



Recipes for the Future of Seaweed Aquaculture

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Abstract

Climate cuisine is about eating the future you want into being. In this article, I examine how seaweed recipes can be forms of climate fiction through the way that the reader is invited to participate in sustainable foodways. I examine several popularizations of seaweed aquaculture that imagine practices of eating and growing seaweeds. Their formal similarities center on participation: they include the direct address of the reader through the second person voice, and position themselves as instructional models. Bren Smith's *Eat Like a Fish* (Smith, *Eat like a fish: My adventures as a fisherman turned restorative ocean farmer*, Penguin, 2019) interpellates the reader as eater, invited to cultivate eating habits that, on a societal scale, would produce a more materially sustainable relation with the planet. The vignette "Ghost Bar," which appears in Holly Jean Buck's *After Geoengineering: Climate Tragedy, Repair, and Restoration* (Buck, *After geoengineering: Climate tragedy, repair, and restoration*, Verso, 2019), sensorily emplaces the reader in a future seaweed farm as a window into the kinds of livelihoods and forms of work that could be part of mitigating global warming. I trace the similarities between Smith's recipes and Buck's interpellation of a reader, both of which use the second-person mode addressing an unmarked "you," inviting this "you" to imagine and actualize the future dish or future scenario they sketch. While these texts have their own limitations at the level of the social imagination, such popularizations of seaweed aquaculture model an important way of understanding the intimacies of climate fiction and recipes. Recipes not only popularize the sustainable eating of seaweeds, but actively constitute a form of climate fiction through their intention to actualize more seaweedy futures.

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Introduction

In North America, seaweeds are entangled with aspirations to enact more sustainable futures—of food and fuel. Organizations like Green Wave promote small-scale seaweed farms, and seaweed sustainability projects are accruing large amounts of grant funding and venture capital. Attractively, seaweeds are a “zero input” crop, needing no fertilizers or pesticides—only a flow of seawater and rope for the holdfast to cling to, or the proximity of bivalves as habitats for seaweed sporophytes in reproduction.¹ Such farms have not yet been established in North America; according to Seaweed Insights, “Countries outside of Asia produced less than 2% of the total farmed seaweed volumes in 2020.” Research at UC Davis examined the effects of adding the seaweed *Asparagopsis* to cow feed, which reduced over half the methane emitted in “cow burps.”² Seaweeds are also imagined as future sources of energy. ARPA-E’s \$25 million dollar MARINER project sees “a growing opportunity for the production of macroalgae” biofuels, hoping to achieve the scale and efficiency necessary to support a seaweed-to-fuels industry. One of this year’s XPrize winners is Seaforestation, which aims to “establish deepwater-irrigated, open-ocean seaweed mariculture as a strategy for food security, regeneration of ecosystem services and carbon sequestration.”³ Each of these projects imagines methods of refining seaweed into consumable products or fuels that lower carbon footprints, steps towards mitigating global climate change. Throughout these discussions of climate futurity, seaweeds are interpellated as messianic figures, ushering in a more sustainable ways of eating and fueling our energy needs.

Of the English language books that popularize seaweed aquaculture published within the last two decades, what is striking is the incorporation of *recipes* as paratext in an appendix at the end of the book. Recipes not only appear in books like Bren Smith’s self-described climate memoir, *Eat Like a Fish: My adventures as a Fisherman turned Restorative Ocean Farmer* (2019), but also in Danish scientist Ole G. Mouritsen’s exploration of seaweed science and gastronomy, *Seaweeds: Edible, Available, and Sustainable* (2013); British anthropologist Kaori O’Connor’s *Seaweed: A Global History* (2017); and Ruth Kassinger’s account *Slime: How Algae Created Us, Plague Us, and Just Might Save Us* (2019).⁴ These texts combine surveys of cultural uses of seaweeds with the basics of seaweed ecology, aquacultural production, and industrial extraction—all with a mind towards the future usefulness

¹ Some seaweeds like nori (*pyropia* [formerly *porphyra*], the seaweed used in sushi) require the shelter of mollusk shells at one stage in their life cycle. This multispecies interdependency was first discovered by Kathleen Drew Baker in the 1950s, whose research made possible the reliable mass cultivation of nori in Japan through the simple intervention of cultivating mussels and seaweed together. “Seaweed Insights,” global production overview, <https://seaweedinights.com/global-production/>.

