

# CLIMAVORE:

## Divesting from Fish Farms towards the Tidal Commons

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### ABSTRACT

In Scotland, residents have fought open-net salmon farms and their toll on human and nonhuman bodies for decades. This paper recollects seven years of work in Skye and Raasay, two islands off the northwest coast of the country, developing strategies to divest away from salmon aquaculture. Addressing the contemporary wave of underwater clearances created by UK's top food export industry, it unpacks the implementation of a transition into alternative horizons by embracing the legacies of toxicity inherited from salmon extractivist industries. CLIMAVORE, a framework developed as a research-led artistic practice by the authors, investigates how to eat in the new seasons of the climate crisis. In a season of marine dead zones, it facilitates new approaches to aquaecology and coastal care that cultivate coastal livelihoods. CLIMAVORE began with a new public forum, shaped as a multispecies intertidal table, established in Skye in 2017 to envision environmentally regenerative and socially reparative forms of food production based on metabolic interactions between humans and depleted landscapes that benefit a plethora of species. CLIMAVORE's site responsive methodology relies on a socially-engaged art practice, consisting of fieldwork, interviews, working groups, oral histories, performative meals, cooking and building apprenticeships, tidal gardening, material testing and public art installations. Ongoing collaboration with residents, scientists, and policymakers critically explores ways of living not only *on* but *with* the coast. This new holistic approach to coastal nourishment provides methodologies for ecological praxis as well as a platform for researchers and the general public to imagine an alternative ecological future: the tidal commons.

**Keywords:** climavore, metabolism, aquaculture, salmon feedlot, extractivism, dead zones, tidal commons

# 1—Dyeing in the Anthropocene

In June 2018 the feathers of a sparrow in Scotland turned pink after eating feed pellets from a nearby salmon farm (BBC, 2018). The sparrow literally turned salmon: an ornithological sighting that revealed how feeding colour is a common aquaculture practice, making salmon acquire the salmon tone humans and markets demand (Johnson & An, 1991). Metabolic distress in the bird's body was a red flag exposing pigment contamination from astaxanthin carotenoids in farmed salmon—UK's top food export and the fastest growing food system in the world led by Norway, Chile and Scotland. Colour and other chemical leaks from salmon farms require new aesthetics to see the multiple shades of the Anthropocene.

In salmon, astaxanthin is the vector of the struggle of altered fish bodies dependent on industrial, posthuman care without which the specimens would collapse (Braidotti & Hlavajova, 2018). The SalmoFan™ is the chart that indicates how to maximise consumers' willingness to pay for the colour of wildness (Cooking Sections, 2020). Dark red salmon is perceived as wild and healthy, whereas pale salmon is difficult to sell at any price. Following Hannah Landecker's analysis of the externalities of animals feeding on corporate waste that are then fed to humans, so many toxic substances are circulating through bodies that bodies may actually be the ones circulating through chemicals—not the other way around (Landecker, 2019). Pink sparrows and farmed salmon reveal how bodies are no longer metabolising colour; it is colour, and its market imperatives that are metabolising bodies.



Fig 1. The SalmoFan™ is the colour chart that the industry uses to choose the artificial salmon for your salmon. Photo: Cooking Sections.

Advancing forms of cross-disciplinary praxis, this paper explores and articulates ecologies of toxicity from a transcorporeal and transcalar perspective in more-than-human worlds. It seeks to retune our senses and develop new ways of seeing in the climate crisis, while divesting from extractive aquaculture through activist, artistic and scientific interventions. Practice-based methodologies include engaging with research-creation as ecological praxis (Loveless, 2019), implementing low-trophic theory (Åsberg et al., 2020; Radomska & Åsberg, 2022), and devising catalysts for ecological awareness and ocean literacy (Cartiere & Wingate, 2019; Ebbin, 2020). Following the need to reimagine novel ecologies as ways of healing (Davis, 2022), this paper compiles the multiple site-specific projects run under our artistic collaborative practice CLIMAVORE, a term we coined in 2015 to investigate food systems as humans change climates.<sup>1</sup>

Departing from social theories of the commons (McCay, 2009; Ostrom, 2015; Bollier & Helfrich, 2019) and the undercommons (Harney & Moten, 2013), the projects discussed here recognise the importance of spaces of fugitive resistance that do not comply with the established order. In line with Stefano Harney and Fred Moten's framework, the goal is to use common experiments with the informal, launched from any kitchen, any basement, any hall, any park bench, any improvised party. Planning in the undercommons, they continue,

<sup>1</sup> CLIMAVORE started as a commission to Cooking Sections that later grew to become the CLIMAVORE Station, registered as a Community Interest Company in Scotland in 2019. Using methodologies learnt in Skye and Raasay, the project has expanded into a framework dealing with a season of drought in Southern Italy and the disappearance of wetlands Istanbul under CLIMAVORE x Jameel at the Royal College of Art.

is “not an activity, not fishing or dancing or teaching or loving, but the ceaseless experiment with the futural presence of the forms of life that make such activities possible.” Barbadian poet Kamau Brathwaite coined the idea of *tidalectics* to challenge the linearity and fixity of Western dialectics bifurcating nature and culture, proposing instead alter/native epistemologies that follow the constant flow of the tides (Brathwaite, 1999). Like in his native Caribbean, the space between waves and currents in Scotland has long connected people travelling and trading, controlling and resisting, living and loving across shores.

Taking ocean water as a four-dimensional medium that moves space and bodies, backwards and forwards, in cyclic motion across an uninterrupted continuum, the *tidal commons* is proposed here as a framework that builds upon an overlay of histories and approximations defying chronological order and linear progression. By working with residents to implement a range of rhizomatic projects in the northwest Scottish islands of Skye and Raasay—including the creation of public fora, school curricula, restaurant menus, performative meals, tidal orchards and waste materials—this paper makes a case for a replicable practice in the Blue Humanities to advance ecological and economic transitions for coastal communities that are exposed to toxicity and extractivism at their doorstep. Using the liminality of the tidal zone—a space of ecological diversity on the margins, of refuge and resistance—it brings collaborations with teachers, chefs, marine biologists, fisherfolk, community trusts, councillors and stonemasons together to devise ways to metabolise climate breakdown. The tidal commons is an alternative series of tools for residents and communities to tint livelihoods and ecologies in the colours they actually wish to see.

