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Still Holding: Plastic Pollution, Artistic Methods, and Accountability in Bohuslän

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Title: Still Holding: Plastic Pollution, Artistic Methods, and Accountability in Bohuslän

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Abstract:

Plastic pollution, with its origins in the production of petrochemical products, is pervasive worldwide, and significantly abundant in the global oceans. Plastics are slow to deteriorate and have already been identified in the fossil record, sitting in geological time. Ocean currents and marine winds determine where and how plastics accumulate and where these effects are concentrated. This article takes the pervasiveness of plastics in marine environments as marine violence as a point of departure in this article, which contributes a critical lens on marine science research that bridges the fields of marine science, environmental justice, and the blue humanities. By reflecting on a case study of marine science research on pollution and accountability led by Therese M. Karlsson on the west coast of Sweden and the author's own site-specific artistic research practice of poetry writing in the same study area, this article argues that the ways Karlsson et al. carry out their research in their case study are feminist and place this research in conversation with blue humanities methods of caring for specific places through creative practice. Furthermore, this article's analysis is continuously informed by environmental justice principles attentive to equity and health across species and ecosystems. Integrating artistic research into marine science research opens further possibilities for activating accountability processes with regards to marine plastic pollution for researchers working in these disciplines.

These approaches to research combined offer frameworks for the research to ask, “What am I holding on to? With whom? Where?”

Keywords: plastic pollution, marine pollution, environmental justice, artistic research, blue humanities, Skagerrak

Introduction

This article engages with plastic pollution in the region where the Swedish petrochemical industry is centered, on Sweden’s west coast, through a critical lens applied to a natural science case study and through artistic research. This mixed-methods approach uses a combination of go-along on a sailboat (or sail-along: rather than walking on land as one does in a go-along, this involved sailing along with marine scientist Therese M. Karlsson to one of her plastic pollution research sites); discourse analysis of Swedish plastic pollution reporting; content analysis of the selected case study—authored by Karlsson et al.—contextualized with a historical reading of the Swedish petrochemical industry through Fredric Bauer and Lea Fuenfschilling and Jason W. Moore; and artistic research in the form of site-specific poetry writing. This article both attributes violences—further developing the frame of accountability that the case study the author applies a feminist lens to in this article led by Therese M. Karlsson uses—of marine pollution and actively envisions alternatives to such violences, bridging the material analysis of political ecology with blue humanities and creative methods to advance environmental justice and blue humanities research with a commitment to opening up life-affirming possibilities for more just worlds through study of waste.

The author began in-person research for this article in the summer of 2019, when she conducted site visits to polluted locations in the Bohuslän province on the west coast of Sweden that included a sail-along with the marine scientist Therese M. Karlsson in the Lysekil archipelago. The author had learned of Karlsson's work not only due to the salience of Karlsson's research in the plastic pollution field but also because of long-standing relationships with people in the region. In the author's community in the Stenungsund area in Sweden, there are a number of people getting cancer, and this has made her concerned about the possible health impacts of the Swedish petrochemical industry based in the area, and wonder how an engagement with these health effects could be a way of practicing care. Karlsson generously invited the author to sail with her to a highly polluted island where she had conducted copious research, Gåsö, in the Lysekil archipelago in the Skagerrak Strait. During and following the author's sail-along with Karlsson, the author added another dimension to her qualitative research on marine pollution in the region: artistic research. On board Karlsson's boat and during other site visits over the course of several weeks in Bohuslän in the summer of 2019, the author carried out a data collection process of note-taking attending to the land and water in keeping with her understanding of feminist accountability with values of relationality and responsibility as theorized by Leanne Betasamosake Simpson (2020), Zoe Todd (2017), M. Murphy (2017), and Max Liboiron (2021), among others. During and following my sail-along with Karlsson and these site visits, the author conducted a synthesis process of composing poems with these notes. The author published these works in poetry publications and at a solo visual art exhibition and they are excerpted in this article as well (see the excerpt from the poem "Barnacle" and the poem **"Sometimes I want to be the log in the water"** within the **"Relational weaving following**

accountability: Feminist creative oceanography” section of the article).

This article analyzes two forms of taking a feminist approach to marine science: with the case study of Karlsson and her colleagues’ work on pollution and accountability rooted in relationship to place, “The Unaccountability Case of Plastic Pellet Pollution” (2018), and with the method of the author’s own artistic research practice, which for this research entailed photography and site-specific writing in order to engage the senses in engaging with plastic pollution and the environment of which this pollution was a part. These methods are part of a solid if scholastically recent tradition of artistic research in the field of blue humanities; see, for example, *from unincorporated territory [hacha]* by Craig Santos Perez, “Midnight Oil” by Sheryl St. Germain, and “Undersea” by Rachel Carson. The author combines these methodological approaches to attend to a context where plastic pollution is a player in geological time in a lineage of transnational economic endeavors including the Swedish East India Company. Plastic pollution on the west coast of Sweden composes particles of accumulated wealth and will pollute the region for centuries to come. In this article, the author show two ways forward that chart a different path than extraction and exploitation: research rooted in relationship and responsibility to place, and artistic research that opens up relational action. Translations from Swedish documents for—and errors in—this article are the author’s.