² <https://www.ucdavis.edu/climate/news/feeding-cattle-seaweed-reduces-their-greenhouse-gas-emissions-82-percent>

³ <https://www.ocean.org/climate-change/seaforestation/>

⁴ Strangely, the only recent example of seaweed nature writing that does NOT include a section on recipes is *Seaweed Chronicles: A world at the Water’s Edge* by Susan Hand Shetterly (2018). Since Shetterly’s writings to stray towards aquaculture, perhaps she missed an opportunity.

of seaweeds. What is it about the recipe, as a form, that belongs in texts that imagine sustainable worlding with seaweeds? While cookbooks have long been inclusive of forms of ecological and cultural knowledge, why are recipes appearing outside the genre of the cookbook itself?

Recent work in food studies has turned critical attention to the recipe as an important social genre and form of vernacular literature.⁵ As Lynn Z. Bloom writes in *Recipe* (2022), recipes provide both “inspiration” and “aspiration” towards a particular dish-as-model.⁶ They are literary forms that “tell stories,” stories which emerge in the language of the recipe and in the language of the cookbook, website, or other medium in which they are embedded.⁷ Recipes are also media of communication that invite participation. Allison Carruth and Amy Tigner trace the origins of the word “recipe” to the Latin verb *recipere*, which, “denotes something that is received” like a receipt: “Etymologically, then, a recipe/receipt is something meant for exchange or movement from one person to another” (Carruth & Tigner, 2017, 74). The genre of the recipe—written in the second person voice—“invites participatory change, often encouraging readers-cum-cooks to add or delete according to their own tastes” (Carruth & Tigner, 2017, 84). Indeed, it is through the use of the second person voice that the recipe writer speaks directly to the reader, using “you” and “your” and imperative verbs. The reader can either imagine or directly enact the recipe. In this way, the recipe always has a performative potential, a script or algorithm or incantation for making something come into existence.

It is this performative and expanded sense of the recipe genre beyond the cookbook that Susannah Worth highlights in *Digesting Recipes: The Art of Culinary Notation* (2015), both in content and form. The book itself is structured as a multi-course meal, from salad to dessert, and the bibliography as a “select ingredients list.” Connecting recipes to J. L. Austin’s discussion of performative speech acts, Worth similarly argues that recipes are set up to do things: “If the recipe is a script or set of instructions to be acted upon or performed, then it necessarily demands an active reader [...] Whether in mind or matter, the dish will be completed by the reader” (Worth 2015, 5–6). The performativity of the recipe sketched by Worth is different than the theatricality of, say, celebrity chefs like Julia Child on TV.⁸ Instead, the performativity of the recipe has to do with the participation of the reader/cook/eater; the recipe remains in a virtual state until they actualize it. Because recipes require a participant for their completion, they are both ontologically incomplete and *speculative*, possibilities yet to be made manifest.

⁵ See for example Susanna Worth, *Digesting Recipes* (Washington, Zero Books: 2015); L. Sasha Gora, “Cooking the Books,” <https://cmagazine.com/articles/cooking-the-books-recipes-by-artists>; “Recipes for an Encounter” ed. Marisa Jahn, Candice Hopkins, and Berin Colonu, <https://www.scotiabankphotoaward.com/content/dam/scotiabank/photoAward/documents/RecipesForAnEncounter.pdf>; Rebecca May Johnson, *Small Fires: An Epic in the Kitchen* (New York, Penguin: 2022); Lynn Z. Bloom, *Recipe* (London, Bloomsbury: 2022).

⁶ Bloom, *Recipe*, 8.

⁷ Bloom, *Recipe*, 33–34.

⁸ Bloom, *Recipe*, 24.

In this article, I examine how several popularizations of seaweed aquaculture—climate memoir, field guide, and climate fiction—involve elements of eating and present close formal similarities to the genre of the recipe. These formal similarities include the direct address of the reader through the second person voice, and their role as instructional models. In the first section of this article, I focus on Bren Smith’s *Eat Like a Fish* (2019), which interpellates the reader as eater and agent outside the scope of the written page. What Bren Smith calls seaweed “climate cuisine” (Smith, 2019, 12) is arguably a form of climate fiction because of the way the eater/reader is invited to cultivate eating habits that, on a societal scale, would produce a more materially sustainable relation with the planet—habits such as eating more seaweed in daily meals. Climate cuisine is about eating the future you want into being. Literal recipes not only popularize the sustainable eating of seaweeds, but actively constitute a form of climate fiction through their intention to actualize more-seaweed futures. I understand speculative fiction, and the subgenre of climate fiction, as performative⁹ and inclusive of non-fiction forms of writing and discourse.¹⁰ I also compare *Eat Like a Fish* with the field guide *Pacific Seaweeds* (2016), examining how field knowledge and culinary knowledge reinforce each other.