## 2—CLIMAVORE Methodologies for Ecological Praxis

In September 2017, just a few months after the British Crown Estate devolved 16,500 km of coastline to the Scottish government (MacAskill, 2020), CLIMAVORE launched a multi-layered project to put forward cross-disciplinary tools for ecologically regenerative and socially reparative frameworks through collective usership of the coast. We began to work not *on* but *in* Skye and Raasay—a prepositional struggle for residents not to inhabit a peripheral island dependent on somewhere else’s centre that differentiates top-down from bottom-up engagement. The goal was to move away from imposed sacrifice zones for national and offshore profit, and instead make choices available for local residents.

Embedded within critical spatial practice, CLIMAVORE envisions forms of knowledge exchange which are reflective rather than objectifying, aiming to neither prove a hypothesis nor prescribe a particular methodology or solution to a problem, but to offer self-reflective modes of thought that seek to change the world (Rendell, 2011). Critical spatial practice—a kind of practice practised by (rather than on) spatial things—requires seeing space as an unstable condition to rethink one’s modes of action and codes of conduct. Eyal Weizman notes it is a discipline used for the democratisation of the built environment, diffusing the agency of shaping space to all those individuals, communities, organisations, stake- and shareholders who are not necessarily professional planners, but end up many times as the ‘victims’ of planning, ruled by corporate and governmental interests (Hirsch & Miessen, 2012). Situated within a similar approach, the project in Skye and Raasay operates at the intersection of visual arts, ecology, science, performance, food justice, and architecture, questioning how to *unbuild* and *rebuild* the spaces scarred by intensive salmon aquaculture.

Extractivism in the food supply chain has eroded bodies, ecologies, and climates, distorting nutrient flows and seasonalities. To speed up growth in salmon farms, seasons are altered through artificial light that tricks salmon’s perception of time: a perpetual summer without winter (CIWF, 2021). At a global scale, the lines between spring, summer, autumn and winter; dry or rainy seasons, are also increasingly fuzzy, while periods of polluted oceans, soil exhaustion and droughts are more prevalent. CLIMAVORE proposes an adaptive form of eating, shifting to filter feeders during times of polluted waters by fish farms or drought-resistant crops under water scarcity. Taking into account how interconnected metabolisms flow and feed on each other, CLIMAVORE blurs the perception of where one body stops and another one begins (Morton 2010). Thus, a metabolic approach uses here food as a tool and lens to investigate the toxicities behind salmon aquaculture by tracing who is digesting whom (Lien, 2015); i.e. salmon fish eating salmon colour, sparrows turning salmon; humans eating to cultivate climates, or climates actually feeding on human diets.

Mounting evidence of ecological harms coupled with the decline in social acceptability of corporate aquaculture requires a transition towards non-extractive, regenerative cultivation of filter feeding ingredients at a local scale, such as bivalves and seaweeds, to engage people in sourcing food from and with the tides. The consecutive set of projects imagine a transition into alternative systems using cultural and artistic tools to shift the scope of the shores from an extractive site for corporate profit to a space for human and nonhuman nourishment; addressing land struggles, the right to food, and redistribution of wealth through the tidal commons. To initiate that process, a public forum was set in the intertidal zone of Portree, the largest town in Skye. Originally commissioned in 2017 by ATLAS Arts, a local arts organisation, the project was modelled after trestle structures used in oyster aquaculture, but shaped as a *multispecies* table. Each day at high tide, its bivalves and seaweeds filtered and oxygenated seawater, while supporting different ecologies. At low tide the table and its benches emerged above the sea and functioned as a new public forum, a multidimensional space for politics, ecology, law, and economy (Weizman, 2014). It served as a dining table for humans to formulate visions for a liminal space constantly shifting between terrestrial and marine culture and jurisdiction.

Following Bruno Latour, such fora can constitute a collective, a community incorporating humans and nonhumans building on the experiences of the sciences as they are actually practised (Latour, 2004). Over breakfast, lunch or dinner (according to the tides), the structure was activated by conversation, debate, and shared meals with residents, politicians, scientists, fishers, educators, artists and researchers, re-connecting people with the coast while tasting ingredients that filter seawater by breathing. Eating and feeding are sites of transformation across a variety of bodies and selves, not only among but also beside ourselves (Paxson, 2023). Seafood in this sense is literally made of sea and sea dwellers, acting as a key culinary infrastructure that uses basic facilities and technologies to convey knowledge, power, and geopolitics, while making humans digest the entire water cycle (Pilcher, 2018). During performative conversations and workshops, humans enjoyed bloody oyster cocktails, twice hand-dived scallops, tidal crispbread, kelp lasagna, and quintessential dulse soup.

The multispecies table brought residents to a familiar site that is often (under)looked at from the shore. It became a reason to inhabit the tidal zone, sometimes for the first time, evidencing disconnection with the coastal landscape. A two-minute-walk at low tide with wellies or barefoot, the setting switched diners' perspective from the sea inland. The short window of the tide, two to three hours, created a sense of urgency to build a common ground for conversation and action. At the table, out of their comfort zones, residents shared frustration, desire, dissent, and when present, confronted local decision makers for inaction towards salmon farm pollution. Some were glad the tide forced debates to end, while others prolonged the conversation until water almost filled their waders.

