

“From a Sustainable Seafood Interest to Joining the Seaweed Harvest in Maine”

NARRATIVE:

How did you get interested in Sustainable Seafood?

*My best food experiences have always involved seafood. I crave that rich, savory rush of amino acids that it has in such abundance. I had a liminal seafood experience in Maine when I was about four and it involved fresh mussels collected a hundred feet from the table. There were adults eating an alien looking piece of flesh surrounding me and I was hesitant to join them. My mother, clever with food psychology, convinced me that mussels would help me grow big *muscles*. I was in the mix immediately enjoying the mysterious power food and it was the beginning of a serious passion for seafood.*

I think the other part of the seafood interest came about while working as a divemaster in Cambodia. The experience of observing life on coral reefs tuned me into the beauty and fragility of the ocean. Physically being where seafood comes from has a similar psychological effect to working on a farm where you interact directly with your food source. We witnessed some depressing activities out on our dives. From what we could tell, Cambodian police boats would sell off fishing rights for cigarettes to Vietnamese dynamite fisherman and industrial Thai squid boats. One week a reef was full of fish, the next it was eerily quiet. This demonstrated how the fishing practices of these other countries were significantly more aggressive compared to their Cambodian counterparts. Also, living in a Developing Country sensitizes you to how crucial seafood is as an affordable protein source - fully one in six people around the globe rely on it, not to mention the livelihoods it sustains. My experience in Cambodia was a small glimpse into this growing problem.

I spent the last two years in a graduate program at Tufts University learning about the nightmare that is our food system and all its nutritional and environmental blowback. To a lesser extent, we also discussed solutions. While we focused mostly on sustainable agriculture, I was more often drawn to the less explored arena of sustainable seafood. The more I researched fishing and aquaculture practices the more evangelistic I became about eating proper seafood. My personal angle started out with nutrition but increasingly it is veering towards ocean health.

*Some early research I did at school looked into the US's failed policies toward aquaculture dating back to the 1970s. These policies, or lack of policies, were largely responsible for our massive trade deficit in seafood today - roughly 80% is imported, which puts it up with the ranks of petroleum and automobiles in terms of dollar value. All too often it is minimally inspected and from countries with lax standards. A *New York Times* article a couple of years ago described our inspection capacity for seafood. One of their metaphors stuck clearly in my mind: If all the shrimp imported to the US were to fill the Empire State Building, we would only have the capacity to inspect the *first two floors*. The fact of the matter is that our growing appetite for seafood is reliant on operations beyond our control and increasingly disastrous to our health and that of the planet.*

One of the reasons we are consuming more fish and fish oil is because there is so much hype about omega-3s. One nutritional argument that has been lost in the noise has to do with [balance](#). Before anybody thought about reducing omega-6 consumption, there was a gold rush towards omega-3 consumption. Our current food system has an extreme abundance of omega-6 (think cheap vegetable oils like corn, soy, peanut in processed foods) skewing a ratio that for most of our evolution was closer to 1:1 to today where it can reach 40:1 in favor of omega-6. Furthermore, keeping a healthy balance may improve your ability to convert lesser omega-3s to the more coveted versions known as EPA and DHA, found largely in oily fish.

Balancing out our omega-6 consumption while improving our domestic/regional seafood production would go a long way towards reducing pressure on the oceans. This is a fact that both health practitioners and the seafood industry must be more forthright about. My point remains that there is a powerful health halo on omega-3s today, which helps promote too many unsustainable seafood practices and excess omega-6 consumption. I still think we need a steady supply of high quality seafood sourced omega-3s. But, there are excellent health benefits to seafood beyond the tunnel vision of omega-3s; it should not be the sole yardstick for good seafood. Iodine comes immediately to mind.

The disconnect with the land-based food supply is changing slowly, but a similar awareness with the ocean is more sluggish. Despite good developments like seafood wallet cards and major box stores pressured into shifting their seafood sourcing, relative awareness of the fragility and importance of the ocean is limited. The threat of “ocean change” as the evil twin of climate change has convinced me that how we eat from and treat the ocean will play a key role in our survival as a species. We managed to save the whales, dolphins, and pandas and preserve numerous national parks. But, this land-centric/mammal-centric/anthropocentric mentality needs to expand and value the ocean and its most important species. A recent [study](#) just reported a 40% reduction in world phytoplankton levels since the 1950s. As one reporter on the study remarked: “Never mind the pandas: it’s plankton, bugs and fungi you should be worrying about.”