This article aims to hold a system of production accountable for violence that it produces by polluting local ecosystems. Pollution from plastics has harmful health effects across species (Brander 2013, Worm et al. 2017, Delaeter et al. 2022), and I understand these harmful health effects as slow violence (Nixon 2013). In this article, I argue that by prioritizing relationships to land and possibilities for accountability via legal processes in a tradition that social scientists

such as myself understand as feminist, the research Karlsson et al. (2018) have carried out refutes the violence of the Swedish petrochemical industry through a feminist research approach even though they do not describe this case study as such. This article's feminist environmental justice reading uses frameworks established by critical Indigenous feminists who theorize through water such as Max Liboiron (2021), M. Murphy (2017), and Leanne Betasamosake Simpson (2020). Their frameworks define and engage themes of accountability (to ecosystems that include humans) and responsibility. While the precise definition of accountability depends on context, this article draws on Leanne Betasamosake Simpson's formulation framing accountability as a process for maintaining ethical relationships (Simpson, 2020, 92; 218; 238). As Mike Gouldhawke argues, "How we relate to the land is tied to who we are" (Gouldhawke 2020, 14). This article argues that by working in a way that relies on ties to the land, the researchers in the case study enact a process of accountability and set a precedent for anticolonial science in Sweden. In addition to introducing anticolonial analyses in a Swedish context—where the state occupies a vast area of Sápmi (Sami land)—this article presents artistic research as an additional method to advance work against petrochemical violence and its legacies and toward caring practices for land.

Despite Sweden's reputation in the United States—from which the author, a white settler of Russian Jewish, Polish, and otherwise unknown European descent, writes—and elsewhere outside of Sweden as an ecologically responsible nation, it is also a nation instrumental in the production of petrochemical products. No fewer than five petrochemical plants are located in the Swedish city of Stenungsund, where the plants produce products such as polyvinyl chloride plasticizers (Perstorp, no date), polymers for cables "particularly for energy applications"

(Borealis, no date c), and plastic pellets to produce products with. What was previously Borealis and is now Borogue is the only polyethelene producer in Sweden (Borealis, no date d). This article has elected to “study up” (Nader, 1972)—or, as Nader has laid out, study the producers of the harms environmental justice researches rather than those suffering those harms downstream—to the source of plastics that enter the oceans at their economic roots. While this article takes as its point of departure the gravity of the downstream effects of plastics, it focuses on turning an environmental justice research lens toward researching origins of violence in the imperial core. It considers marine plastic pollution’s origins in production and how marine plastic pollution performs violence on people’s bodies while imagining alternatives to such systems of production and living. This article aims its lens at one of the sources of production of the toxicants that cause this violence rather than attending strictly to the health impacts themselves, contributing to a body of literature that has already thoroughly researched many effects of ecological violences, especially with regards to petrochemicals, but undertheorized those violences’ origins. This article uses studying up as a tool to advance Karlsson et al.’s work on accountability across disciplines from the natural sciences to the social sciences both by applying a feminist political ecology analysis to a study on petrochemical pollution and setting that in dialogue with the author’s own artistic research on pollution in the region. In addition to illuminating infrastructural, political-economic, and, above all, social problems of marine pollution—plastics in the ocean disproportionately affect people sexed female at birth, and they do so as a manifestation of an economic system that prioritizes profit and competition over cooperation and mutual aid—this research is committed to positing life-affirming alternatives to extractive

interactions with the oceans, including how individuals form and maintain relationships with the oceanic environments to which they are connected.

Situating this study

In Stenungsund, Swedish petrochemical production combines with a highly concentrated accumulation point for marine debris arriving on the North Atlantic Current from the Americas. Four currents converging in the Skagerrak Strait on the coast of Stenungsund and north of the city of Gothenburg render the region of Bohuslän the most polluted in all of Europe in terms of marine debris (Ekwing, 2019, n.p.). It is this confluence of production of plastics and accumulation of plastics—and associated capital—that this article takes as its point of departure. This convergence of plastic production and accumulation physically and financially demonstrates marine debris as a tangible aspect of a global system of commodity production.

In “13 ton plastpellets läckte ut - driver in längs Bohuskusten” (“13 tons of plastic pellets leaked - accumulating along the Bohuslän coast”), reporter Lisa Axelsson described plastic pellets that leaked from a container on a cargo ship, the M/V Trans Carrier, on its way from the Netherlands to Norway washing up on the Bohuslän coast in the spring of 2020 (Axelsson, 2020, n.p.). In 2016, Anders Ekwing reported in “Bohuskusten – hela Europas soptipp” (“The Bohus coast – the dump of Europe”) that “[o]n beaches in Bohuslän, Denmark’s west coast, and in the Norwegian Ytre Hvaler National Park, over 20,000 pieces were found per 100 meters” (Ekwing, 2016, n.p.).