Urbanisation and globalisation combine with climate and other changes to trigger new hybrid communities, recombinant and feral ecologies (Rotherham, 2017; Barua, 2022; Tsing et al., 2021). However, current thinking in conservation fails to accommodate the consequences of changing environmental conditions, including fusion of species and ecological communities. Accommodating 30-40 human guests at a time, the design of the table allowed both a central stage for a single debate as well as separate conversations on side benches. The feeling of fighting together for a common cause fueled new forms of kin among residents living in scattered parts of the islands. Schoolchildren used it as a multidirectional outdoor classroom, where birds, seaweeds, and shellfish dwelled all around them. Intergenerational surveys engaged people with marine biology through lesser known non-human residents. These included mounds of shells indicating people's appropriation of the table as a picnic site, seagulls using the metal structure to drop shellfish to crack it open, and other companion species who would come to the table to feast on leftovers. As an artificial reef, the structure was colonised over time by different critters and seaweeds to shelter, latch, thrive or reproduce according to the shapes, surfaces, textures and sizes of its metal bars, ropes, buoys and anchoring points. Different forms of engagement and cross-species relationships, both planned and unplanned, made it successfully explicit at the table that the tidal zone is a space for recombinant publics to care for.

This is the shift argued for by back-to-the-land movements, which recognise that strong idealistic orientations towards ecological land stewardship can counter traditional profit-oriented agriculture or aquaculture through non-commercial farming (Sutherland et al., 2019). However, hindrances in setting up the multispecies table unveiled how marine licensing regulations are still designed for corporate operations, such as salmon aquaculture, discriminating against small-scale tidal farms. Setting up the latter in the form of the

table required identifying loopholes in the definition of permanence, framing the installation as a *temporary* structure. In regards to permitting, approval was sought from the three stakeholders involved—Marine Scotland, the harbour master, and the private landlord on the foreshore. In parallel, a permit to become ‘non-commercial oyster farmers’ was granted, a legal fiction whereby farming food ‘not for profit’ allowed the platform to exist, using intertidal groundedness as the antithesis to offshore corporate exception.

At a local level, limitations and obstacles included complaints from three neighbours on the shore, who were either employed by the salmon industry or had vacation rentals now facing people congregating in front. These frictions prompted sometimes uncomfortable conversations on the rights to collective usership of the tidal zone, a public space that suddenly took over people’s daily lives, desires, and imagination. The different phases and projects contributed to make a case for the tidal commons building on historical legacies and definitions of the common good. In this sense, ocean literacy not only brought along awareness about interconnected metabolisms, ecological webs and multi-species kinship, but the project also triggered new aesthetics, new forms of looking beyond one’s own shell, gut or skin, exposing the violence behind centuries of dispossession across space, bodies, and feed chains.



Fig 2. CLIMAVORE: *On Tidal Zones*. Cooking Sections, 2017-ongoing. Installation view. Photo: Nick Middleton.

### 3—Underwater Clearances

Scotland’s landscape has a long history of transformation led by industrialised animals. During the eighteenth to nineteenth century Clearances, an estimated 150,000 people were removed from the Lowlands and Highlands to make room for imperial breeds of Cheviot sheep (Ryder, 1968). Fuelled by the slave trade, new waves of capital contributed to an unprecedented land revolution (MacKinnon & Mackillop, 2020). As sheep became more valuable than humans, food systems and communal land-usership were dismantled (Devine, 2018). Traditional ecological knowledge was profoundly affected through the dissolution of Dùthchas, the end of the clan and transhumance systems, the enclosure of the commons, and the appropriation of hunting and fishing rights (Mhathúna, 2021).<sup>2</sup> Many uses of the land were not counted as uses because land use for the colonisers was primarily understood in terms of cultivation, and so colonialism was justified as using what was unused (Ahmed, 2019). Obviating customary rights, displaced Gaels were granted minimal plots of land through the 1886 Crofters’ Holdings (Scotland) Act (Wightman, 2015). Averaging five hectares in size and stretching to the ‘unproductive’ shore where possible, they were the tactic deployed by new landlords mitigating the possibility of ancestral land-users starving or rioting. In places like Skye, where tourism and second-home ownership have made housing unaffordable, retaining croft land and rethinking ownership models is now synonymous with rural empowerment to continue advocating for land reform (Calo et al., 2022). New approaches striving not for sustainability but self-determination have made it difficult to ‘decroft’ land for non-farming purposes, opening up new movements and forms of civic organisation.

<sup>2</sup> Ingredient names have been kept both in Gaelic and English.

Three centuries after the sheep arrived en masse, the proliferation of farmed salmon across the west coast is creating a new wave of underwater clearances, as feedlots erase and displace a multitude of human and nonhuman beings in Scotland, and overseas. Once homestead-scale enterprises, salmon farms have grown into global conglomerates with five main companies owning over 96% of Scottish salmon production (SSW, 2019; SAMS, 2018). The untreated waste they release equals half of Scotland's human excrement (CIWF, 2021), which also includes chemical runoff from insecticides and delousing medication that accumulate in organisms along the trophic chain, traceable in far away locations (Tett, 2018; SEPA, 2018). And yet, the industry's main defence argument is local job provision. Over the eight years of our work in Skye and Raasay, most interlocutors have been discrete in expressing criticality towards the salmon industry at first. It takes time and trust to share entanglements between labour struggles and coastal toxicity, as relatives, neighbours, or friends' livelihoods are made dependent on polluting industries. From the beginning, the project acknowledged the violence and complicated sensibilities around neoliberal short-termism, refuse and precarious employment, while refusing sacrifice zones 'to feed the world.' But they not only damage the bodies of human labourers.

Salmon farms also scar fish bodies deep into their tissue, carrying the industry's imprint all the way to their guts, bones and sex to fight disease and sea lice, enhancing productivity (Lymbery, 2002). As one of the most recently domesticated species in modern history, salmon are bred to be hungry; they must put on weight at any cost (Lien, 2015). Like others confined in factory-farms—feedlot beef, battery broilers, megafarm hogs—their existence is undermined by pollution, pests, and profitability (Blanchette, 2020). Salmon are densely packed, enclosed in feedlots with one to two hundred thousand other fish (Turnbull et al., 2005). Resulting deformities include stunted growth, misshapen hearts, damaged brains, blindness, and deafness (Vindas et al., 2016; Remø et al., 2017; Reimer et al., 2016). Acceleration also causes melancholia, but instead of making fish life less stressful, farming corporations feed them stress relief antidepressants (Herrera et al., 2019). To protect their wild counterparts in the (taken for granted) case of escape, most salmon are bred to be sterile, which makes them not exert energy on reproductive affairs and reach market weight faster (Xu et al., 2022).