Every second breath of air we take is thanks to oxygen producing phytoplankton in the ocean. It is responsible for controlling climate, temperature, and the oxygen and carbon cycles. As such, it is the most important ecosystem for maintaining life on the planet. In her book, *Sea Sick: Global Ocean in Crisis*, Alanna Mitchell says life on land is utterly dependent on the life and chemistry of the ocean. This “switch of life” as she calls it is not in the atmosphere or on land. We have our finger dangling on this switch when we tamper with the ocean. Its resiliency is now severely compromised by rising temperatures, pollution, overfishing, and acidification all of which are compounding each other. I find the acidification piece the most troubling and interesting since it relates most to seafood consumption for me.

In simple terms, too much carbon in the atmosphere forms carbonic acid in the ocean, which lowers the pH. Many important species low on the ocean food chain must calcify to make their bodies or shells and a lower pH inhibits this process. In other words, acidification is causing widespread “osteoporosis of the ocean.” For someone who lives for shellfish, this is a nightmare. I attended a talk at this year’s Boston Seafood Show on acidification. There was an oyster grower from Washington State talking about how they lost half their seed stock recently for this very reason—it was depressing. Years ago people laughed at the threat of ocean acidification claiming that the ocean had back-up systems for its back-up systems. Ironically, today even the global seafood industry is lobbying to deal with this problem. Let us hope it helps pull the rug out from underneath their highly subsidized, carbon heavy, industrial fleets.

The wild part is that seafood production is one of the sharpest double edge swords we have. It can destroy the oceans and hence the world or it can help heal and nourish it at the same time.

Other than the obvious solution of lowering our carbon emissions, eating sustainable seafood can help sequester carbon. I think it is poetic justice and ecologically elegant that my favorite seafoods may help this function, namely bivalves, [forage fish](#), and seaweed. Granted, not everyone is jumping on the oyster, herring, and dulse bandwagon just yet but most of that bias is cultural. We need to rediscover their qualities quickly. By far the best thing I sampled at the Boston Seafood Show was pickled herring and yet the majority of it is sent off for bait.

Remember that bivalves like oysters, clams, and mussels are ecological engineers that clean and bring life back into our estuaries and coastal waters. And, they sequester carbon—[Australian oyster farmers](#) are getting carbon credits. Forage fish need to be reserved for other species in the food chain but this is still compatible with *direct* human consumption so

as to prevent them from getting vacuumed up and converted to fishmeal. This highly globalized trade diverts fish away from food insecure populations at a significant protein loss towards industrial chicken, pork, pet food, and inefficient types of finfish aquaculture. As the largest biomass of fish in the ocean, forage fish sequester significant amounts of carbon in their *feces* in the form of calcium carbonate, which also happens to raise ocean pH. And lastly, seaweeds are a no-brainer; they eat carbon, make oxygen, shelter and feed innumerable species.

Many committed seafood fans share my love for these three seafoods mentioned above, but as Paul Greenberg can attest, the majority of people still want the fish and flavors they know well. In his new book *Four Fish: The Future of the Last Wild Food*, he argues that a healthy relationship with seafood will hinge on how we can carefully steward wild populations of salmon, bass, cod, and tuna while replicating those four highly marketable flesh-types in sustainable aquaculture. I will site the main points from his conclusion to illustrate exactly what constitutes stewardship of wild fish and the practice of sustainable aquaculture:

Priorities for Fishing:

1. Profound reduction in fishing pressure (end industrial fleet subsidies, rely on small-scale “fisher-herders”)
2. Conversion of significant portions of ocean ecosystems to no-catch zones (Marine Protected Areas or MPAs)
3. The global protection of unmanageable species (i.e. Tuna since it moves through international waters)
4. The protection of the bottom of the food chain (prevent forage fish from being an input)

Priorities for Domestication/Aquaculture:

1. Efficient (excellent feed conversion and growth rate)
2. Non-destructive to a wild system (doesn't pollute with waste, diseases, genetic transfer or divert food away from wild etc.)
3. Limited in Number (focus on a few - like we did with land animals)
4. Adaptable (actually thrives in captivity and on alternative feed sources)
5. Functional in a polyculture (combines well with other farmed species like seaweed and shellfish in an ecological synergy)

To many people, aquaculture is still a four-letter word. This is largely thanks to the track record of industrial salmon and shrimp farming over that last couple decades. This does not need to be the case going forward. If we think organic, local, sensible agriculture is an environmental home run, then we must also consider the potential of aquaculture. It is hard to imagine a farm can exist that has virtually no outside inputs, no irrigation, cleans the water, sequesters carbon, invites biodiversity, produces food quickly, and all with a relatively flexible harvest schedule. This is all possible with shellfish aquaculture, algaculture, and finfish polycultures. There are other complications of working in a marine environment, but clearly the possibilities are exciting.

What brought you to seaweed?

