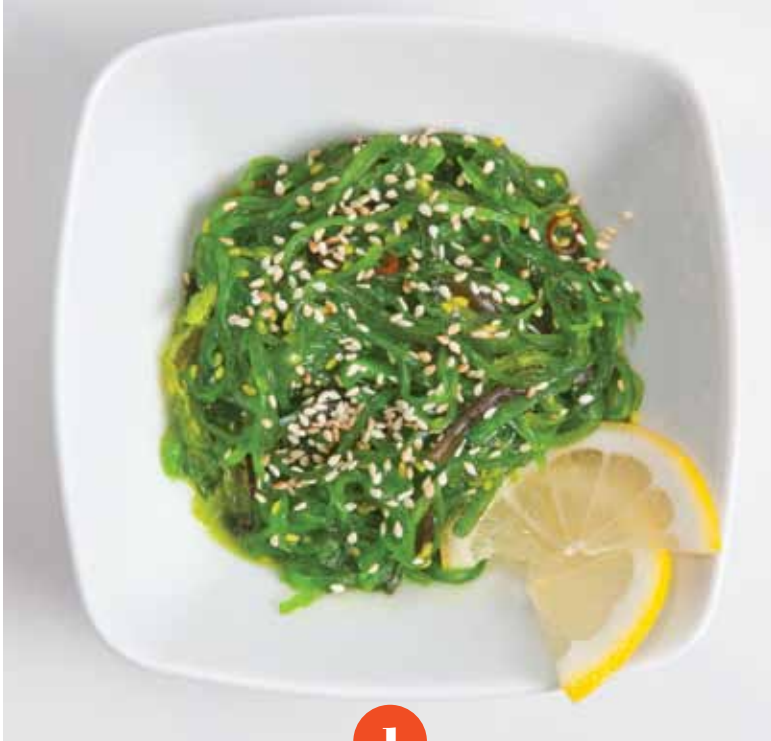


Seaweed: Beyond Superfood

Is British Columbia's seaweed our saviour?

By Jane Mundy





1

SIX EDIBLE SEAWEEDS

Alaria

Sometimes referred to as wakame, alaria has long chartreuse-coloured fronds and is common around the low tide line. It has a faint smell of rhubarb and tastes a bit like celery or radish tops. This is a favourite among chefs. On a blind taste test, presented side by side with land vegetables, you wouldn't guess alaria comes from the sea.



2

Laminaria japonica

Japanese kombu, or *Laminaria japonica*, is a chocolate-brown kelp and has a sweet taste. In Japan it is used to make candy and dashi—the classic Japanese stock. Being a natural tenderizer, it is especially good cooked with beans, baked with breads, fried as tempura and even pickled—an all-purpose food source.

Y

ou may think of seaweed as the stinky, slimy stuff that washes up on the beach; as the wrap that holds together sushi rolls; or as a salty, crunchy snack. You may not know that it's used in toothpaste and in many frozen foods. Spas slather it on your skin and it's appearing on menus at upscale restaurants and craft breweries throughout BC. Seaweed is also a possible partial solution to the planet's global warming crisis: Scientists, including a few on Vancouver Island, are looking at ways of adding value to algae by converting it into biofuels and bioplastics. In fact, seaweed cultivation could be a huge cash crop for the province—if done right.

PEOPLE IN MANY cultures have used seaweed since prehistoric times, as food and fertilizer, cosmetics and construction. It has been harvested in the wild and cultivated and farmed in vast quantities. Here in BC, First Nations have used seaweed as a means of sustenance for thousands of years, as they do to this day. And in the past few decades, seaweed farmers have been harvesting and selling wild seaweed from small ocean "gardens," but Asia supplies most of the province's seaweed.

Should BC's seaweed industry expand? Nowhere on Earth can you find a more diverse abundance of seaweeds than on BC's coasts. (Canada has the longest coastline in the world, and the most water.) But to respect ecological cycles of the oceans, to take into account populations that live along the coastline—insects, fish, birds, mammals and humans—harvesting, cultivation and processing on a large scale requires research and development of new methods and technologies.