The distinction between wild and non-wild appeared when naturecultures showed signs of collapse (Haraway, 2003; Rose, 2004). The wild is neither a place you can go nor a site you can visit; it limns experiences of time and place, past and present, and beckons us to a future we know will never come (Halberstam, 2020). Similarly, wild salmon is a category invented for a system destroyed by overfishing and aquaculture that differentiates domesticated from non-domesticated fish. Rather than wild, it would be more accurate to describe them as stream-spawning, since compensatory policies make hatcheries yearly release millions of juveniles into water streams to replenish depleted populations (Swanson et al., 2018). Domestication perpetuates disorientation, pushing species to extinction.

In parallel, millions of salmon escape feedlots during winter storms or when predators break the nets. In Scotland, around 146,000 escapees are reported annually (Tett, 2018), but single events can reach much higher numbers, such as the 300,000-fish escape off the coast of Washington in summer 2017. Free salmon should return upstream, but domesticated escapees deviate, with neither the memory to migrate to their ancestral river nor the olfactory capacity to find it (Ueda et al., 2021). Unable to become returnees, escapees drift due to their blurred senses and the damage caused by intraspecies genetic homogenisation (Östergren et al., 2021). If they are not sterile and mate with free counterparts, corporate diseases may enter other bodies, leaving a genetic imprint, a lethal life mark (SAMS, 2018). These entanglements are not necessarily negative. 'Genetic erosion' of a 'pure' species risks engaging in eugenic discourses, especially when unexpected ecological assemblages allow for other forms of queer kinship to flourish (Davis, 2022).

Repercussions of intensive aquaculture cannot be contained by the salmon's skin or the confines of underwater pens. Pollution billows out, seeping across boundaries of land, water, and flesh; making toxins permeate humans and more-than-humans without consent in new forms of molecular colonialism (Agard-Jones, 2013; Tsing et al., 2019). These chemical regimes guiding industrialised living extend the biopolitics of life towards the molecularization of life, as market efficiency increasingly alters bodies through those seepages from the inside-out (Murphy, 2008; Davis, 2022). Even if feedlot salmon escape their medicated enclosures, there is no 'outside' outside the post-species body, or the post-industrial habitat (Landecker, 2013). Bodies are porous and permeable, not impenetrable, composed of what surrounds them

(Chen, 2012). And yet, farmed fish are trapped in their own modified viscera, their engineered skins, the true edges of their confinement. Paradoxically, chemical fluidity with the surrounding makes them only more caged. Biologists would follow predator-prey relations to understand the metabolic interactions between stream-spawning salmon, parasites and viruses scarring bodies in underwater pens. CLIMAVORE's practice in Skye and Raasay recalibrates those roles to position humans (extractive food industries in particular) as the actual 'virus' that farmed fish cannot escape.

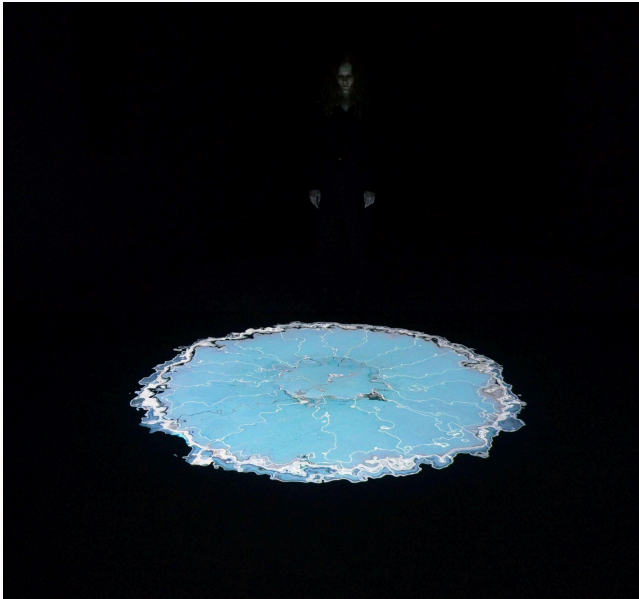


Fig 3. *Salmon: Traces of Escapees*. Cooking Sections, 2022. Installation view. Photo: the authors.

Animal feeding requires a vast amount of space, logistics and infrastructure that concentrate matter into waves of *waste* colonialism (Liboiron, 2021). Such processes of dispossession by contamination make unexpected particles penetrate all the way into our DNA. A metabolic rift makes the extraction of flows not return to where they came from, contributing to overdevelopment in privileged geographies at the cost of underdevelopment in zones where extractivism physically takes place (Wark, 2015). In Skye, the salmon feed facility newly built in Kyleakin, opposed by neighbours and environmentalists for its stench and ocean floor damage, annually produces 240,000 tonnes of pellets that rely on landscape-consuming practices worldwide in order to supplement salmon's dietary deficiencies in the pen (FF, 2020; Tett, 2018). Over time, the industry has perfected a planetary assembly and disassembly line to convert exhausted spaces and bodies from faraway ecologies into vibrant flesh and colour.

As Hannah Landecker points out, the modern idea that salmon's omega-3 fatty acids are good for humans originates from epidemiological studies in the 1970s in 24 Greenlandic Inuits whose diets evidenced null cardiovascular diseases, which soon shifted the thinking about fish as drugs to drugs as fish (Dyerberg & Bang, 1979). Making healthy nutrients reach our gut via farmed salmon metabolism is not simple. In the Arctic and Antarctic, factory boats *suck* krill out of the water to extract omega-3 oils, leaving seals, whales, birds and penguins to starve. In the subtropics, trawlers deplete anchovy and sardine populations off the coasts of Peru, Senegal, Western Sahara, India, Thailand, Vietnam, or the Philippines, where processing facilities render staple fish into fishmeal and fish oil. These FMFO facilities concentrate global matter into palatable lumps for global exports, leaving the sludge and stench of fishmeal behind.