Seaweed is the quintessential source for that savory flavor or “umami” that many of us crave. I don't have a sweet tooth; rather I have a savory tooth. Monosodium Glutamate (MSG) was first isolated from kelp in Japan in 1907, which eventually led to the Ajinomoto “taste enhancer” empire. If you're smart, you will avoid the industrially processed version today. Go back to basics with kelp and instead of an allergic reaction you will get vital nutrients not readily available from land-based foods.

One of the first books that informed my seafood worldview was Taras Grescoes *Bottomfeeder: How to Eat Ethically in World of Vanishing Seafood*. Grescoe is also a seafood centric eater who could no longer live in world of ignorant bliss. The book is about his odyssey around the world to rediscover his passion for seafood in an ethical and ecological fashion. He concludes

that eating further down the ocean food chain is not only the most intelligent, but often the most delicious. Although he fails to have a chapter dedicated to seaweed, I chose to take his message another step down and appropriate more seaweed into my diet. For the last couple years I've made it a staple to point where I bet it makes up 5-10% of my diet. Like anyone curious about their food source, I wanted to get the full picture. Since I spend time every summer in Maine right next to some of the east coasts major seaweed actors, I figured I should get involved directly.

Who are the key seaweed companies around Maine today and which ones did you get to know?

The key seaweed companies/operators that focus on seaweed for human food are a small group. All of them are within a thirty-minute drive of each other in Downeast Maine and I was able to communicate with and visit each of them.

- *Maine Sea Coast Vegetables*
- *Maine Seaweed Company*
- *Ironbound Island Seaweed*
- *She Sells Seaweed*

Maine Sea Coast Vegetables, run by Shep Erhart, is the largest company handling over 50,000lbs. per year (dry weight). They have the most diverse product line selling primarily to major retailers like *Whole Foods* and health food stores. *Maine Seaweed Company* handles about 10% as much seaweed and is run by Larch Hanson and he mainly sells bulk to a loyal customer base over the Internet. *Ironbound Island Seaweed* is the design of an apprentice of Larch who started his worker owned company, which sells mainly to local retail shops and bulk over the internet. *She Sells Seaweed* is an operation run by Kacie Loparto, also an apprentice of Larch, and is mainly geared towards farmer's markets.

This small cohort of seaweed companies often trade between each other and with some seaweed companies in the Canadian Maritimes, namely the island of Grand Manan in New Brunswick just over the border. Grand Manan is able to produce excellent quality and quantities of the red seaweeds, Dulse and Nori. As such, the above Maine companies have developed strong commercial ties there with Grand Manan operators like *Atlantic Mariculture*, *Flagg Dulse*, and *Roland Dulse*. Grand Manan is a spectacular island perched right at the entrance to the Bay of Fundy with large cliffs and epic tides, highly conducive to seaweed.

I visited the seaweed operations there with some fellow seaweed fanatics recently. It is odd to come from Maine where only a handful of harvesters support the needs of the seaweed companies. Whereas on Grand Manan, over the course of the summer there can be upwards of 100 harvesters collecting Dulse on a small island with a population of 2,500. Granted, the red seaweeds are smaller and take more time to harvest in quantity, but the operation there felt much larger comparatively.

I was able to visit and communicate with many of these companies and learn about the scale of their operation. However, the bulk of my experience with seaweed this summer happened as an apprentice for Larch Hanson's *Maine Seaweed Company*.

What is it like working for a seaweed harvester in Maine?

I helped with the "hay season," which typically runs from late April to early July. The work often consisted of early mornings heading out on the water before sunrise during strong tides that occur around new and full moons. The best seaweed spots are usually out near exposed points and ledges facing the ocean. The key seaweeds we harvested are in the family of large browns, namely Kelp, *Digitata*, and *Alaria*. To a lesser extent we harvested some red

seaweeds like Dulse, Laver, and Irish Moss and the odd bit of green seaweed known as Sea Lettuce. (See “workshop” for name clarification).

Harvesting these seaweeds is a charm. The intertidal zone is teeming with life and completely invigorating. Methods do vary, but we don wetsuits and carry cheap kitchen knives wrapped in old wetsuit material to stay buoyant. Depending on the seaweed, we harvest directly from little boats or get immersed in the tide pools and surf zones. At times the technique is as easy as taking candy from a baby while at other times it is like detangling yak dingleberries in an avalanche. Harvesting Alaria is especially athletic and it is Larch’s specialty.