Seaweed has long been recognized as a valuable foodstuff and trading commodity. For instance, Japanese aquaculture of nori is worth \$2 billion USD annually. About 13 million tons of seaweeds are harvested each year in about 40 different countries. And 95 percent of that yield comes from 10 countries—Canada isn't in the top 10.

"I believe that farming seaweed is a going concern," says Dr. Louis Druehl at Canadian Kelp Resources, which has a pro-

cessing plant in Bamfield on Vancouver Island. In 1981, Druehl was the first person outside Asia to cultivate seaweeds in a scientific manner. One year later, he showed General Electric how to farm kelp. "During the OPEC crisis we were looking at alternative ways to get fuel," he says. "One alternative is kelp."

Druehl initially farmed kelp for food and cosmetics. "One species of kelp used for kombu lives for up to 25 years, so we harvest and leave the growing stem, like mowing the lawn," he says. "The very best kelp is aged for at least 10 years and sells for up to \$100 per kilo. But we just have a small room to dry so that is our limiting factor."

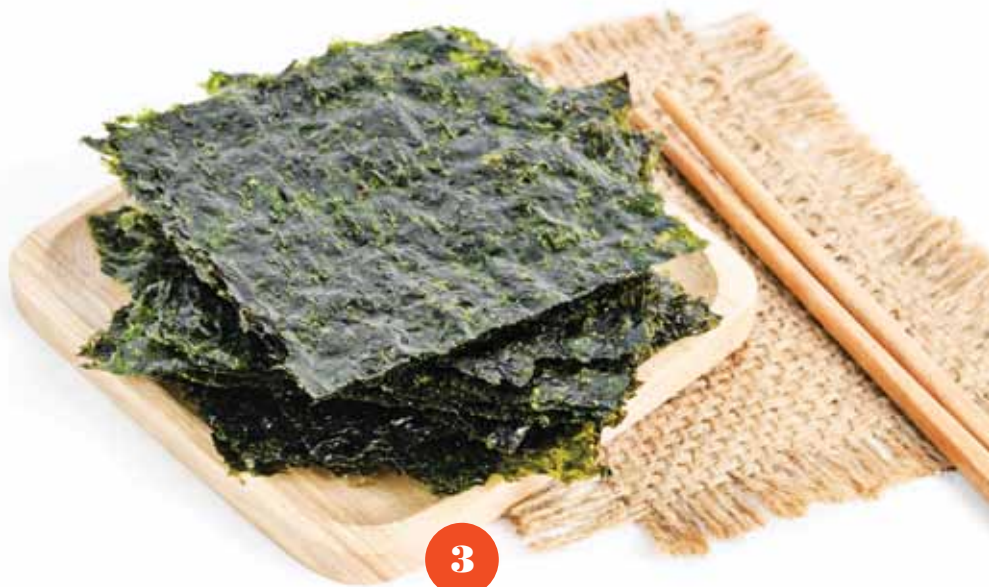
Amongst his customers are Vancouver's Tojo's Restaurant and the Fairmont Hotel. Tofino Brewing Co. makes kelp stout; Wolf in the Fog in Tofino features "Bamfield Seaweed Salad" and you can buy products on his Canadian Kelp website. "Now the focus is on farming kelp with the idea of removing carbon from the water and thereby reversing ocean acidification," he says.

"Louis Druehl's knowledge of seaweeds and method of farming sustainably inspired me," says Dafne Romero, with North Pacific Kelp Wild Foods Ltd. She harvests kombu, wakame and giant kelp in Haida Gwaii. "It's like pruning our marine forest—and we garden in different areas," she says. The blades of giant kelp, *Macrocystis pyrifera*, are dried and packaged as "seaweed lasagne."