[Production: insert Figure 1a here]

[Production: insert Figure 1b here]

Understanding physical oceanography is useful for understanding how pollution moves through oceans globally. Thermohaline and wind-driven circulation drive how the ocean moves globally (Simpson and Sharples, 2012) and contribute substantially to moderating the global climate. Changes in ocean pH affect the ocean's—the world's largest carbon sink—ability to fix carbon; increases in ocean pH decrease the ocean's carbon sequestration capacities (Levitus et al. 2001). The production (by, for instance, processing fossil fuels) and circulation (and subsequent deterioration and entry of materials such as plasticizers into the ocean) affects oceanic pH (Romera-Castillo et al. 2022). Ecotoxicological qualities and effects of hazardous chemicals that circulate in the oceans and accumulate via plastics in various beings in the ocean (Takada and Karapanagioti 2019). Ocean currents and marine winds determine where and how plastics accumulate and where these effects are concentrated.

The province of Bohuslän is located on the Skagerrak Strait and the northern part of the Kattegat Strait, the region of the North Sea directly to the west of the author's study site of Stenungsund that is protected by the Norwegian and Danish landmasses and where the Norwegian, Atlantic, Jutland, and Baltic Currents converge in the gyre (SMHI 2011) that circulates seawater and, with it, marine pollutants. Artur Svansson (1975) noted as early as 1975 that “cod liver from the Göteborg archipelago has been declared unfit for human consumption on account of high PCB content” (Svansson 1975, 35). While pollution—notably challenging to quantify (Rochman, 2016), even with precise tools—from the Gothenburg archipelago and the Lysekil archipelago further north where the author conducted research for this article may be at different levels today than pollution levels were at the time of Svansson's writing, it is critical to

consider marine pollution as part of a historical process that was present and affecting the oceans and global ecological processes already in the twentieth century.

Feminist accountability in the ocean, part I: Against extraction

There is a significant body of natural science scholarship on plastic pollution from the plastic production industry on the Swedish west coast thanks to marine scientists including the authors of the case study examined here, Therese M. Karlsson, Lars Arneborg, Bethanie Carney Almroth, Lena Gipperth, and Martin Hassellöv (2018). While this article focuses on their case study from their 2018 article led by Karlsson, the authors have collaborated in various capacities on various other articles (see, for example, Karlsson et al., 2020; Persson et al., 2021; Nylund et al., 2023). Karlsson et al.'s quantitative research is foundational to the argument in this article. This article analyzes a study Karlsson et al. conducted on plastic pollution titled “The Unaccountability Case of Plastic Pellet Pollution.” This work is carried out by a team of researchers who are all based in the region and focuses on plastic pellets. In their (2018) study, Karlsson et. al recorded 4,086 pellets “caught by a net that spanned the whole transect of the creek, collecting the surface water. Analysis confirmed that both new and older degraded plastics were present in the collected sample (Supplementary material 4A)” (Karlsson et al., 2018, 55) over the course of just one hour of measurement.

Karlsson et. al's “The Unaccountability Case of Plastic Pellet Pollution” looks into plastic pellet pollution from Borealis' “polyethylene production facility” (Karlsson et al., 2018, 53); the authors note that this facility “is the only polyethylene production site in Sweden and the annual polyethylene production capacity in Stenungsund amounts to 0.75Mtons (Mark- och miljödomstolen Vänersborg, 2015), which corresponds to approximately 5% of the European

polyethylene demand (PlasticsEurope, 2014)” (Karlsson et al., 2018, 53). It is therefore a noteworthy site at both Swedish and European scales; pollution from this plant is ecologically and socially significant. Karlsson et. al “make a first estimation of the total release of pre-production pellets from a production site to the surrounding environment and find it to be between 3 and 36 million pellets annually” (Karlsson et. al, 2018, 58). The authors find that “[e]xtensive occurrence of pellets on regional beaches are wide spread although declining further away from the industrial complex area but still extend several tenths of km in the complex archipelago” (Karlsson et. al, 2018, 58). Crucially, they “show documentation of spills around areas of subcontracted companies involved in transport, storage, cleaning and waste management. The release is expected to be a consequence of inadequate precautions during production, loading, transport and handling of the material” (Karlsson et. al, 2018, 58). They also found that “[t]he color signature of the pellets that is found in the Stenunge Å creek (white, black, blue and yellow) is also found in resembling proportions in the archipelago” (Karlsson et. al, 2018, 57). The author witnessed pellets in these colors when she conducted her sail-along with Karlsson to Gåsö in July 2019; some of them are visible in one of the photographs included in this article. This article understands what Karlsson et. al term leakage as a form of enclosure (Federici, 2004) of oceanic space, limiting marine health with endocrine-disrupting toxicants as part of a legacy of securing profit via extraction.

The chemical cluster in Stenungsund was established in the 1960s (Hållbar Kemi, n.d., n.p.) as part of a legacy of the Swedish chemical industry that rose to prominence as Sweden industrialized during an era of European colonialism and capital accumulation based on extraction. At the time of writing, Stenungsund is the center of Swedish petrochemical

production and home to the chemical companies Nouryon, Perstorp, Inovyn, Linde, and Borouge (Hållbar Kemi, n.d., n.p.), which is “[f]ormed from the combination of three regional leaders Borouge, Borealis, and NOVA Chemicals” (Borogue International, 2026). Because this case study focuses on research undertaken while Borealis was the relevant petrochemical producer and Borogue was formed in 2026, I will continue to refer to Borealis throughout this text. According to MRC Plast, Borealis was “a leading provider of innovative solutions in the fields of polyolefins, base chemicals and fertilizers” (MRC, 2021, n.p.).