In the second section I focus on “Ghost Bar,” a climate fiction vignette that appears in Holly Jean Buck’s *After Geoengineering: Climate Tragedy, Repair, and Restoration* (2019). Paired with the chapter that precedes it advocating for large-scale seaweed aquaculture for biofuels, “Ghost Bar” sensorily emplaces the reader in the possible future that Buck advocates for. I trace the similarities between the recipe’s and Buck’s interpellation of a reader, both of which use the second-person mode of addressing an unmarked “you,” inviting this “you” to imagine and actualize the future dish or future scenario they sketch. Like Smith’s *Eat Like a Fish*, *After Geoengineering* has a distinct focus on outlining working-class jobs that the “you” might occupy, an important model of how ecological and class dynamics should be thought together. While these texts have their own limitations at the level of the social imagination; nonetheless, such popularizations of seaweed aquaculture model an important way of understanding the intimacies of genre. Like the latent potential of a recipe to be cooked or performed at a later date, seaweed futures will only arrive if the reader acts to bring them about.

⁹ On science fiction as performance, see Melody Jue, “Performative Science Fiction,” *Science Fiction Studies* 45 (2018), Special Issue: Climate Crisis and Science Fiction, 423–424.

¹⁰ Lindsey Thomas and Lisa Yaszek have written about how public policy writing and disaster preparedness manuals are forms of nonfiction writing that can be seen as forms of near-future speculative fiction through their scripting of response plans for what may occur in 10, 20, 50, or 100 years (Thomas 2016; Yaszek 2009). Such a view de-privileges literary fiction the only form of speculative thinking and instead aims at studying imagined and possible futures that emerge through other forms of non-fiction documentation that often may seem quite mundane—but collaboratively written by people in many industries and fields.

Eat Like a Fish

In his memoir *Eat Like a Fish: My Adventures as a Fisherman Turned Restorative Ocean Farmer* (2019), Bren Smith connects the future of seaweed farming to futures of eating. Weaving the emerging story of American seaweed farming with the difficulties of his own adolescence, Smith addresses seaweed farming specifically from a blue-collar standpoint. Beginning with his experience participating in industrial fishing operations—and finding himself jobless when the cod fishery crashed—Smith envisions seaweed farming as a way of generating meaningful work for former fishers. “We wake before dawn, risk our lives, and destroy our bodies; in return, we are graced with a meaning so rarely found in modern life. There are certain jobs that bind people to the earth: coal mining, farming, fishing” (Smith, 2019, 51). Smith’s promotion of ocean farming aims to bring about a sea change in not only what we eat, but in aquacultural methods. His model of 3D ocean farming envisions a place for hard-working former fishermen while presenting a viable alternative to the hyper-extractive industrial fishing industry. Indeed, *Eat Like a Fish* shows remarkable similarities to Samuel Taylor Coleridge’s famous poem “Rime of the Ancient Mariner” (1798) (recently adapted into the climate-concerned graphic novel, *The Rime of the Modern Mariner* by Nick Hayes) with Smith positioning himself as the mariner who participated in industrial overfishing only to redeem himself through restorative ocean farming.¹¹ Like the ancient mariner, Smith directs his story, peppered with advice, to a future reader/farmer who may be inspired to start an ocean farm of his or her own. “This is our chance to reimagine our dinner plate by inventing a new ‘climate cuisine,’ not around our industrial palate of salmon and tuna, but around the thousands of undiscovered ocean vegetables and shellfish found right outside our back door” (Smith, 2019, 12). Yet Smith’s vision also draws on the settler-colonial mythology of the frontier: “We were founded as a maritime nation [...] If the pioneering spirit of the nineteenth century was captured by the instruction to ‘go west, young man,’ then this book is a twenty-first century call for our generation to ‘head out to sea’” (Smith, 2019, 13). The frontier narrative serves to rebrand seaweed farming as an acceptable occupation for working class men; in doing so, Smith attempts to dissociate seaweeds from their usual connotations in North America with health food, austerity (in Ireland, seaweeds were once considered a “famine food”), and East Asian foods like sushi.