(I bought a package from Romero's stall at the Farmers Market in East Vancouver and invited some friends to dinner. It was a hit: everyone agreed the texture and flavour were wondrous and they even preferred its lightness over heavier pasta. I also substituted salt for Romero's ground kelp.)

Marine biologist Amanda Swinimer was also inspired by Druehl to start her company, Dakini Tidal Wilds. She dons a wetsuit to wade in low tide for wild wakame. "Then I haul mesh bags of seaweed in a wheelbarrow to a drying shop and hang each piece from cedar racks," she says. Talk about Labour of Love. "Bull kelp is harvested differently. It's always submerged by water, so I wear a full wet suit and snorkel offshore to the kelp forest, where the fronds rise to the surface. I cut a few inches above the top of the stipe, and swim back and forth to the beach and my wheelbarrow."

Swinimer is seeing more demand from the chef community, likely because ▶



3

Porphyra

Also known as laver or nori, porphyra has ruffled, thin leaves that range in colour from olive green to dusty pink to purple. Indigenous peoples have eaten it for generations, and nori is a staple in the Japanese diet, commonly seen in North America as dried sheets.



4

Rockweed (Fucus)

The most commonly known seaweed in BC waters. It has delectable little pods that you can pop in your mouth like roasted pumpkin seeds and can be substituted for olives in a "west coast martini." You can find these bushy pod-like clumps with yellowish tips draped over rocks in the high-tide zone.

people want to eat wild and local food. For instance, Mission Hill Winery's restaurant in West Kelowna and Butternut Tree Restaurant in Edmonton, Alberta, feature her product as Seaweed Salad. And Finlandia Natural Pharmacy in Vancouver sells it as a food supplement.

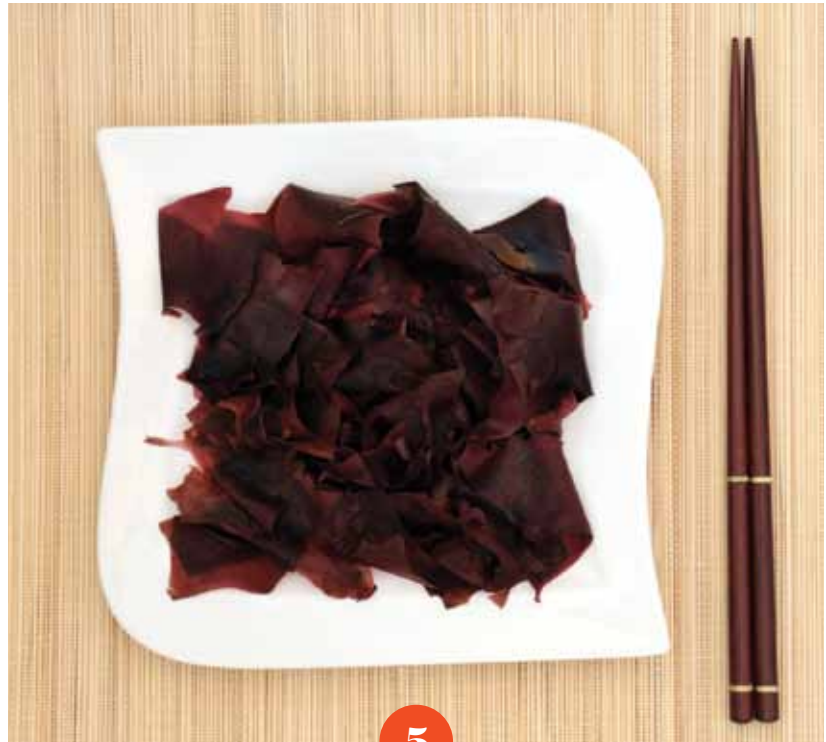
"Don't be fooled by the product being dried. Because inter-tidal seaweed is used to being alternately dried and wet, reconstituted seaweed is still a living food," Swinimer explains. As for that fresh neon green (food colouring) seaweed salad at the Asian grocery store, it's highly unlikely to be fresh. "Fresh seaweed costs too much to ship: it has to be submerged in a sealed bag with clean ocean water and packed in ice." And why bother? Like Romero's seaweed lasagne, dried is fine.