Borealis’ Twitter biography, as of July 30, 2020, read, “We don’t just make ground-breaking plastics, chemicals and fertilizers. We make discoveries. #KeepDiscovering” (Borealis, n.d.b, n.p.). This lens of discovery extends colonial logics of extraction: the sentence structure focuses on “discovery,” invoking the doctrine of discovery and logic of terra nullius, which entail the rights to plunder and colonize. This article argues that by quantifying and publishing scholarship on pollution originating from Borealis’ facility, Karlsson et al. work to hold this company accountable for the plastic “leakage” (Karlsson et al. 2018, 59), or pollution, while it dominates and encloses terrain through the leakage of toxic products, with has harmful ecological consequences across the food web.

In a Tweet from July 28, 2020, Borealis wrote, “We welcome @Siegwerk_inks as a new strategic partner of #ProjectSTOP (@endoceanplastic) to support the creation of sustainable waste management systems in Indonesia to eliminate leakage of plastics into the environment. <https://bit.ly/2BC7AxN> #EndOceanPlastic #EverMinds” (Borealis 2020, n.p.). This announcement of a strategic collaboration to end ocean plastic serves as a greenwashing endeavor, simultaneously performing corporate responsibility and enacting neocolonialism. It is

part and parcel of the corporation's role in the transnational chemical landscape. According to the website *Industrihistoria i Väst* (The History of Industry in Western Sweden):

“The Swedish petrochemical industry originated with the companies Mo and Domsjö, Fosfatbolaget and Perstorp and their production of chemical products and plastics from various raw materials in the 1940s and -50s. It was at that time that people began to realize that petroleum would be the most inexpensive and best raw material for plastic production; simultaneously, American petroleum corporations wanted to strengthen their position in Europe” (Ohlsson, n.d., n.p.).

Stenungsund was selected as the center of the Swedish petrochemical industry due to the qualities of its location, including both physical geography and infrastructure. In private correspondence, Sanida Okanovik of Molekylverkstan Science Center in Stenungsund wrote to me: “it is said that the location, Stenungsund, was ideal for the establishment of the industry because of the sea, the railroad, the oil harbor, and the freeway” (2020). Ohlsson confirms this, writing that “[t]here were a number of reasons why Stenungsund was selected, emphasized Bengt Berglund: access to electric power via Vattenfall's new oil power plant, good access to land and water, and the strong local interest in the establishment of the industry. He emphasized the significant efforts that the municipality made over the years in the form of building housing, which was necessary for the establishment and expansion of the industry” (Ohlsson, n.d., n.p.).

I understand the location of Borealis and the broader Swedish petrochemical cluster as a case in what Jason W. Moore (Moore, 2015) conceptualizes as a world-ecological process. This

move articulates notions of center and periphery for the sake of accumulation in the context of Northern Europe. While Sweden was on the periphery of Europe economically in the 19th century, the chemical industry had the potential to move Sweden toward the center. Moore explains that “There was, in short, a ‘great frontier’ *within* Europe no less than outside it (Webb 1964) – and this great frontier was propelled by an interlocking web of *commodity* frontiers” (Moore, 2010, 190). According to Fredric Bauer and Lea Fuenfschilling:

“The Swedish chemical industry emerged in the 19th century, inspired by developments in Europe. In the early stages, a major driver for the inorganic chemical sector was the production of phosphate fertilizers, which was dominated by Fosfatbolaget. The organic chemical sector largely grew out of the Swedish forest industry: MoDo produced ethylene oxide from sulfite liquor available at their pulp mills, and Skånska Ättiksfabriken (later Perstorp) produced acetic acid, methanol and tar through dry distillation of wood. Fosfatbolaget also entered the organic chemical sector in the 20th century with their production of acetylene, used for vinyl chloride and subsequently PVC plastics (Berglund, 2010)” (Bauer and Fuenfschilling 2019, 176).

Bauer and Fuenfschilling argue that the chemical industry “is however an important industry in the domestic economy as it is one of the four large and influential energy intensive manufacturing industries together with the forest, mining, and steel industries. The industry employs around 33 000 people and accounts for around 17% of total Swedish exports” (Bauer and Fuenfschilling, 2019, 176-177). Moore’s analysis argues that “[a]t heart, this perspective offers a simple proposition: capitalism does not act upon nature so much as it unfolds *through*

nature–society relations. It is a protest against, and an alternative to, the Cartesian worldview that puts nature in one box, society in another (Moore 2009b)” (Moore, 2010, 190-191). This article follows Moore’s analytical framework: the Swedish petrochemical industry and today’s plastic pollution—the effects of which will last many centuries to come, given the time it takes plastics to fragment and the fact that they do not biodegrade—in the Stenungsund area function as a material legacy of emerging Swedish extraction of both materials and wealth under capitalism.

When the petrochemical cluster was established in the 1960s, this unfolded against a background of previously established material and immaterial logistics. Okanovik and Ohlsson both discussed the transportation possibilities that made siting the petrochemical cluster not only possible but also worthwhile to those deciding where to site the petrochemical industry. Furthermore, there was a strong corporate history in the region. Not only was, for example, Volvo based in the Gothenburg area, but there was also the history of “the only successful chartered company in Sweden” (Rönnbäck and Müller, 2020, 1) in the region, the Swedish East India Company.