Smith’s attempt at rebranding and even dehistoricizing seaweed from culturally-specific eating practices is spun in a way that tries to make seaweed edgy. While working with a legal team to streamline the permitting process for ocean farms, Smith writes that he was thrilled that the hashtag #legalizetheotherweed gained popularity on Twitter. Dining with Patagonia founder Yvon Chouinard, Smith marveled at the way Chouinard’s chefs cooked mussels, which have, “the potency to

¹¹ Samuel Taylor Coleridge, “Rime of the Ancient Mariner” in *Lyrical Ballads* (1798), a poetry collection co-written with William Wordsworth. See also the *Rime of the Modern Mariner* (2011) by Nick Hayes, a graphic novel which adapts the original poem to address the impacts of pollution and waste on ocean life.

be the gateway drug to a new ‘climate cuisine’ that is both delightful and hopeful. It was like the first supper marking the future of seafood” (Smith, 2019, 247). Like “#Legalizetheweeds, Smith’s choice of “gateway drug” also takes pleasure in characterizing seaweeds as something appealing precisely because you *shouldn’t* eat them. The play on (sea)weed and marijuana is fairly common in the industry, also present in the naming of the “Dutch Weed Burger” (whose recipe is collected in the cookbook *Ocean Greens* (2016) by Lisette Kreisler and Marcel Schuttelaar) as something that even meat eaters might just want to try.

In another example of using a recipe to rebrand seaweed, Smith recounts how he worked with a chef to create a recipe for barbecued kelp noodles. He writes, “In a single recipe, he completely achieved the vision I’d hoped for: de-sushified and de-healthified seaweed” (Smith, 2019, 168). This phrasing belies a subtle form of Sinophobia, celebrating a dissociation of seaweed from Japanese sushi by modeling something more American (barbeque-flavored). “De-healthified” also suggests an attempt at connecting seaweed eating to the pleasures of eating something solely because it tastes good, not because it has nutritional virtue. Yet it is also significant that Smith singles out “a single recipe” as the literary form which achieves these desired dissociations. The recipe—something shareable and amenable to replication—becomes a persuasive form for altering the reputation of seaweed. The recipe is persuasive precisely because it can be experienced in the act of eating—the proof, so to speak, is in the pudding.

Like the recipe for barbecued kelp noodles, other recipes included at the end of *Eat Like a Fish* cater to a specifically American (and New England) palate: a version of crab cakes, shrimp fra diavolo with kelp, kelp and cauliflower scampi, and seaweed butter.¹² “Imagine being a chef in 2019 and discovering that there are thousands of vegetables you’ve never cooked with” (Smith, 2019, 160). By collaborating with chefs to create new seaweed recipes—recipes that, like barbecued kelp noodles, might go for \$6 / each and be accessible to all income levels, not just those who can afford to visit fancy restaurants—Smith aims to promote a particular vision of the future.¹³ In this future, kelp scales up to become a more popular food in America that is visibly noticeable on the dinner plate, rather than invisibly present as an extract.¹⁴ These new seaweed recipes channel the following fantasy: if enough people ate seaweed cuisine, made popular by the right dish—that might be enough to bring about a more sustainable future aquaculture that both feeds us and remediates the oceans.

Capaciously understood as a literary form, recipes are key not only to promoting interest in eating seaweeds, but also to practicing seaweed farming. The program Smith founded, GreenWave, is invested in open access sharing of best-practices for ocean farming—and throughout the book, there are special DIY sections (in

¹² Seaweed butter has a delicious history in northern France.

¹³ At the time of writing this, Walmart carries kelp noodles for around \$9 and Amazon carries kelp noodles for around \$6.50.

¹⁴ Melody Jue, “The Problem with Invisible Seaweed,” *Society and Space* (April 3, 2023), <https://www.societyandspace.org/articles/invisible-seaweed>.

sans-serif font) that shift into the *second-person voice* to instruct the reader step by step on how to get started on ocean farming. For example,

The process of outplanting is surprisingly easy. Untie one end of your horizontal longline, and feed it through the seed spool. Unravel two feet of seed string, and splice it into the line, using your fid (as an ocean farmer, you're gonna become a master splicer). Then slowly motor your skiff down along the longline, allowing the seed spool to unravel around the line. Your job is to make sure it unwinds evenly. (Smith, 2019, 146)

The procedural quality of passages like this is intimate: it directly addresses the “you” of the reader, interpellating them as a future seaweed farmer. Yet to be a seaweed farmer, certain steps must be followed. There are thus two kinds of recipes at work in *Eat Like a Fish*: recipes for how to cook with kelp, and a recipe for how to become a seaweed farmer. Both recipes invite participation, interpolating future cooks, eaters, and farmers as people engaged with meaningful work. These DIY sections are, effectively, recipes for change (in the figurative sense of the phrase) for developing ocean farming in a way that differs from an industrial extractive paradigm—the kind that caused so many fisheries to crash.¹⁵ In this way, *Eat Like a Fish* gathers together literal recipes for seaweed cuisine with figurative recipes for climate mitigation through the particular activity of aquaculture.