Last year, Kristina Long planted a hectare of kelp in Bamfield as a test farm to grow it as the basic material for biodegradable plastic. "I believe that kelp is a biomass that could replace cornstarch in a compostable product," says Long. "Cornstarch is a GMO competing with the agricultural food market. It is resource-exhausted with mono-crop issues such as disease; it requires oxygen to break down (seaweed requires methane) and will take longer to break down in a landfill. As well, sugar kelp has great tensile strength and is thermal-resistant."

All three women have licenses to harvest seaweed through the provincial Ministry of Agriculture. And they concur: wild harvesting isn't a money-maker unless you're harvesting a lot. "People say it's a no brainer; all you have to do is put lines in the water but there's a limited market for the end product," says Long.

Long is currently talking with the provincial government about her project and has "received positive feedback." She has six wild harvesting licenses (one per seaweed species) and pays the province \$100 per license, along with royalties for every ton harvested. Kelp farming lines are submerged in her sea gardens, they aren't conflicting with marine traffic and black floats labelled "sea farm" are not obstructing any views. She is hopeful that revenue from her Sea Forest food products – that will hit the market this summer—will kickstart the bioplastics project.

Of the 90 applications the provincial government received this year to harvest wild aquatic plants, 69 have been approved and the remainder are under review, with some requiring further engagement with First Nations. "Licensing decisions ensure that the harvest of marine plants is done in an approved manner, and that the harvest will not compromise habitat or traditional



5

Palmaria

Better known as dulse, palmaria is a small plant (15 to 30 centimetres) with maroon fronds. Its tangy flavour can be dried and used as a condiment, or the leaves can be soaked and added to sauces or soups.



6

Ulva lactuca

Ulva lactuca, or sea lettuce, has a crisp, grassy taste, vaguely reminiscent of peas. It is the bright green, almost translucent stuff you see washed up on shore and just about everywhere in the high tide zone.

First Nations use of the resource,” says Nichole Prichard, aquatic plant specialist with the Ministry of Forests, Lands, Natural Resource Operations & Rural Development. “There are a variety of reasons for the applications, including interest in selling the seaweed as food.”

“WE’VE GOT A huge opportunity for a commercial seaweed industry in BC. We’ve got thousands of kilometres of coastline, and we’re already one of the richest areas, in terms of seaweed diversity, in the world,” says Dr. Stephen Cross. He is research chair at Natural Sciences and Engineering Research Council of Canada in sustainable aquaculture at North Island College in Campbell River.

Cross sees kelp farming as a potential new industry for the province—one that could yield economic and environmental benefits. He is also CEO of SEA Vision Group Inc. and operates a pilot-scale multi-species aquaculture farm (that mimics naturally occurring ecosystems) in Kyuquot Sound on Vancouver Island. He recently placed baby kelp seed on ropes at 30 fish farms to test the viability of seaweed aquaculture—and potentially save the salmon farming business.

Cross and his team at North Island College are working with both salmon farmers and the Department of Forestry to potentially harvest sugar kelp—*Saccharina latissimi*—from commercial kelp farms. The idea is that excess nutrients from a fish farm act as a fertilizer for kelp. In turn, kelp provides additional revenue while absorbing much of a farm’s waste, including sucking up planet-warming carbon dioxide. “It’s about creating value from waste,” says Cross. (Harvested kelp from fish farms is not intended for human consumption.)

First Nations have a long history with aquaculture, from building clam gardens to harvesting wild kelp covered with nutrient-rich herring roe. “We are working with Coastal First Nations communities on Vancouver Island and the BC central coast to create vertical underwater gardens, with a variety of shellfish, seaweeds and edible plants,” says Cross. “We are partnering with the forestry sector to grow kelp and other seaweeds to create new habitats. And seaweed sequesters carbon and cleans ocean water of phosphorus and nitrogen: by providing carbon credit it can become part of the BC climate action plan.”