Chartered companies, as Manu Karuka (2019) so elegantly argues, were instrumental to the rise of transnational capitalism, concentrating financial interests to serve the growing state. Moore argues that “[c]apitalism, as world-ecology, first emerged during the tectonic shift in the Atlantic world’s locus of power after 1450. It was a shift from power over territory to power over the fruits of commodity production and exchange” (Moore, 2010, 191). The Swedish East India Company, an early attempt at commodity exchange, “was founded in Gothenburg in 1731 as a typical chartered company” (Rönnbäck and Müller, 2020, 3) by Dutch East India Company

founder (Jameson, 1891, 91). Rönnbäck and Müller explain that “[t]he know-how and capital” for the Swedish company “came to a great extent from the prohibited Ostend Company in the Austrian Netherlands. Many employees of the Swedish company were of Scottish and Flemish origin”—like Usselinx—“and made their early careers in the Ostend Asia trade” (Rönnbäck and Müller, 2020, 3). In “*Ostindiska kompaniet: människorna, äventyret och den ekonomiska drömmen*,” Tore Frängsmyr explains that “[a]s early as the 1620s, Dutch merchants considered Gothenburg to be the ideal harbor and tried to get the king interested in the cause.” Meanwhile, van Ittersum articulates:

“The Swedish Crown had long since sought to increase the country’s trade (and thus its custom revenues, which determined its military and naval capabilities) by copying and adapting Dutch innovations in commercial organization, such as the chartered joint-stock company and the public bank. It was hardly coincidental, then, that the Swedish Chancellor should have instructed the newly-minted ambassador in March 1635 to introduce Willem Usselinx, the indefatigable promoter of a Swedish West India Company, to Louis XIII of France and his ministers, including, of course, Cardinal de Richelieu⁵” (van Ittersum, 2010, 398).

Dutch capital and expertise played a significant role in the establishment of Sweden as an imperial power, and Dutch influence in Sweden was part of a broader, world-ecological phenomenon wherein wealthy states sought to increase their wealth through chartered trade. While physical oceanography may know no borders, nation-states, their corporations, and the corporations that follow hardly operate solely under what might, in reductive terms, be called laws of nature. Raw materials for plastic pellets must be extracted and distributed for Borealis’—

and, more broadly, Borogue's—business structure to function, and pollution, or leakage, is an aspect of that process.

Feminist accountability, part II: Working relationally

Karlsson et al. conducted this study in a region where each of them lives and works, some fifty kilometers from their university and institute: Göran Broström, Bethanie Carney, Lena Gipperth, and Martin Hassellöv were all based at the University of Gothenburg and Lars Arneborg was based at the Swedish Meteorological and Hydrological Institute in Västra Frölunda, which lies within the city of Gothenburg, at the time of publication of “The Unaccountability Case of Plastic Pellet Pollution.” Therese M. Karlsson was completing her doctoral studies at the University of Gothenburg at the time of the article's publication. While marine pollution is a global problem with its roots in transnational corporations such as Borogue—which acquired Borealis in 2026; is jointly owned by Abu Dhabi-based state-owned energy company group XRG (ADNOC no date, XRG no date) and the Austrian petrochemical company OMV (Borogue International, no date a); and has its headquarters in Vienna with offices, hubs, and manufacturing sites on every continent except Australia (Borogue International, no date b)—it is also a local issue.

By conducting research local to where they live and work, Karlsson et. al carry out research grounded in specificity and relationship. This is in contrast to much of the research traditionally carried out in the natural sciences, which often relies on parachute research. In parachute research, researchers begin and complete projects in places they have limited or no stakes in. Karlsson et al., in contrast, work close to where they live, where they have stakes in

and relationships to the ecosystem and broader surroundings they study. “The Unaccountability Case of Plastic Pellet Production” functions as feminist research due to the research design and execution prioritizing relationships with and responsibility to place. In feminist research, relationality is a key concept. Relationships, more than they make claims, demonstrate commitments. Karin Amimoto Ingersoll’s citational practice in *Waves of Knowing: A Seascape Epistemology*, for example, demonstrates commitments to creating a “relationship rather than a gap” (Ingersoll, 2016, 143). She cites Hokule’a navigator Nainoa Thompson articulating, “For decades of my life, I made an agreement that I needed to touch salt water everyday. It was a commitment to the ocean because it was my source of well-being and strength. And in making the commitment, I made myself stronger’ (Thompson, 2008)” (Ingersoll, 2016, 134). In Ingersoll’s conceptualization of oceanic literacy, she attends to interdependence, interconnection, cyclicity, and fluidity by drawing on Bruce Blankenfeld; creative writing by drawing on Haunani Kay Trask; and feminist scholarship by drawing on Ramona Fernandez. Her citational practice takes place against the backdrop of her first-person writing along with images of herself—a Kānaka Maoli (Native Hawaiian) surfer and scholar—and mediations on the Indigenous practice of surfing. All of these practices together embody knowing through the sea in a refusal of patriarchal prescriptive knowledges. As indicated when she argues that “[s]eascape epistemology is not a knowledge of the sea. Instead, it is a knowledge about the ocean and the wind as an interconnected system that allows for successful navigation through them. It’s an approach to life and knowing through passageways” (Ingersoll 2016, 6), this knowledge is relational and thus feminist. Furthermore, Gouldhawke argues, “Settler claims to sovereignty and private property are also relational – that is to say, transactional. They reflect the relationship

between an individual citizen and their state, as well as a particular way of relating to one another and to the world – social and economic systems of domination, individualism, competition, and exploitation” (Gouldhawke 2020, 14). The forms of relationality individuals, including researchers, practice matter. “Relationality” is not one-size-fits-all.