Working in the ocean in this manner requires patience, respect, and a sense of timing. You have to keep vigilant about the swell, surf, and shifting tides for the safety of the gear and yourself. Once you get the hang of it, you can land large quantities quickly so a sustainable practice is important. There are some comprehensive guidelines on this matter below. But, Larch would contend that “memory of place” is the most important factor. This requires coming back and stewarding the same beds year after year to develop a sense of your impact. Not all of us may have the luxury of visiting the same seaweed beds for decades, but it is an important concept to consider.

The drying process is equally rewarding if you have a taste for repetitive/meditative agricultural activities. Remember, it is important to have the right infrastructure to handle your harvest otherwise it will be wasted. We usually had a brief meal and nap to get ready to hang the wet seaweeds during the heat of the day. Achieving complete dryness is difficult depending on the weather and often requires two days. Usually we finish the drying in a firewood-heated greenhouse. The seaweeds change form dramatically as they sweat mucilaginous alginates, lose 90% of their water weight, and darken to deeper versions of their former self. It is easy to develop a liking for the sites, smells, and touch of the drying process. I highly recommend it. The rest of our time was spent with packaging, construction projects, and gardening. Packing can be tedious but is an important component of the process allowing you to handle the finished product and understand quality control factors. The building projects and gardening work helped keep the options varied.

The experience taught me that there is room for more people to get involved in this work in the future or at least add it to other working farm models. Once you develop your own drying and processing set-up, all you have to do is develop a market. Larch built up his client base mostly by traveling around giving presentations on the nutritional and healing merits of seaweed over many years. The combination of the Internet, local foods movement, and a renewed interest in wild foods is making room for more people to get involved in harvesting seaweed. Of course, harvesting for yourself and friends is equally if not more rewarding.

What are some concerns moving forward in the world of seaweed harvesting?

There is concern that a consistent quality supply from the wild harvest is hard to maintain. Overharvesting does not appear to be the culprit since the scale of the fishery is still so small comparatively. Rather, weather changes of late appear to affect the consistency of the product and this complicates relationships with large retailers who demand just that. There are still many areas in Maine that have minimal harvest activity. So in theory, this would mean there is potential for more people to harvest and sell to the larger businesses to provide them with more options. But, they already have their established harvester relationships and will rely on those primarily. They are increasingly interested in a farmed product in the future since it does have more potential for consistency.

Basically, the message from the established businesses is that there is room to grow, but the growth needs to be more grassroots. If people are serious about seaweed harvesting then they need to find a niche area and steward it while taking advantage of the growing trend of direct marketing into areas like farmers’ markets, CSAs/CSFs, specialty stores, and

restaurants etc. I'm sure there will always be some degree of trade with the main companies, but the message is not to rely on them.

Also, if wild harvesting does expand dramatically then more harvesters will have to convene and manage territories directly, since it has been largely informal up to now. It is hard to say how fast it will grow and how it might manage itself. Currently, there is such a body called the *Maine Seaweed Council*, but they are primarily concerned with regulating the more industrial rockweed fishery, which is used as fertilizer. As far as I know, there is no formal council for actual harvesters. I sense that harvesters are territorial about their spots and an open forum about hotspots will be import to negotiate. If seaweed consumption in America does grow rapidly, then farming will have to pick up the slack much they way it has in Asia. Canada, Ireland, and Denmark are already investing heavily in farming seaweed.

There were some Nori farm attempts in Maine and Washington State in past decades, but there were social, economic and technical complications. Many upland landowners and commercial fisherman were not friendly with the idea. The ventures were heavily focused on value added dry roasted Nori sheets, which could not compete with Asia in terms of price and quality. And, they were not using an indigenous species, which was risky practice. The impression I get from talking to those involved is that it requires more investment and market development. But, the time to get involved might be ripe now considering some new developments.

A company near Portland in Casco Bay named *Ocean Approved* is successfully farming Kelp. Hopefully their model will be replicable in the future. They are unique from the companies mentioned earlier. Other than farming, they are selling it as a frozen cooked product compared to the wild harvested, dried, and raw product.

I had a conversation with one of the owners, Phil Dobbins, and he gave me an idea of their marketing angle and the logistics involved. Getting out of the strict health food and macrobiotic niche has been hard for seaweeds in America. *Ocean Approved* contends that "access" is the key to breaking into the stubborn American market. For example, they make a product that is more convenient like kelp noodles that can be added at the later end of cooking times, with more traditional noodles. They also make a kelp slaw that only requires a quick dressing and some garnish. These are smart ways to turn more people onto seaweed. He said a seaweed farming operation starting from scratch, just to cover costs and develop some cash flow, would require roughly \$20K of investment for the rafts and the lease process. That would not cover the equipment for processing if you wanted to add value and it does not include the boat costs and labor etc. They have invested about half a million dollars right now and will make additional investments in the future. They sold their successful mussel farming business and were just awarded a significant federal [grant](#) from NOAA. They plan to provide the know-how and seed to fishermen who already have water experience, boats, and waterfront access for landings. Young farmers might be next in line given the opportunity.