Sugar kelp can be used to make ethanol biofuel. Druehl prefers to call it “kelpanol.” In his book *Pacific Seaweeds*, Druehl says there has been a disturbing trend in

diverting farmland from growing food to producing sugar-rich crops to end up as biofuel ethanol, but kelp is an alternative source of carbohydrates for the synthesis of biofuels. “Kelp-derived fuels would release farmland for the production of bread, beef and bourbon. Furthermore, they would partially replace fossil fuels as a sustainable energy source,” he writes.

ANYTHING CAN BE farmed. If you do enough research to find out how something grows in nature, it can be cultivated. Kelp start-up costs are low: you need some anchors, rope, a boat and a lease. Fish farms cost millions of dollars, but you could start a kelp farm for less than \$20,000. Cross says the technology is here, but if you want to be a kelp farmer, maybe wait for marketing to catch up. Kelp’s value depends on its end market and how it’s processed.

Clearly, wild harvesting is not going to feed the world. But farming might. In 2014 China produced 12.8 million tons of farmed seaweed, with about 80 percent destined for human consumption. Japan’s nori (*Pyropia*) industry amounts to \$2 billion per year, and it’s one of the world’s most valuable crops. The Japanese consume about 100,000 tons of the stuff per year and the Irish have used it since 400 AD. Koreans know well the health benefits: mothers eat wakame after childbirth and it is served in hospitals. They chuck it into hotpots. Seaweeds contain vitamins C, A, B2, calcium, magnesium and iron. Fish get their Omega 3s from seaweed, so by eating more of the plants that fish eat rather than eating the fish, we can reduce the pressure on fish stocks.

Seaweed could also have a huge impact on climate change. Research by the University of the Pacific in 2012 suggested that converting nine percent of the world’s oceans into seaweed farms would capture 19 gigatons of CO₂ a year (humanity’s net emissions are estimated at 37 gigatons). They would help to reduce acidification of waters due to climate change, which in turn would improve shellfish conditions. And cultivated seaweed farms would rapidly attract biodiversity, including many fish species.

To imagine the economic potential, the Japanese nori industry is bigger than the Canadian auto industry. So why are we so far behind the times? Perhaps we have to start by eating seaweeds farmed locally and call them “sea vegetables.” So, give it a try and keep in mind that small-scale ocean farms growing healthy food while reducing carbon emissions can turn the tide and save our seas. 🐟

GARDENING AND EATING

As coastal gardeners know, seaweed is rich in nutrients. On Pender Island, Andrew Butt attributes the success of his 100 olive trees to seaweed. “I fertilize and mulch with seaweed washed up on the beach,” says Butt. “I’m also aware of the environment and living things, including insects, so I gather from different points and never strip the beach.” Butt knows that kelp provides nitrogen and phosphate and his roses also benefit. “And we eat seaweed. We cut kelp fronds from pristine water and use it in soups and stews for that umami taste.”

If you can’t gather fresh seaweed, dried is just as good. Reconstitute dried dulse and wakame and use it just as you would fresh “sea vegetable.” Put dried seaweed in a bowl and cover with warm water for about two minutes. Rinse and drain the seaweed and use your hands to squeeze out excess water. To make seaweed lasagne, boil the dried fronds for about three minutes, rinse and use in your favourite recipe.

To cut down on salt, use dried kelp flakes. To make a delicious snack, brush sheets of nori with sesame oil or soy sauce and roast at 400°F for about 10 minutes.

To store fresh seaweeds: rinse and keep very cold in the fridge, up to five days. Most varieties can be dried in a low (250 degrees) oven. Dried flakes can be stored in the freezer for two or three months. Most seaweeds are used in soups and stocks and as wraps for fish and savoury dishes or chopped into salads and shredded as a garnish.

Each seaweed has a taste as distinct as its shape, texture and colour, from nutty to sweet-celery.