Eat Like a Fish is not the only non-cookbook to feature a section on seaweed recipes; they are also commonly found in scientific field guides. To conduct a brief survey, I checked the substantial algae section at the UC Santa Barbara Library (and Cheadle Center for Biodiversity and Ecological Restoration) and found six additional field guides with recipes. The field guides most likely to have recipe sections (1) concerned only algae, not general seashore life, of a specific region (2) were designed as public-facing manuals rather than “keys” or publications for a strictly scientific audience¹⁶ (3) were geared to including economic and/or cultural information about seaweeds. Most of the time the recipe sections were included as appendices at the end of the field guides, including *Seaweeds of Hawaii* (1979), *Common Seaweeds of the Pacific Coast* (1977), *Seaweeds of the British Isles* (2003), *Philippine Seaweeds* (1988), and *Limu: An Ethnobotanical Study of Some Hawaiian Seaweeds* (1974). Two exceptions to this pattern were *The Book of Seaweed* (1977) and *Seaweeds: Edible, Available, & Sustainable* (2013), which placed recipes in the *middle*—however, both texts were not field guides, but rather global overviews of the cultivation, commercialization, and culinary uses of seaweed. Gathering seaweeds

¹⁵ According to one article from *Scientific American*, the world has lost half its fish stocks since 1970. <https://www.scientificamerican.com/article/ocean-fish-numbers-cut-in-half-since-1970/>.

¹⁶ One exception to this was the first volume of *Seaweeds of the British Isles*, which was part of a more quantitative species survey. None of the other five volumes in the series had a recipe section, but the first volume contained a 1 ¼ page appendix with descriptions of several recipes. Perhaps the reason why this volume was the one to contain a recipe section was because it contained information on the seaweed *Porphyra* (recently reclassified as *Pyropia*), whose common name is “laver.” Laver is the main ingredient in the heritage cuisine “laverbread” in Ireland and the British Isles, which can be spread on toast or mixed into bread, or fried into cakes in bacon fat, among other uses.

is, like mushroom hunting, part of a culture of foraging in which the correct identification of species is tied to practices of cooking.¹⁷ In other words, these field guides anticipate an interested reader/eater/forager: you want to know what you are picking and if you are going to cook well with it.

Perhaps it is no surprise that recent seaweed cookbooks also tend to look a lot like field guides, specifically through the inclusion of ecological frontmatter. For example, *Sea Vegetable Gourmet Cookbook and Wildcrafter's Guide* (1996) includes species-specific information about seasonality and when to harvest particular seaweeds. *The Seaweed Cookbook: Superfood Recipes from the Sea* (2016), by Mara Seaweed co-founder Xa Milne, includes species identification information about choice culinary seaweeds local to the British Isles, like Pepper Dulse.¹⁸ *Ocean Greens: Explore the World of Edible Seaweed and Sea Vegetables* (2015) includes similar species information—orienting the reader to “what are seaweeds?” and the three major phyla (Green, Red, & Brown)—while also including fun “shout-outs” to food pioneers and phycologists.

The genre of the field guides enfolds the recipe, and vice versa, and what they have in common is their orientation towards a future reader. They are genres that strive to be useful as pedagogical resources and as procedural models (either how to identify species, or how to cook). Consider the field guide *Pacific Seaweeds*, which invited recipes from Rae Hopkins of Canada Kelp Resources Ltd., who, in a direct address to the reader, writes, “I hope these recipes help you discover the potential of cooking with sea vegetables. Explore, Eat, Enjoy” (Druehl and Clarkston 2016, 287). In addition to the in-recipe use of second person voice and imperatives (e.g. “Do not rinse with fresh water”), the framing of the recipe section is about inviting the reader to be a participant observer, naturalist or scientist, forager, cook, and eater. *Pacific Seaweeds* also utilizes call-outs to the reader in the third person form of a report. Sometimes this occurs as a way of pointing out unsolved morphological questions that the authors invite the reader to solve. At other times, the authors instruct readers on how to think like a phycologist. Take for example the following: “When you find yourself bored—say, waiting for the bus—eyeball a branch of seaweed and determine its phyllotaxy. When you get good at this pastime, try determining the phyllotaxy of scales on a pinecone or a pineapple” (Druehl and Clarkston 2016, 194). Other passages sympathize with the challenge of accurately identifying seaweeds: “For now, the authors would not fault a reader if they chose to identify a *Scytosiphon* specimen as ‘species unknown’ (written as ‘sp.’), marvel for a moment at the vast complexity concealed in a seemingly simple form and move on” (Druehl and Clarkston 2016, 189). At other moments, the authors encourage the budding phycologist to be optimistic about discovering new species: “*Aureophycus aleuticus* is found growing on rock in the shallow subtidal zone in areas exposed to waves. It is an uncommon kelp only known in the Aleutian Islands in Alaska. The recent discovery of this kelp (2008) should inspire kelp hunters to look farther and harder for

¹⁷ For a list of mushroom field guides that include recipes, see https://www.foragingguide.com/mushrooms/field_guides.