Karlsson et al.’s relationships to the region demonstrate an attention to the area that is committed to engaging local knowledge, illustrating a commitment to the well-being of the ecosystem they work in that challenges key norms in traditions of positivist science focused on extraction and exploitation of data. Sailing to Gåsö to collect data, for instance, requires intimate knowledge of the archipelago, its tides, and its weather and current patterns. These knowledges depend on specificity that is a cornerstone of feminist research. In addition to living and working in the area, the authors describe their study region in detail: “The fjords inside the islands of Orust and Tjörn are not directly influenced by any larger rivers, so rather than a typical estuarine circulation the circulation in the fjords is to a large degree influenced by the stratification outside the fjords as well as local wind forcing. The main water exchanges are through the southern entrance and are caused by upwelling and downwelling of the coastal stratification (Björk et al., 2000) which is strongly related to regional wind patterns (Hansson et al., 2013)” (Karlsson et al. 2018, 53). Furthermore, the authors’ research takes “a multidisciplinary approach, including environmental surveillance, measurement of pellet fluxes, hydrographical mapping and modelling as well as legal studies and environmental impact assessments” (Karlsson et al. 2018, 52), embodying care for the area by attending to various aspects of land stewardship in the coastal context.

Laura Nader argues that focusing social scientific inquiry not on those who have been dispossessed but up on those who are responsible for dispossessing energizes students and fills gaps in social science literature. She asks, “What if, in reinventing anthropology, anthropologists were to study the colonizers rather than the colonized, the culture of power rather than the culture of the powerless, the culture of affluence rather than [sic] the culture of poverty?” (Nader, 1972, 5). This demonstrates inclusive rather than binary thought: “We aren’t dealing with an either/or proposition; we need simply to realize when it is useful or crucial in terms of the problem to extend the domain of study up, down, or sideways” (Nader, 1972, 8). Notions of inclusivity and expansive thought are contingent upon relationship and crucial to feminist research practices that prioritize relationships over prescriptivism. In “The Unaccountability Case of Plastic Pellet Pollution,” the authors attend to the source of plastic pollution (while still acknowledging the effects of the plastic pollution), taking an approach that studies up and models inroads for accountability processes with regards to this pollution by collecting data and formalizing these data as scholarship.

Karlsson’s Ph.D. thesis, *Source and Fate of Plastic Particles in Northern European Coastal Waters*, “showed continuous spills of plastic pellets associated with production, transportation, and storage” (Karlsson, 2020a, 2). Significant among Karlsson’s findings is that “although there is a legal framework in place, it is not being adequately enforced, which has resulted in limited responsibility and accountability for the involved actors” (Karlsson, 2020a, 2). Karlsson, like Rochman (2016) and others whose scholarship is foundational to plastic pollution literature, argues that “attempts to decrease plastic pollution need to be focused as close to the source as possible, since that is where prevention and mitigation measures will be most efficient”

(Karlsson, 2020a, 2).

Karlsson et. al (2018) discuss how although there are regulations intended to prevent this type of pollution, these regulations are not used to hold companies like Borealis accountable. The authors articulate it best:

“It can therefore be stated that there are several frameworks, on international, European and national levels in place that should hold the different actors involved responsible for preventive measures, and accountable for extensive spills of plastic into the environment. The suitable policies and legislations have, however, not been sufficiently implemented and enforced” (Karlsson et. al, 2018, 58).

In publishing their 2018 article, the authors both formalize the data they have collected and place social pressure on Borealis in the form of scholarship using a frame of accountability. While Karlsson and coauthors do not label their study as a feminist one, I contend that their approach to the research, contingent upon knowing the sea they research, begins a process of holding the company accountable that is in relationship to the site of the research as well as interpersonal relationships and thus employs a feminist approach to marine pollution.

Relational weaving following accountability: Feminist creative oceanography

Legal frameworks are fundamental for ensuring holding institutions accountable. Another method for attending to relationships, including fostering accountability, is artistic research. Astrida Neimanis argues, “[t]he fluid body is not specific to woman, but water embodiment is still a feminist question; thinking as a watery body has the potential to bathe new feminist

concepts and practices into existence” (Neimanis 2012, 89). Artistic research can enable the abilities of both the person who carries out the research and those who engage with the research to see things in unprecedented ways and to make choices accordingly. Artistic research in marine contexts, discussed in this article with the term creative oceanography, can expose and articulate findings that more traditional forms of marine science research do not. Creative methods can assist those of us in various relationships to oceans to conceive of ways to use this accountability in the service of thriving oceans at this historical moment characterized by the multifaceted violences of climate change. As Julie Sze writes, “for environmental justice movements, creative, generative, and bottom-up relationships are their *raison d’être*. So too are history, art, love, and refusal” (Sze, 2020, 9). I argue that these relationships can take forms including art pieces such as those I describe in this article; environmental policy instruments such as the Fossil Fuel Treaty and Global Plastics Treaty that are currently in the stages of conceptualization, discussion, and negotiation; and scholarship, syllabi, and other academic documents, especially interdisciplinary ones, which address expansive subjectivities through a multiplicity of perspectives and methods.