GREENHORNS WORKSHOP - KEY POINTS

Why Seaweed?

- *Ultimate in sustainable seafood*
- *Thrive in cold, clean, nutrient rich waters of Gulf of Maine*
- *Fun to harvest (see video/photos)*
- *Highly needed nutrition in modern diet*
- *Good farming potential*
- *Delicious, versatile, beautiful*

What are seaweeds?

- *Seaweeds or “sea vegetables” are macroalgae growing on rocks, the seafloor, and on each other in the intertidal zone and shallow seawater (except free floating seaweed in Sargasso Sea)*
- *Different from land plants that build root systems and flowers*
- *Seaweeds are classified into three groups: Brown, Red, and Green*

What are the key species for consumption in Maine?

Brown:

- *Laminaria longicuris (Kelp, Oarweed) and L. saccharine (Kelp, Sugar Kelp)*
- *Laminaria digitata (Finger Kelp, Kombu)*
- *Alaria esculenta (Winged Kelp, Wakame)*

Red:

- *Palmaria palmata (Dulse)*
- *Porphyra umbilicalis (Laver, Nori)*
- *Chondrus crispus (Irish Moss)*

Green:

- *Ulva lactuca (Sea Lettuce)*

Where are these seaweeds found?

Generally, the green seaweeds inhabit the shallowest zones along the shore or upper intertidal, and the reds inhabit the lower intertidal, and the browns are usually found in the mid to lower intertidal but mainly in the subtidal zones. Often times we can see this distinction clearly when harvesting on a “spring tide” (strong low tides around new and full moon). The browns (kelps) will be slightly exposed in the subtidal zone, the reds will be a little further up, and the greens will be even further up. In my experience the best quality seaweeds are found in areas exposed to the open ocean where there is good wave action, shade, and surf with outer ledges and tide pools. Some of the kelps like Oarweed and Sugar Kelp survive well with more protection further up in bays, but they usually demand flow to be of good quality. There are many exceptions and surprises so experiment for yourself.

Note: Rockweeds are a dominant brown species usually in upper intertidal especially in protected bays that cover rocks making them extremely slippery. They are used primarily for fertilizer and are not to be confused with our primary large brown kelps.

When is the best time to harvest?

*Generally, the best time to harvest is around spring and early summer with the kelps. As the summer progresses there is more competition for nutrients as phytoplankton bloom. The combination of warmer waters, storms, and more periwinkle damage all tend to lower the quality of kelps as the summer progresses. The exception is *Digitata*, which has less noticeable damage since it is hearty and lives in more turbulent waters. The red seaweeds tend to grow back quickly once harvested, especially *Dulse*, which can be harvested every two weeks in the summer and are typically harvested right into October on Grand Manan. A combination of weather, tradition, and the seaweed life cycle dictate that most harvesting is done in the earlier warmer months. However, people do harvest in winter sometimes and I would be curious to learn more about potential differences in taste and nutrition from those seaweeds.*

Drying/Storing Method?

Aim to dry seaweed as soon as possible to prevent mold. Typically 4-10hrs of full sun which often takes 1-2 days, if not possible dry/finish inside at 80-100 degrees F with stoves and fan circulation until they become crispy or brittle. There are different techniques for different species but typically we hang up browns and spread reds and greens on mesh trays or clean rocky ground.

Seaweed stores virtually indefinitely in airtight opaque containers. We worked with sealed plastic bags away from light and moisture for commercial convenience, but ceramic or glass jars would be ideal. In proper storage, most completely dried seaweeds stay nutritionally sound for ages. Certain kinds tend to age well and take on new flavors and properties. It may be worth experimenting. Do not store in the refrigerator or with strong odors. They absorb moisture and odor easily.

Are there sustainable harvest guidelines?

*Understand that seaweeds are ecologically critical to other plant and animal life on the intertidal and coastal waters. They provide shelter and food for many organisms directly. Indirectly, they enrich waters with nutrients when they break down. As the dominant species, Rockweeds perform this function the most and as such there is greater concern about the industrial scale harvest of this seaweed. But, the more edible seaweeds appear in less quantity, so we should take equal if not more care to harvest sustainably, especially if more people get interested in harvesting in the future. Shep Erhart of *Maine Coast Vegetables* helped devise some key elements below worth noting. Furthermore, the *Maine Seaweed Council* has come up with a detailed practical chart on this exact topic: http://maineseaweed.org/files/Guidelines_2009.pdf*

Key Elements:

- Careful seasonal evaluation
- Choosing healthiest plants/beds
- Selectively harvesting in moderate amounts
- Cutting above the holdfast
- Generally leaving appropriate biomass (30-50%) to insure re-generation
- Making a living not a killing
- Promoting cultivation vs. capture mentality

- Establishing regulations proactively with Legislature and the Department of Marine Resources (DMR)

One way to embody this practice is to develop a “memory of place” by stewarding a niche and physically going out on the water on a consistent basis. Larch Hanson has been doing this for decades and hopes that people can develop a similar sensibility.