Fishmeal removes fish meals from local markets, creating nutritional pathologies in the global South to satisfy the global North's voracious salmon protein appetite (Isaacs, 2016). Those living on the shores of trawling hotspots are increasingly deprived of ancestral fisheries, resulting in iron, zinc, and calcium deficiencies (Vianna et al., 2020). And like anchovies and sardines flowing to salmon-consuming countries, fishless and jobless bodies migrate following the same currents to Europe or the US (Green, 2018). Their families bear the brunt of 'blue economies' that sacrifice people's futures, so farmed salmon can be fed mined nutrients and displaced labour; fed Somali food security, fed the fish oils of Mauritania and The Gambia, fed the food of West Africa. Salmon is nutritious because it leaves other people without nourishment (Starin, 2022; FAO, 2022). Farmed salmon are fed hunger when they are fed up.

Feeding seafood sea food is expensive, so replacement with peas, corn, wheat, sunflower, linseed, and rapeseed is seen as a ‘sustainable’ alternative replacing offshore oil with onshore protein. This creates problems further down the feed chain. If salmon are not fed nutrients mined from the sea, they are fed soy plantations in the quickly deforested Pampas and Amazon that strain the Guaraní aquifer to make soy make omega-3. Other ‘improvements’ such as catching wrasse fish to eat the lice in salmon depletes faraway ecosystems. Locating salmon farms in deeper waters only makes pollutants less visible. Moving the pens inland does not address fish welfare or extractivist feed supply chains. Growing kelp to bioremediate dead zones under feedlots, or using it as feed to replace imported soy, does not end chemical sludge.

Increasing awareness about the global environmental impact of salmon aquaculture has increased objections across the Scottish Highlands and Islands; and yet, ministers keep overturning local council’s decisions to stop the expansion of salmon farms for the sake of the UK’s economy (Mackenzie, 2023). Indeed, finfish aquaculture is scheduled to grow almost 50% by 2030, despite reports authored by the Scottish Association of Marine Science presented in Parliament (SAMS, 2018). Despite disease outbreaks, antibiotic and excrement runoff involved in its production, salmon is seen as emblematic Scottish food, one of the most profitable items on the menu, and a healthy low-carbon alternative to beef in school meals. But other ways to create responsible employment and diets that do not exhaust landscapes to feed carnivorous fish need further testing. When the landscape eats itself, society eats itself (Landecker, 2023). It is then our responsibility to divest from extractive systems and shift towards land- and water-use that focuses on primary sources of nutrients while nourishing the human and more-than-human ecologies they come from. In this context, CLIMAVORE’s practice in Skye and Raasay consists of a set of methodologies to advance alternative aqua-cultures through multiple fora that bring bodies, disciplines and stakeholders together into present, past and future understandings of non-extractive coastal nourishment. Menu changes and public tastings around alternative low-trophic high-protein ingredients have amalgamated efforts to both recover the culinary heritage of staple tidal foods while working on cultivating *sea food* anew.

## 4—Metabolic Streams

Eating in the 21st century needs to happen within an ecosystem. But in the climate emergency, the English term ecosystem—first coined in print in the mid-1930s although intrinsic to many indigenous beliefs—needs to be revisited. New forms of equilibrium are required to unlearn decades of limitless growth, a radical politico-economic reorganisation that can lead to smaller and more equitable social metabolisms (Gerber, 2020). Thus, metabolic interactions woven through multispecies food webs provide CLIMAVORE eaters and eateries with the agency to adapt diets and desires to a planet in crisis, and think of *sea food* from a different perspective. After four years, the multispecies table, originally permitted for six months, was taken out of the water in October 2021, but the work of the CLIMAVORE Station in Skye and Raasay has continued through a range of collaborations along three streams: Relearning, Regrowing, and Rebuilding that use regenerative ingredients to advance the tidal commons.

### 4.1 Relearning

Bivalves and seaweeds have been declared climate-fixers and carbon sinks—a boom in financialised assets to incentivise the ‘blue economy.’ Increasingly, more than a food source, the coast is seen as a gold mine for mitigation, not decarbonisation, providing environmental services to remediate the Anthropocene. Yet offsetting calculates nature’s value for human benefit without deconstructing inherent extractivism (Cooking Sections, 2022). Decades of grassroots work fighting for food sovereignty and agroecology have challenged agribusiness interests, but coastal landscapes need to be regarded as living habitats, not return on investments. Against corporate appropriations of sustainability and nature-based solutions, CLIMAVORE seeks to use food as a tool to proactively restore environments while tackling the source of pollution. Aiming to unlearn infrastructures of modernity, externalities and techno-fixes, its approaches to sea-farming revolve around traditional ecological knowledge, common sense, and communal sensing. As anthropologist Bonnie McCay remarks when analysing coastal commoning strategies, the liminal space of the littoral is a construct

crucial to the creation of *communitas*, moments or events when people put aside their differences to come together in celebration of the past or to create new futures (McCay, 2009; 2017).

Etymologically connected to *Bouillon Restaurant*, the word ‘restaurant’ referred to an establishment in eighteenth-century France whose name literally translated as restorative soup. Named after a quasi-medicinal specialty dish, the soup, and the space to eat it, intended to nourish, heal and warm up people’s bodies (Spang, 2000).<sup>3</sup> In the climate emergency, the restaurant, alongside school canteens, collective kitchens, museum cafes and other feeding spaces in cultural platforms, are places not only to restore the human body but also care for the planet’s ecology; to promote systems that grow regenerative foods while cultivating habitats. Since 2017, restaurants across Skye and Raasay have removed farmed salmon from their menu and incorporated bivalves and seaweeds in dishes to promote ways of eating with and for the coast. Through new cooking apprenticeship programmes we set up with the local high school in Portree, restaurants are training the next generation of climavore cooks on the islands.<sup>4</sup> Working closely with chefs, foragers, divers, bakers, brewers and kitchen teams, the apprentices invent, prepare and serve climavore. In parallel, this strand has assembled personal memories, recipes, songs, postcards, photographs and films, capturing shared coastal experiences around these ingredients through Gaelic folklore and place names.