A rich body of creative work has set a precedent of creative oceanography. A small handful of these works includes Rachel Carson’s poetic meditation on the ocean, “Undersea” (Carson, 1937); Craig Santos Perez’ experimental poetry writing through colonialization on his home of Guåhan (Guam), *from unincorporated territory [hacha]* (2008); M. NourbeSe Philip’s book of poetry *Zong!* (2008), which traces the roots of contemporary capitalism to slavery through poetry taking apart the legal text from the murder of slaves aboard the Zong slave ship; Sheryl St. Germain’s ecopoetic “Midnight oil” (2013); Kathy Jetñil-Kijiner’s video poems such as “Anointed” (2018) documenting nuclear testing in the Marshall Islands in collaboration with

Dan Lin; Max Liboiron's digital photography piece "Plastic is land (eider ducks & Arctic char)" (2018) examining waste from the angle of the laboratory; and Lisa See's novel about women free divers on the island of Jeju, *The island of sea women* (2019). These works, in conversation with one other, illustrate some of the pervasive reach of imperialism in the oceans.

This practice of creative oceanography continues apace in scholarly literature. In "Plastic imaginaries," Kristina Lindström and Åsa Ståhl (2017) engage marine pollution such as fishing nets and other fishing gear, noting the waste's "sea smell" in their speculative work based on ethnographic research on pollution. Astrida Neimanis writes about art as amplifier (Neimanis, 2017, 55) and tool of embodiment. She explains: "Writing, images, objects, and other art forms can work in these ways, giving us access to an embodied experience of our wateriness that might otherwise be too submerged, too subcutaneous, too repressed, or too large and distant (or even too obvious, mundane, and taken for granted), to readily sense: a drought experienced at the back of a parched throat, a fishy ancestor swimming up my unfolding vertebrate body, a glacier melting felt in my gut" (Neimanis, 2017, 55). Providing that access to embodied experience—and thus knowledge—can name truths in a mode that fosters accountability.

Hydrofeminisms is, of course, particularly equipped to speak to embodied experience in a liquid context. This creates a venue for synthesis for previously separate knowledges to come together and offers possibilities for accountability. Neimanis writes, "water has other logics, other patternings and means of buoying our earthly world, too. Not least, water is a conduit and mode of connection" (Neimanis 2012, 86). The connection of oceans resounds across hydrofeminisms, Pacific studies, the blue humanities, and other literatures that require watery

knowledges. The ocean functions synthetically, both physically (through the hydrologic cycle and the carbon cycle) and conceptually; Neimanis describes water as a facilitator (Neimanis 2012, 87). María Ignacia Ibarra uses a hydrofeminist framework in the context of the privatization of water in Chile to argue that “the decolonial hydrofeminist approach proposes a critique of the neoliberal development model, denouncing the commodification of water and vindicating the situated knowledge of women who inhabit watersheds, rivers, and estuaries” (Ibarra 2025, 3), fostering accountability for those who benefit from the privatization of water in Chile with her use of a synthetic hydrofeminist lens.

Carrying out synthesis was a core component of the author’s methodological work studying plastic pollution in Bohuslän as the research process entailed combined notes taken from various site visits with shared themes including extraction, ecotoxicology, political economy, marine health, and gender to write poetry. The author’s artistic practice, including artistic research, is interested in sparseness, translation, and working in multiple languages: processes that allow [her] to collage together juxtaposed concepts and illuminate sites of possibility, always to expand the viewer’s imagination of what is materially possible. This work requires specificity in order to effectively create an affective experience for the reader. Swimming, sailing, surfing, and otherwise being at sea are also crucial to the author’s process-based practice of writing *through* as method. This research began with an interest in making an archive of poetry and photography to focus in the context of the ocean on some of what has been almost exclusively focused on on land, bringing the blue humanities to engage further with state and other imperial violences, addressing material possibility by inquiring into how patriarchy,

capitalism, and colonialism materialize through the oceans and how these systems perform gendered violence via marine pollution.

Poems that the author composed through this project's creative research have been published under the titles of "Temporary painting" (in *Rare Earth: The Ground is Not Digital*), "Purity subscription" (in excerpt in *g u e s t*), "Niche oceanographers" (in *Smooth Friend*), and "Barnacle" (in excerpt in *Paperbark Literary Magazine*) as well as exhibited as "Sometimes I want to be the log in the water" in a solo exhibition (2022) at Dörren: det visionära tomrummet (The Door: The Visionary Void) in Gothenburg curated by Kajsa G. Eriksson. "Barnacle" and "Sometimes I want to be the log in the water" most concisely illustrate interests shared with Karlsson et al. and in part result from the author's sail-along with Karlsson, and they are the poems excerpted and included, respectively, in this article.