What are the current regulations for seaweed harvesting?

Seaweed Permit	\$58.00	\$58.00
Seaweed Supplemental	\$29.00	\$29.00
Seaweed - Non-Resident	\$230.00	\$230.00
Seaweed - Non-Resident Supplemental	\$58.00	\$58.00

(Source: Maine DMR)

Anyone can harvest up to 50 pounds of seaweed per day for non-commercial purposes without a seaweed license. Anyone harvesting seaweed that has become naturally detached and is dead does not require a license. Beyond that, you need pay as outlined above. Supplemental licenses indicate that you are working for and under another license holder.

What is the Public Trust Doctrine?

How can we harvest seaweed on private property if only 40 miles of Maine’s 3,500-mile ocean coastline is public? The Public Trust Doctrine, with a few exceptions, states that all intertidal lands are open to the public for purposes of fishing, fowling, and navigation. Since seaweed is recognized as a fishery by the state, seaweed harvesters full access. Unfortunately, accessing the good spots without a boat can be difficult. Any serious seaweed harvester will require a boat to reach optimal spots with relative ease.

More information on the Public Trust Doctrine:

<http://www.seagrant.umaine.edu/files/pdf-global/04pubacc.pdf>

Where do I go if I have an interest in apprenticing with a seaweed harvester?

Maine Seaweed Company is so far the only company I know that readily welcomes apprentices. Larch Hanson requires that you write a letter explaining your interest and then visit him in person before making a commitment. If you are persistent, you might be able arrange a time with some other harvesters who work for other companies. Be sure to make contact in the spring at the latest, before they prepare for the bulk of their harvest. Sandor Katz had a memorable [experience](#) out with harvesters from *Ironbound Island Seaweed* for example. If you are more curious about future option for working with seaweed be sure to read the above narrative portion regarding “concerns moving forward.”

What about seaweed for farming and horticultural purposes?

Seaweeds make excellent fertilizer for all kinds of plants and are good supplements for farm animals. There are long standing traditions in the British Isles and in France of gathering large amounts of seaweed from the intertidal to amend soils inland. Native Americans included seaweed and fish with their staple crops. Rockweed that gets tossed up on beaches by storms is the classic candidate for easy mulching and fertilizer. We would usually add our scrap seaweeds into the compost pile since these seaweeds tend to get slippery and smelly compared to rockweed and need some breakdown first. I have heard reports that

seaweed adds excellent structure to plant beds and yields great results when tilled under in the spring. Rockweed is also an excellent slug deterrent when dry because it gets sharp and jagged. There is a company in Maine that provides numerous seaweed products for agricultural purposes called *North American Kelp*. The more food-based companies I have discussed do sell scrap seaweeds and some rockweed for gardening purposes as well.

On his [North American Kelp](#) website, Bob Morse outlines some seaweed benefits for plants:

- Increases seed germination and root development
- Increases bloom set and size of flowers and fruit
- Relieves stress in plants caused by extreme weather conditions
- Increases plant resistance to disease, insect attack, drought, and frost
- Increases microorganisms in the soil that fix nitrogen from the air
- Increases mineral uptake from the soil
- Increases storage life of fruits and vegetables by retarding loss of protein, chlorophyll, and RNA.

Tell me briefly about the key nutritional and medicinal benefits of seaweed?

Big picture:

We evolved from single celled creatures living in the primeval Ocean. The solution in and around the cells of our body does not belie this beginning. In fact, a highly similar complex matrix of minerals is shared between the ocean and our cellular fluids. The mineral concentration of amniotic fluid in the human womb is the most striking example of this connection with the ocean. Seaweeds concentrate and deliver these nutrients in way that our body remembers and understands for optimal function. In this way, they are the original whole food where the sum complex is greater than the parts.