¹⁸ *Osmundea*—my favorite—which has an incredible pepper-garlic-umami flavor when nibbled raw.

that elusive find... your footnote to fame” (Druehl and Clarkston 2016, 207). That fame might be acquired in the form of a “footnote” is a humble and notably literary formulation, interpellating the reader as a *potential textual element* of future field guides.

Eat Like a Fish and *Pacific Seaweeds* offer future-orientations to seaweeds that necessarily make room for the participation of unknown readers who might be farmers, eaters, investors, scientists, or simply other seaweed-interested parties. They sketch a capacious understanding of the recipe as type of performative text—encapsulated by Smith’s instructions for how to become a seaweed farmer (Greenwave’s mission) and how to cook with seaweeds. The recipe is a virtual (unrealized) set of instructions that is fully completed by the actualization a reader’s actions beyond the page. Yet *Eat Like a Fish* goes further in connecting both kinds of recipe, literal and figurative, to the more expansive realization of a more sustainable ocean future. The titular phrase “eating like a fish,” meaning the practice of eating more seaweed, becomes a way to bring about better planetary relations. The humble genre of the recipe can have effects outside the short duration of the single meal: when repeatedly created over time, by many people, the seaweed recipe can function as a participatory form of climate fiction. Put differently, when repeated at *scale*, the seaweed recipe becomes a way to enact a more ecologically sustainable future. This is its directional politics.

“Ghost Bar”

I now turn to a different variation on participatory literary forms in Holly Jean Buck’s *After Geoengineering: Climate Tragedy, Repair, and Restoration* (2019). Although the book’s title centers geoengineering—a word whose connotations imply a separation between humans and planet, involving the exercise of technical forms of control—Buck sees geoengineering as offering intertwined forms of social and economic being. “Though *geoengineering* is a keyword in this book,” she writes, “my hope is that it is a keyword that future generations will not recognize—not because they’re living it and it’s become an ordinary background condition, but because it’s a weird artifact of the early twenty-first-century way of seeing the human relationship with the rest of nature” (Buck, 2019, 24). *After Geoengineering* begins by examining a graph of net carbon emissions that would be required to avoid 2 degrees Celsius of global warming. Reading the graph like a road map of the future, Buck points out that for the scenario to work, carbon would need to be removed from the atmosphere starting in the 2020s and 2030s through carbon capture and storage (CCS) “at a scale far beyond the demonstration projects being planned today” (Buck, 2019, 7).

What follows are a series of descriptions of the next few decades—2030s, 2040s, 2080s—that Buck intentionally writes in the second-person voice. These vignettes invite the reader in as a participant, emplacing them in a variety of scenarios: protesting solar geoengineering, or contemplating a career based on carbon management, or imagining with a future child how to dissolve the “carbon monster” by planting 10 billion trees. Like a choose your own adventure story, she offers the

reader options at the bottom of each decade. For example, “*If you think the actions on climate will basically work out, turn to the next page. If you think it’s all just talk, performance, showmanship, turn to page 10*” (Buck, 2019, 8). For a non-fiction book about geoengineering published with Verso Press, Buck’s choice to directly address the reader through this choose-your-own-adventure method is an unusual and striking choice. Furthermore, while each chapter focuses on specific techniques of carbon capture and mitigation, her inclusion of speculative vignettes—or what she calls “sketches”—briefly emplace the reader in a possible world where such technologies exist alongside other social and economic transformations. The fictive sketches often center someone working, or preparing to work, in a particular type of career opened by something like offshore seaweed farming or a biorefinery—speculative fictions that, like Smith’s *Eat Like a Fish*, attempt to imagine attractive working-class futures.