Aiming to divest away from salmon farming and develop alternative aqua-cultures for the tidal commons, *Becoming CLIMAVORE* was set up as a campaign and a global network of more than twenty museums, cultural and pedagogical institutions that joined the restaurants in Skye and Raasay to unmake their menus and adapt their food offerings to the climate crisis. Striving to take action towards food justice, the move encompasses collaborations with Tate and Serpentine Galleries in London, IKSU in Istanbul, Køs in Køge or SPACES in Cleveland.

Becoming is a continuous process opposed to the steadiness of being. Like the act of cultivating or filter feeding, becoming acknowledges that things exist in a state of perpetual movement and flux, and invites to think about dynamic processes beyond essentialist visions from the past (Stark, 2017). Becoming is a process that itself requires constant questioning and reiteration, again and again, even if becoming can become tiresome. Following Sara Ahmed, to change existing practices, to unlearn and relearn, is challenging, but, knocking on institutional doors, opening them up, and keeping them open is an effective form of feminist pedagogy (Ahmed, 2021). Becoming CLIMAVORE is not only a process to question and reimagine menus, but it is also a framework to nourish public access to foodways that produce spaces of collectivity and bodies in constant exchange. It embraces the agency of desire as a force that makes and does things, rather than evidencing that something is lacking. Desire emerges thus as a force that generates active, forceful and hopeful forms of becoming.

## 4.2 Regrowing

Cleared from their lands, coastal inhabitants in Scotland had to feed on the margins. Since salmon became the property of landlords with fishing rights in newly enclosed estates, common people were relegated to other ‘floating fish’ caught in weirs and ‘non-floating species’ from shellfish beds. As seaware appreciated in the 18th century, crofters were sometimes granted access to common grazing in return for ‘kelping the tides,’ mainly for industrial purposes. Kelp-gatherers would not limit themselves to ceilp (kelp), but also collected similar-looking seaweeds or black wrack, *slaodach* (serrated wrack), *feamainn bhuilgeanach* (knotted wrack), *iomleach* (thongweed), or *gille-mu-lunn* (mermaid’s tresses). Once brought to the croft, the many ‘kelps’ were laid on *feannagan* (lazy beds) to fertilise the long and narrow raised beds with layers of turf and nutrient-rich seaweed.<sup>5</sup>

Apart from their fertilising capacity, seaweeds and other ingredients gathered from the foreshore also supplemented the crofters diet. Stigmatised ‘famine foods’ included *duileasg* (dulse), *slòcan* (sloke/laver),

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<sup>3</sup> Antoine Furetière’s 1708 *Dictionnaire Universel* defines restaurant as a ‘Food or remedy that has the property of restoring lost strength to a sickly or tired individual.’

<sup>4</sup> Use of upper case in CLIMAVORE refers to the project in Skye and Raasay, whereas climavore (lowercase) refers to a framework that can be used by anyone, as in vegetarian diet (climavore diet).

<sup>5</sup> The beds were ‘lazy’ because the ground was simply inverted by a spade, instead of a plough, so the land did not physically need to be worked as much. The name may instead originate from Old Norse *lasenn* (dilapidated, fragile), which perhaps more accurately defines the rough ground on which seaweeds were laid to nurture it.

glasag (sea lettuce), or langadal (sugar wrack). People learnt how to identify seaware—its flavours and uses for cooking—as much as it became a subject of study for others across the class divide, who did not economically depend on them to survive, but made them into cult objects of public desire and Victorian admiration. Seaweeds became a window for upper class women in Britain restricted from practising science, who resorted to botanical art and illustration of tidal flora to advance knowledge production. Their work was disregarded by most male contemporaries as a ‘suitably genteel hobby,’ an ‘acceptable pastime.’ Anna Atkins is perhaps the most outstanding figure, who used photographic technologies to push scientific research, developing new ways of seeing nature. *Photographs of British Algae: Cyanotype Impressions* (1843) compiled her innovative methods, allowing nature to print itself in a range of blues. Her first ‘photographs’ of British algae ever made set the visual basis to understand geometries, growth and reproduction patterns. Along the lines of the salmon sparrow centuries later, Atkins’ use of cyanotypes created a paradigm shift through *machinic* vision that made people see the world in different tones.

Working with the archives and specimens of the Royal Botanic Garden in Edinburgh, CLIMAVORE assembled these histories into a public exhibition, *Tidal Records*, tracing histories that over centuries learned from the tidal zone and contributed to ocean literacy among different publics.<sup>6</sup> Highlighting the ecosocial role of tidal ingredients, the work of other lesser known ‘unacceptable scientists’ and collectors on the margins from the 18th-20th centuries were included in the display. As pioneers of the Blue Humanities, they transgressed rigorous observation with artistic depictions, while identifying species, inventing taxonomies, visual methods and lexicon to narrate them. In 1863, Margaret Gatty compiled *British Sea-weeds*, which simplified algological language for amateurs. Later on, Catharine Cutler provided specimens and illustrations to male botanists, who named *Cutleria* after her. Amelia Griffiths collected and preserved nearly 250 different species of seaweed, leading *Griffithsia* to be named in her honour. Mary Wyatt assisted Amelia Griffiths and jointly published *Algae Danmonienses*. Catharine Allardyce contributed to the naming of new species by other experts she worked with. Lilian Lyle published a pioneering study of *The Marine Algae of Guernsey* in 1920 and identified *Antithamnionella lyle*, which bears her name until today. In 1931, Lily Newton published *A Handbook of British Algae* purely from specimens in the British Museum of Natural History. Linda Irvine became an authority on coralline algae. But it was not until Kathleen Mary Drew that a female phycologist gained worldwide recognition due to her findings on slòcan (sloke, laver), which led to a boom in commercial cultivation of nori, especially in Japan. She co-founded the British Phycological Society in 1952 and served as its first president. Crossing the gendered boundaries of legitimate science of the time, Atkins, Gatty, Cutler, Griffiths, Wyatt, Allardyce, Lyle, Newton, Irvine, and Drew all popularised species that relied on healthy environments to survive. They developed new ways of seeing the coast. Laying the foundations for the cultivation of tidal foods, they captured underwater life sensing what industrialism was making extinct.