Small picture:

Iodine:

Seaweeds are the best biomolecular source of iodine hands down, land plants and animals are deficient, and marine animals accumulate fat-soluble toxins too easily. Humans evolved with exposure to a consistent supply of iodine as they exploited the intertidal zones of the world throughout history. Today there is substantial human exposure to halogens like fluorine, chlorine, and bromine in the food supply. These elements are more chemically reactive than iodine. In the body, they can disrupt stable iodine molecules, displacing iodine's ability to help with normal thyroid function. Poorly functioning thyroids cause numerous problems but the most obvious is a sluggish metabolism, which likely contributes to our "diabesity" epidemic. Also, radioactive iodine 131 competes with normal iodine 127 in the body. With a consistent healthy supply of iodine 127, the body will not readily take up iodine 131.

Removal of radioactive / heavy metals:

Seaweed has a special set of phytochemicals known as phycocolloids, principally algin, agar, and carageenan. They are mucilaginous compounds that bond to heavy metals and radioactive elements that are then safely removed in stool. According to experts like Phycologist [Ryan Drum](#), we are all radioactively "dusted" in the modern world. Radioactivity was even more acute circa cold war nuclear testing and the Chernobyl disaster. As such, there was an effort by US and Russian authorities to get seaweed supplements to the public to remove radioactive elements and prevent excess uptake of iodine 131 as stated earlier. The US supposedly stopped this policy to prevent panic. There is no shortage of heavy metals in our lives today and seaweeds are an excellent defense.

Dietary minerals:

If nothing else, you should be eating seaweed for their excellent mineral content. The minerals in seaweed are chelated and colloidal. In other words, they are bioavailable mineral sources that our body knows how to absorb readily. They possess these qualities and quantities far beyond land plants and land animals. Modern agricultural practices have made most food and the soils they grow in deficient in minerals. Seaweed has all 56 minerals we need and is an excellent source of major minerals like potassium, sodium, calcium, magnesium, iron and trace minerals like chromium, iodine, and copper.

Vitamins, proteins and fats:

*Seaweeds host all of the vitamins in varying degrees depending on species and harvest time. They generally have significant amounts of B vitamins, especially Laver. Alaria has high quantities of Vitamin A (source: *Maine Coast Sea Vegetables*). In terms of Protein, the reds seaweeds have higher percentage amounts but generally seaweeds do not contain substantial amounts per serving. But, they have high quality complete proteins, which help complete high protein foods like beans. One particular amino acid it has in quantity is the non-essential glutamic acid, famous for MSG. This amino acid helps flavor and tenderize other foods while providing energy for mental and nervous system function. Similarly, it has few fats but they are balanced and of high quality, which when combined with high fiber and thyroid friendly iodine can help with weight loss.*

Misc.

Seaweeds have a host of phytochemicals that are being tested increasingly for their general anti-bacterial, anti-viral, anti-inflammatory properties and their specific abilities to combat cancer, hypertension, hypercholesterolemia etc. Many of these studies are currently conducted in Asia and a solid body of evidence is growing, but the anecdotal evidence and folk medicine tradition is already enormous.

FAQs:

Too much iodine?

There are doctors who think the RDI (Recommended Daily Intake) for iodine is too low and that healthy individuals are able to “spill” excess iodine as necessary. Note that most east Asian countries eat large quantities of seaweed that far exceed our iodine RDIs with great benefits. However, please consult a doctor if you are concerned, especially if you are pregnant, postmenopausal, or have thyroid problems.

Too much sodium?

Salt and potassium work together as a battery, they pump nutrients in and out of the cell and they maintain a balance of pressure. Evolution had us eating about 2.5 to 3:1 ratios of potassium to sodium (sodium was scarce and potassium was abundant - nuts, vegetables etc.) and the opposite is true today with processed foods. Also, potassium helps you flush out excess sodium. Reiterating the whole food matrix argument, seaweed delivers copper necessary for supple arteries which helps relieve hypertension, which often points the finger at sodium intake. The salty taste attributed to seaweeds is often thanks to more diverse types of mineral salt combinations. The sodium content is relatively tame when put into context below. If you are still concerned you can rinse before cooking.

- A serving (1/3 cup) Kelp has 1/3 as much sodium as a 1/2 tsp. table salt
- Alaria has 1/4, Dulse 1/8, and Laver 1/9 the amount as a 1/2 tsp. table salt
- The sodium content of an average sea vegetable serving is often less than that of a carrot, serving of chard, or a bagel (source: *Maine Coast Sea Vegetables*)

Is it a reliable source of B12?

Many vegetarians and vegans report getting adequate B12 from seaweed. There is controversy on the matter and supposedly no adequate studies have been conducted. There are reports that B12 on seaweed is an analogue and actually not real B12. Older studies demonstrated that the bacteria living on and around seaweed was the potential source of B12. Either way, a raw product with low temperature processing will likely yield more life and bacteria etc. Although not a vegetarian option, I like to carefully consume the tiny dry shells and baby shrimp that good raw seaweed products contain. There is no dispute over the B12 content of those little creatures!