Within these vignettes, recipes and food come up at particular moments of intimacy, or at moments of instruction. As examples, I will focus on the first two chapters of the book on cultivation: “Cultivating Energy,” a chapter that centers on growing algae as forms of biofuels, followed by a chapter on “Cultivating the Seas” focused on seaweed farms. In “Cultivating Energy,” Buck begins with a description of future fieldwork in Southern California. “We were enrolled in a course that taught the basic recipes for manipulating life,” she writes, “not as part of a college degree [...] Rather it was part of an effort to train new workers in the biofuel industry. You didn’t actually need to know much of the scientific grounding of microbiology to follow the recipes. They worked anyway” (Buck, 2019, 53–54). Here, the term “recipe” stands in for a series of procedural steps that one follows in order to achieve a desired result (much like Smith’s how-to recipes for setting up a seaweed farm). Recipes appear accessible, and even “shooting the DNA-laden gold onto Petri dishes prepped with algae cells” (Buck, 2019, 53) can be completed by someone without a major in microbiology in the kitchen-like space of the laboratory. Buck uses the term recipe again when she describes this experience of seeing algae cultivation as a new kind of agriculture, or carbon alchemy, “a sophisticated transmutation of life and land for the ends of sequestering carbon, in laboratories as well as in fields and seas. Like philosophers of yore, they are innovating new recipes and tools to change matter from one thing into another. Their aim is to take the carbon that is heating us up and put it back into a regenerated earth system” (Buck, 2019, 57). Here, Buck draws on the form of the recipe to think about alchemical change—of transmuting atmospheric carbon into something else. Growing algae for fuel involves enacting recipes that can easily be performed by non-experts.

The second chapter on “Cultivating the seas” concerns another form of algae, seaweeds, also described in the alchemical language of transformation to popularize their potential for fuels. Like their microscopic kin, seaweeds are macroalgae that make energy from sunlight: “Capture sunlight, turn it into fuel: it sounds like a futuristic formula” (Buck, 2019, 79). Buck surveys several proposals, including offshore cultivation by companies like Marine BioEnergy—supported by ARPA-E—which is experimenting with a “kelp elevator” off the island of Catalina in California. Buck writes, “The new kelp farm concept is simple: the entire kelp farm gets moved down at night to receive nutrients from deeper waters, and up during the day

to reach sunlight. This is a significant difference with the 1970s concept: submerging the kelp rather than building a large pumping infrastructure,” which saves money (Buck, 2019, 80). Further, “Drone submarines would tow these kelp farms to new waters, communicating with harvesters by satellite, which would save labor costs. The drones could also submerge the farms to avoid being storms and passing ships” (Buck, 2019, 80). Refineries could then create kelp-based methane to complement other renewable forms of energy. These oceans are the metaphorical kitchens of a climate future in which one might imagine the enactment of “a future formula” (Buck, 2019, 79), or recipes, for producing fuel from seaweeds.

What is notable about Buck’s vignettes—such as the one that follows her chapter on kelp farming that I described above—is how they emplace the reader in imagining particular forms of work and ways of life in these new configurations for sustainably growing energy. What they add is the social work of world-building *after the recipe*, or after the kind of seaweed popularization work that Smith advocates for. For example, Buck invites the reader to speculatively imagine what it might be like to work on a future offshore kelp farm in her sketch entitled, “Ghost Bar.” Like her previous sketch “Flowers” in chapter 1, “Ghost Bar” also centers around questions of meaningful work and identity, alongside lost romantic prospects—and it is food, in a way, that activates both sociality and the feeling of stepping into this possible future. “Ghost Bar” begins when a young woman, Vilma, walks into a bar after a day of monitoring an offshore kelp farm. The first thing she does is order food from the bartender, who remains unnamed. Although Vilma had chosen offshore kelp farming as an opportunity for solitude after her last breakup, the moments when the bartender serves her food create brief occasions of intimacy. Vilma admires the simple sliced tomato and a fried egg on hot flatbread (the egg fresh from the bartender’s pet chicken), and “a generous glass of gin, twisting a banana leaf into an umbrella” (Buck, 2019, 88). Later during her visit, as they research the severity of an approaching storm, “He made her an espresso with orange peel and cinnamon” (Buck, 2019, 89). While these foods endear the bartender to Vilma—with the hint of romance—what is curious to me is how, in a fictional sketch about future seaweeds, there is no eating of seaweeds. The foods described might be served at any hipster brunch location, with perhaps the exception of the banana leaf rolled into the shape of an umbrella. Whereas Bren Smith imagined eating seaweeds (served in the right recipe) as a gateway to imagining future seaweed farming, what we find in “Ghost Bar” is a picture of seaweed farming without any eating of seaweed at all. In fact, seaweed is sensorily described in negative terms: near the biorefinery, “the air stank of seaweed” (90). Thus while “Ghost Bar” does immerse the reader in a version of large-scale seaweed farming, enhanced by surveillance technologies, it also *distances* the reader from the kind of intimacy one can experience with seaweed via the sensory nature of eating.