Building on centuries of foraging and appreciation, CLIMAVORE developed a pilot modular system in Skye and Raasay to grow multiple low-trophic species while cultivating their habitats. Conceived as a sea allotment accessible on foot, the community-owned tidal farm prototype consisted of ropes and nets made out of plant-fibres, scarred stones, trestles and tidal gardens to grow red, green, and brown seaweeds; sea vegetables and bivalves. The ambition is not to introduce other species but to enhance the already existing ones by providing additional surfaces to attach to, or trimming down other surrounding species to slow down their growth and prioritise the target ones. These experiments on marine biology have been run in partnership with local community trusts to enhance the tidal commons through sea allotments that can support local food sources from the intertidal, while generating new revenue streams.

### 4.3 Rebuilding

Seaweeds and bivalves have been key in human and nonhuman diets, but also used as building substrate across geographies over millennia. Their role in providing nourishment and shelter has supported coastal dwellers to invent building techniques such as thatching, cladding, insulation, and plastering incorporating them. Both ingredient and material, seaweeds and bivalves can advance an architecture for the tidal commons. In Skye, CLIMAVORE has forged a new link between the food and construction industries by turning food waste into a building component, white shell lime, that replaces highly polluting cement, while

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<sup>6</sup> Cooking Sections, *Tidal Records* exhibition at RBGE, Edinburgh, 6/26-8/29/2021. Advisors: Max Coleman, Kirsty MacDonald, Heleen Plaisier, Clare Scanlan, and Martin Wilkinson.

reducing landfill waste and imported materials. Learning from previous experiments we developed in New Orleans, Taiwan and Los Angeles, collaborations with local fabricators, stonemasons, and material scientists have led to the prototype of a new terrazzo-like composite that replaces cement and petrochemical resins with seashells collected from climavore restaurants. As opposed to uniform synthetic materials, the rough surface and texture of the new composite reveals its nature: a mixture of shell lime and shell aggregate recognisable in the grain, colour and shine of the different heterogeneous components that make up for the surface. Using hydraulic pressure, additional sets of prototypes were required to produce custom-made die casts in order to withstand compaction and form solid rock just out of crushed shells and water—a geological process that would otherwise take millions of years underground. What started with dyeing and colouration to trace metabolic flows has moved on to dieing and compaction as a way to digest alternative nourishment. In parallel to our shell midden and fabrication workshop, a new syllabus at the West Highland College Construction Skills Course has also taught how to construct climavore.

Instead of externalising it, food waste is metabolised, incorporated into the nourishment process to recirculate it. As a consequence of food becoming cheaper, corporations have relied on such ‘circular economies’ to balance externalities and capital accumulation. If we take the pork industry as an example, it is no longer the meat that leads the value chain but the renderings and byproducts that monetise waste (Blanchette, 2020). This ambition is also evident in the salmon industry with new goals to expand the transformation of blood, viscera, heads and trimmings into subsidiary products and industries—be it fertiliser, pet food or nutraceutical supplements. For CLIMAVORE, circularity and efficiency take a different path, one that does not follow the industrialised pig or salmon commodity frontiers. Instead, it puts forward a Public-Common Partnership (PCP) framework for the tidal commons. Imagined as a reverse engineering of Public-Private Partnerships, PCPs propose both de-risking and enabling processes of commoning through new strategies for municipalism against the legacy of the enclosures (Heron et al., 2022). Developed in partnership with Abundance, a UK-based organisation that promotes public-common strategies to democratise the economy and realise a just socio-ecological transition for everyone, the logic of a PCP scheme in Skye and Raasay aims instead to evolve from a circular economy model (monetising waste streams for individual or corporate profit) to a commoning economy (monetising waste for wealth redistribution).<sup>7</sup>

The tidal commons framework envisions the shores of the country to be publicly owned and collectively used, preventing extractive practices such as salmon farming, while reinforcing food security in ecologically respectful ways. Different global experiences have outlined the social and environmental benefits of cooperatives advancing ways to empower coastal residents and reimagine coastal food systems, while thinking with kelp and other sea species to push conservation, commoning, and legal action (Araos et al., 2023). Following Erik Olin Wright’s strategy of eroding capitalism, the tidal commons framework builds on more democratic, egalitarian, participatory economic relations and emancipatory economic spaces through collective actors entering the cracks of this complex system (Wright, 2021). The PCP at the base of the tidal commons is conceived through a Common Good Fund, a figure inherited from similar models in Scotland, where they originated in the 15th century to represent a substantial portfolio of land, property and investments that once belonged to Scotland’s Burghs. The Funds are now managed by Scotland’s 32 local authorities, and each Fund is typically governed by a small committee of Councillors. However in practice, these assets have often been inadvertently disposed of, squandered through corruption, or enclosed through prescription.<sup>8</sup> At the core of the tidal commons framework developed with Abundance, the Common Good Funds should be radically revitalised, realising their potential to support new forms of democratic public ownership. The tidal commons envisions a PCP whereby the revenue of community sea allotments and the venture producing waste-shell composites can feed into a common shared pool, making alternative modes of seeing, and living not only on, but *with* the coast.