In "Barnacle," the author writes:

"i could listen to the waves forever freshwater fluxes absolute body trust i told therese
that it's clear she belongs in the water and she said, "vet i fan, men jag trivs." is my favorite
thing about the ocean how it asks me to follow my body? trying 2 bear with myself at least
a week's worth of sand in my ears if plastic appears invisible if plastics appear invisible
Tell me what you want to do crust recycles my destiny, the aleutian trench
scour moat intense winnowing a hill in the middle of the ocean maintained by wind
energy when the water turned from fresh to brackish intertidal whelks
running scenarios about the future all the time pitted if centrifugal response
commodity thermoplastics meet plastic grazers

it feels that i have estranged myself you know? isotope chasing love 2 get caught up in
the failures of systems gesture goods multimillionaires, hollywood celebrities, and
special military programs oil predation polymetallic nodules loose observer
nothing is certain but death and plastic skärgården blir ett filter” (Weeks 2022, 11-13).

In the last line, “skärgården blir ett filter” translates to “the archipelago becomes a filter.”

Therese named in the poem is Therese M. Karlsson; the line Therese speaks in the poem translates to, “I don’t know, but I enjoy it.” In “Barnacle,” especially in the section excerpted here, the author has focused as a poet simultaneously on the embodied experience as discussed by Neimanis and structural violences of the petrochemical industry. This is a juxtaposition that continues throughout the body of poems the author composed in this research, including in “Sometimes I want to be the log in the water”:

“sometimes i want to be the log in the water
even in an inlet
outside swell
mediated wave

calcite
aragonite
calcite

tomorrow’s tide
freeway yarrow

grazing
burning
everything neatly individuated
three different basins
beyond the sensor threshold
internal reflection crisis

chemical senses
zonal jet
zero moon
no bioluminescence

my practice stays the same it is i who changes

cove phytoplankton report
a PVC pipe in the bay
flood watch
constructive waves

my images are only of seaweed
old growth grasses
modified bitumen and aggregate replacement
settler is the way i was raised
bat stars respond to phthalates

without thinking i go to the ocean
it looks tropical
ctenophores and holes
nets overloaded with plankton
empty moon
what's a stakeholder
benthic foram assemblage
grazing out
grazing in" (Weeks 2022, n.p.).

The author took notes for and synthesized "Sometimes I want to be the log in the water" primarily in California after the COVID-19 pandemic prevented her return to Sweden for this research. Nonetheless, the concerns are consistent, and this poem considers research the author carried out in Sweden in 2019, including her cache of seaweed photographs, her attention to polyvinyl chloride (one of the key products Borealis has produced), and a reference to grazing, which Karlsson et al. also reference when they name cattle and sheep (Karlsson et al. 2018, 52) in their study area. The two poems, despite their different forms, have shared rhythm and syntax,

reflecting connections across the global ocean: every part of the ocean is connected to every other part. Because of the liquid qualities of the ocean, the author's concerns were impossible to fully extricate from one another and their points of origin. These concerns included "waste, logistics, gender, energy, infrastructure, surveillance, climate change, statemaking, anticolonialism, kinship, and political economy. Both poems engage with geological time. "Benthic foram assemblages" references fossil records used to measure climate change's effects in the ocean, calcite and aragonite are common sea creature shell materials that are affected by ocean acidification and are also used in marine biogeochemistry research on climate change, and "oil predation" references wars fought for control of the transnational petrochemical economy.

Conclusion: Holding on to a livable planet

This paper has offered two tools for confronting violences of petrochemical pollution: relation-based feminist research and creative feminist research. Conducting feminist research based on relationships that involve local knowledge can empower researchers to activate accountability processes such as policies and legislation, and creative research can open up and embody modes of thinking about how to approach such accountability processes and formalize synthetic and embodied knowledges. In this article, I have argued that Karlsson et al.'s (2018) marine science research documents a commitment to holding on to the well-being of marine ecosystems on the Swedish west coast with fellow researchers in a practice of care that is formalized in the blue humanities. The author first elected to work with the concept of "holding" because she collected the poems she wrote for this research under the shared title of "Hold Fast," which is a play on both seaweed biology (seaweeds use holdfasts to anchor themselves so that

they can grow toward the sun in the water) and to speak to commitment to place—a place wrought with plastic pollution is one that has a limited ability to thrive; minimizing pollution is an aspect of caring for a location—in a feminist practice of care, responsibility, and accountability.

Possible tools to hold on to on a planet where plastic pollution in the oceans is a pressing problem include governance tools such as local policy, the United Nations Global Plastics Treaty, and financial mechanisms taxing petrochemical product producers, each of which takes a structural approach to a global problem. Karlsson et al.'s scholarship analyzed in this article provides a set of data and analysis on a local, relationship-based scale that demonstrates why activating such accountability tools is needed. Artistic research as presented in this article provides another feminist antidote to extractive ways of relating to land predicated on Cartesian dualism and extraction.

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Captions

Figure 1: Raw plastic pellets, or nurdles, (Figure 1a) and their context (Figure 1b), July 2019.

Alt text: A hand holds ten nurdles in varying shades of white, brown, and blue cupped in its palm against a granite rock background (Figure 1a); large pale pink granite rocks with lichen growing on them poke out of dark blue water; there are rust tones where the water meets the rocks (Figure 1b). Photos: author.