“Ghost Bar” is also a meditation on different kinds of social and physical infrastructure. Vilma had originally tried to convince the bartender to evacuate his bar and stay with her to weather the storm, yet he chooses not to abandon his floating bar, since the bar is where people know to find him. When he refuses to move, Vilma argues that people already know how to find him through social media rather than simply physical location: “Your fans are following you, anyway, for your pithy

observations about your chicken and your sunset photos, while they dream of the offshore life” (Buck, 2019, 89). What Vilma finds when she reaches a restaurant at Bikini is that she was right; he should have evacuated. “Hear about the ghost bar?” asks one person, before commenting simply, “Gone” (Buck, 2019, 91). In conclusion, an Indonesian seaweed harvester at the bar pulls out a “worn journal” that is “filled with black lines,” tallies of the people killed “by the carbon in the atmosphere” (Buck, 2019, 91). Like the “ghost reef” that the tourist was supposedly interested in seeing, the “ghost bar” is another lost refuge. It is also a physical and social infrastructure for multispecies meetings, inclusive of the cat, the chicken, the bartender, and Vilma—and a place for companionship, which as Donna Haraway reminds us in *When Species Meet* (2006), is a word whose etymological origins come from the Latin for “sharing bread.” “Ghost Bar” reminds us of who we no longer eat with, who might be missing at the future table.

However, “Ghost Bar” also haunted by other energetic pasts. Halfway through the vignette, when Vilma sails to the nearest land to wait out the oncoming storm, we learn where the story takes place: “Frigate birds and boobies crowded the rocks. She scanned herself in at the small-craft marina at Bikini and made for her favorite of the island’s five restaurants” (Buck, 2019, 90). Bikini (Atoll) is, of course, one of the Marshall Islands known site of atomic testing by the United States. Vilma and another person at the bar comment on a tourist in a bright swimsuit and magenta muumuu, anticipating their interest in “ghost reefs” damaged by ocean warming or the “bomb museum” (Buck, 2019, 91). It is curious that Buck chose to place her story about a farm for seaweed biofuels near the unwilling experimental testing ground for another form of energy: atomic bombs. Indeed, while Buck’s choice of placing a future offshore seaweed farm near the Marshall Islands might seem like an act of ecological restoration or repair, it is not clear from the context of the story how much say the Marshallese people had in the presence of new offshore farms in their territorial waters. Without the assurance of local consent, seaweeds bio-refineries may just be another unacknowledged form of colonial infrastructure, superimposed upon the same site. Sovereignty must be a concern for future kelp farming—although I imagine Buck would be the last person to advocate for multinational corporate management of kelp farms (in “Flowers” she imagines more rustic commune-like arrangements of communities).

Conclusion

Lynn Z. Bloom remind us that recipes are instructive for how they reveal a logic. In cooking this can mean getting the feel for the range of variation in how a particular dish is made. Bloom writes that recipes are, “an introduction to the logic of a dish, a scaffold bringing order to the often casual process of making it.”¹⁹ While recipes codify the “informal practices of cooks,” they are also, paradoxically, things that

¹⁹ Bloom, *Recipe*, 8.

“anticipate latitude.”²⁰ When compared across variational forms, recipes have the capacity to introduce a *logic*: of ingredient proportions, and of methodologies. A careful reader and experienced cook can deduce what steps and sequences are crucial to the recipe, which parts might be substituted, or which corners cut. If recipes can be read for the way that they introduce a logic, we might also ask the same of texts that attempt to map out pathways to future aquaculture.

If “Ghost Bar” and *Eat Like a Fish* introduce a particular logic of seaweed aquacultural practice, it is a logic that centers meaningful forms of blue-collar jobs through participatory narrative forms. “Ghost Bar” and *Eat Like a Fish* anticipate and interpellate readers as future seaweed farmers, imagining a *place* for readers through detailed descriptions of what it might be like to work on a seaweed farm and how they could imagine themselves doing this labor. Smith outlines a procedural set of steps for how to set up a seaweed farm, while Buck sketches a more literary portrayal of working on a large-scale seaweed farm in the more distant future. Both texts center eating relations for thinking about the future in a way that offers a capacious understanding of the recipe—not only as the steps to produce a particular dish, but as the steps that, when magnified, would produce the eating relations needed to bring about a more sustainable future.

Conflicts of interest None.

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