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<sup>7</sup> Participants in the first Tidal Commons workshop included Malcolm Combe, Chrissie Giles, Col Gordon, Bobby Macaulay, Iain MacKinnon, Catriona Malloys, Theona Morrison, Andy Wightman, Francisco Araos, and Magnus Davidson. Convened by Miriam Brett, Kai Heron, Keir Milburn, Bertie Russell, Daniel Fernández Pascual, Alon Schwabe, Dani Burrows, and Shona Cameron. Held at Royal Botanic Garden Edinburgh, 7/30/2022.

<sup>8</sup> Ibid.



Fig 4. *From The Shores That Found Their Sea*. Cooking Sections, 2022. Installation view. Photo: the authors.



Fig 5. *Bivalve Murals*. Cooking Sections, 2023-ongoing. Photo: CLIMAVORE CIC.

## 5—Shells as Environmental Witnesses of the Future

At the high edge of the tidal zone, ancient middens—mounds of discarded shells—evidence ancestral diets and indigenous presence. Bivalves have been accessible protein sources worldwide, strengthening food security, sovereignty, and the human brain (Duarte, 2014). Their materiality also records histories of coastal inhabitation as witnesses of the Anthropocene (Schuppli, 2020). Like tree rings dating climate changes or the lines in salmon scales indicating water chemistry, the growth bands in seashells evidence environmental transformation. They materially record their surroundings. Eisirean (oysters), feusgain (mussels), creachainn

(scallops), coileach (cockles), and other bivalves not only recirculate water in order to feed. They improve coastal habitats by adding oxygen, removing carbon dioxide, and absorbing nutrient excess. One mussel is able to filter up to 25 litres of water a day. A single oyster can filter up to 150 and needs no irrigation, feed, drugs or fertilisers to be farmed. As they filter the sea, their shells capture information about oxygen, salinity, and floating matter.

Bivalves work like palimpsests, witnessing the intertwined relations between human and nonhuman forms of testimony, while storying multispecies worlds (Chao, 2022; van Dooren et al., 2016). In order to share the knowledge accumulated by CLIMAVORE and open up a space for public imagination, *Oyster Readings* was devised as a performative installation and a methodology to visually analyse the legacies of toxicity and the future of coastal inhabitation. Storying in this regard demands to differentiate between forms of disturbance that are inimical to all life and those that offer multispecies opportunities (Tsing, 2014). *Oyster Readings* was conceived after meeting an oysterman in Port Sulphur, Louisiana, who could read the coast with his hands.<sup>9</sup> By touching the sharp edges of familiar reefs, he could tell the environmental changes in oyster populations. Sensing the shore might not be more accurate than a fortune teller reading the palm of the hand, and yet, something divinatory in this practice resembles dendrochronology in trees, reading the lines and the colours of the past to understand the common future. Coupled with local knowledge from field interviews with indigenous residents, oyster shuckers, marine biologists and geologists, deep observations into the material history of bivalves revealed traces of growth, stress, hurricanes, floods, acidity and disease imprinted on shells as flavours, robustness, or discolouration. Weaving together human and oyster futures, reactions among those who got an oyster reading touched intimate points in life, bringing up strong memories and emotions. Most had never even imagined there could be parallel lines in bodily exchanges between those who inhabit above, between and beyond the shores.

Regardless of origin, oysters oxygenate the water but also bioaccumulate substances floating in it. Moving away from fixed binaries of ‘clean’ and ‘dirty,’ and learning from fluid gradients of toxicity and possibility embedded in queer understandings of ecology can open up eroticism, kinship, and care to more-than-human relations. This does not mean that humans should be fed heavy metals. Bivalve producers regularly test specimens for public safety, and in the event of lethal algal blooms, they stop all activity.

In Skye, a scallop diver family in Sligachan (Gaelic for ‘the place of many shells’) has used the foreshore like their Neolithic ancestors’ clam gardens. In good weather, young bivalves are brought from deeper waters to grow nearshore and be easily reachable, hence their name ‘twice-dived’. They are everyday custodians of the shore, watching salmon farms off the loch they live on, while monitoring water biodiversity, enhancing interactions between dolphins, starfish and bivalves. Their food sourcing practice also relies on storying: layering everyday knowledge and encounters with underwater toxicity from salmon farms in their long dives. But it is also a sensing tool to see the future, what the currents will bring, what species will dwell.



Fig 6. *Oyster Readings*. Cooking Sections, 2021. Installation view, Performance.  
Photo: courtesy RBGE.

<sup>9</sup> Commissioned by Prospect 5, New Orleans Triennial 10/23/2021-01/23/2022. Also shown at Cooking Sections, *In the Eddy of the Stream*, an exhibition at the Royal Botanic Garden Edinburgh 07/02-09/18/2022.

## 6—Conclusion: Growing Food, Cultivating Habitats

Tidal zones are liminal spaces that challenge the ecological, legal and financial thresholds of coastal areas. They appear, disappear, reappear, and constantly change in size and chemistry, while shaped by new human-made seasons of ocean pollution. These littoral spaces are at the core of entanglements between risk and social security, profit margins and contamination struggles, geological processes and weather events; between what is used and what is refused. Thinking with waste seashells and beach-cast seaweeds allows us to expand the possibilities of caring for coastal ecologies, while sensing and monitoring human actions affecting them. The tidal commons emerges from a set of methodologies for ecological praxis ranging from public fora, tastings and menu changes, to pedagogic programmes, sea allotments, exhibition-making, and internalised waste materials. They constitute a practice for implementation of alternative forms of world building, storytelling and conservation through the production of a metabolic lens to see the world anew. Skye and Raasay, like many other coastal communities impacted by underwater clearances from salmon farms worldwide, have the power to turn aquacultures and our imagination inside-out, connecting many bodies together. By bringing publics and commons into new alliances, PCP models can prove a viable alternative to the dependencies created by extractivist food production systems. The tidal commons is an invitation to follow our gut and build a flourishing world for a multiplicity of species in the present future.

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

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