Pollution safety?

According to phycologist Ryan Drum, seaweeds do not seem to accumulate fat-soluble pesticides and industrial wastes such as PCPs, PCBs and dioxins, unlike marine animals. Heavy metals do in fact accumulate in seaweeds and most Asian sources today do not test for heavy metals. Yet, coastal people worldwide have been eating seaweeds with low levels of heavy metals for centuries without toxic symptoms. Experts suggest that metals in seaweeds form strong bonds with indigestible polysaccharides and most are found strictly in their non-toxic organic compound form. It is still best practice to seek clean seaweeds from local sources that you know and trust. *Maine Coast Sea Vegetables* were the first seaweed company to obtain organic certification addressing some of these issues.

Cooking and eating basics:

I like to eat seaweed in bite size pieces added to stir-frys, soups, salads, sandwiches, and cooked in with grains and beans and teas. I will include some good recipe books and resources for more elaborate preparations below. As a general rule of thumb, browns seaweeds tend to be fibrous and require more cooking time, which lends them well to cooking with grains and beans. Red seaweeds are more delicate and cook up quickly when added to soups and stir-frys. For the past couple years now, I find I rarely omit kelp from cooked grains and never sauté garlic and onions without some Nori or Dulse. It is that simple.

Aim for consistent, regular consumption:

- 1 oz./week = little more than 3 lbs./year
- I probably consume 10-15 lbs./year
- Japan avg. 12lbs./year

Ryan Drum says stomach flora can adapt in 4-6 weeks of consumption to better digest seaweed as long as it is minimally processed. This is another area of ongoing research thanks to a recent French [study](#) comparing Western and Japanese gut flora and gene transfer. They found that Japanese individuals had specially adapted enzymes for seaweed digestion.

Workshop round up:

Thanks to all those adventurous individuals who attended our workshop in Machias on August 15th. It is not easy clambering over slippery rocks and cliffs to get to the good seaweed spots. Next time we will make life easier by arranging for some boats. Thanks for your good questions and patience. I would like to see the Beehive make a poster someday about "Ocean Change" and the role sustainable seafood can have in helping fix the problem. Please feel free to contact me with any questions about seaweed or sustainable seafood at robert.cushman@gmail.com

Recommended Reading:

Sustainable Seafood/Ocean Health:

Books:

Bottomfeeder: How to Eat Ethically in World of Vanishing Seafood by Taras Grescoe
Four Fish: The Future of the Last Wild Food by Paul Greenberg - <http://www.fourfish.org>
The Most Important Fish in the Sea by H. Bruce Franklin
The Geography of Oysters by Rowan Jacobsen - <http://www.oysterguide.com>
Stocking the Blue Eyed Scallop by Euell Gibbons
Sea Sick: The Global Ocean in Crisis by Alanna Mitchell - <http://www.alannamitchell.com>
The Sea Around Us by Rachel Carson

Links:

Meta-source for wallet cards - http://seagrant.gso.uri.edu/sustainable_seafood/guides.html
National Marine Fisheries - <http://www.nmfs.noaa.gov>
Oceana - <http://na.oceana.org>
Marine Protected Areas - <http://mpa.gov>
NOAA: Ocean Acidification - <http://www.pmel.noaa.gov/co2/OA>
Forage Fish - <http://www.foragefish.org>

Seaweed:

Books:

Sea Vegetable Celebration by Shep Erhart and Leslie Cerier
Irish Seaweed Kitchen by Prannie Rhatigan - <http://www.prannie.com>
Seaweed: Natures Secret to Balancing Your Metabolism, Fighting Disease, and Revitalizing Body and Soul by Valerie Gennari Cooksley

Links:

Maine Coast Sea Vegetables - <https://www.seaveg.com>
Maine Seaweed Company - <http://theseaweedman.com>
Ironbound Island Seaweed - <http://www.ironboundisland.com>
She Sells Seaweed - <http://www.shesellsseaweed.com>
Ocean Approved - <http://www.oceanapproved.com>
Main Seaweed Council - <http://maineseaweed.org>
North American Kelp - <http://www.noamkelp.com>
Ryan Drum - <http://www.ryandrum.com/seaweeds.htm>
Maine DMR - <http://www.maine.gov/dmr/index.htm>

PDFs:

Sustainable Harvest Guidelines - http://maineseaweed.org/files/Guidelines_2009.pdf
Maine Seaweed Council Public Trust Paper -
http://maineseaweed.org/files/MS_C_White_Paper_Slade.pdf
Public Trust Doctrine for General Public - <http://www.seagrant.umaine.edu/files/pdf-global/04pubacc.pdf>