

Preventing Monster Fish Farms in Maine

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 OCEANA

Introduction

Maine's coastal way of life, its economy, and the natural beauty that draws millions to the state every year are all under threat. In 2021, a Norwegian-based company named American Aquafarms proposed to build one of the largest marine salmon aquaculture projects in the world in Maine. If ever approved, the massive fish farm would be located just off the coast of Acadia National Park.

After public outcry, the state government rejected American Aquafarms' permit applications, but the situation revealed a glaring lack of protections against similar pursuits in the future. Maine's current regulations leave the state vulnerable to large-scale industrial aquaculture projects that would upend the very things that make it a beloved home and destination: its unique scenic splendor and ecological importance, its deep and rich fishing traditions, and the coastal economy that depends on both.

To protect the future of Maine, the state must establish clear limits on the size of marine fish farms, including the total amount of fish by weight (or biomass), and the density of fish in a farm. By setting limits on biomass and stocking density, Maine can prevent monster fish farms from even being considered in its waters.



Finfish Farming: A Risky Endeavor

Fish farms in the ocean are inherently risky. Aquaculture for finfish like Atlantic salmon can devastate seafloor habitats and nearby waters.¹ These farms often use vast amounts of pesticides and chemicals to fend off disease and parasites.² Most farmed finfish species, including salmon, are carnivores, and feed for farmed finfish often includes fishmeal and fish oil from wild marine fisheries. So finfish aquaculture can potentially contribute to overfishing and increased pressure on wild fish populations.³ Fish waste, as well as uneaten feed, introduces nutrient pollution, including nitrogen and phosphorus, which can lead to harmful algal blooms.

Accidents can lead to other adverse outcomes, such as mass fish die-offs, escapes, and sea lice outbreaks, all of which have been reported around the world. Low oxygen events have suffocated fish by the hundreds of thousands. Storms and negligence have resulted in massive escapes of sometimes non-native fish into local ecosystems. And conditions at salmon farms are often ripe for outbreaks of parasitic sea lice, which can even spread to wild fish populations outside the pens.

None of these problems can be guaranteed to be contained within the farm. Intentional or accidental discharge of waste, disease, parasites, chemicals, and the escaped fish themselves can wreak havoc on surrounding ecosystems.⁴

And, of course, the bigger the farm, the bigger the potential problems.



Unlike finfish farming, properly managed shellfish and kelp farming can make the ocean healthier. Oyster and mussel farms remove excess nitrogen from the water column through filter feeding,⁵ and kelp farms can absorb agricultural runoff.⁶

Tried and True: Maine's Clean Coastal Economy



As a many generational Mainer, my life, work, and business is directly threatened by this proposal.

- Sarah Redmond (founder of Springtide Seaweed LLC, an organic seaweed aquaculture company located in the waters of Frenchman Bay, Maine)⁷

The health, abundance, and beauty of Maine's coasts are integral to the state's economy. In 2021, Maine's fisheries brought in \$890 million in revenue — \$730 million was from lobster catch alone.^{8,9} More than 4 million visits to Acadia National Park in 2021 made it the sixth-most visited national park in the United States and generated \$702 million in economic output that year.¹⁰

Established aquaculture operations contribute to the economy as well. Maine currently hosts scores of aquaculture projects, including oysters, mussels, kelp, salmon, and other finfish,¹¹ which together brought in \$72 million in 2021.¹² Small-scale, restorative aquaculture of shellfish and kelp can benefit the surrounding ecosystems, but marine finfish aquaculture is riskier and dirtier, and warrants careful oversight and clear, unambiguous regulation.

Maine does not have clear limits on the size and scale of marine aquaculture. The state's 24 existing marine finfish farming operations¹³ are permitted to be quite large, as compared with those in Norway and other regions. However, the operation proposed by American Aquafarms would produce more salmon per year than all 24 existing salmon farms in Maine combined.¹⁴

American Aquafarms' Disastrous Proposal Showcases Maine's Vulnerability

American Aquafarms proposed an industrial salmon farm in Frenchman Bay, right next to Acadia National Park. This massive fish farm would pollute the bay and displace fishermen and lobstermen. We must protect our coast from projects like American Aquafarms that have no place in Maine's waters.

Scale

If allowed, this would be the largest ocean-pen salmon farm in North America, covering a surface area the size of 15 football fields across two sites.



30 SALMON PENS

Two sites would house 15 salmon pens each with up to 742,000 fish per pen.

30,000 METRIC TONS

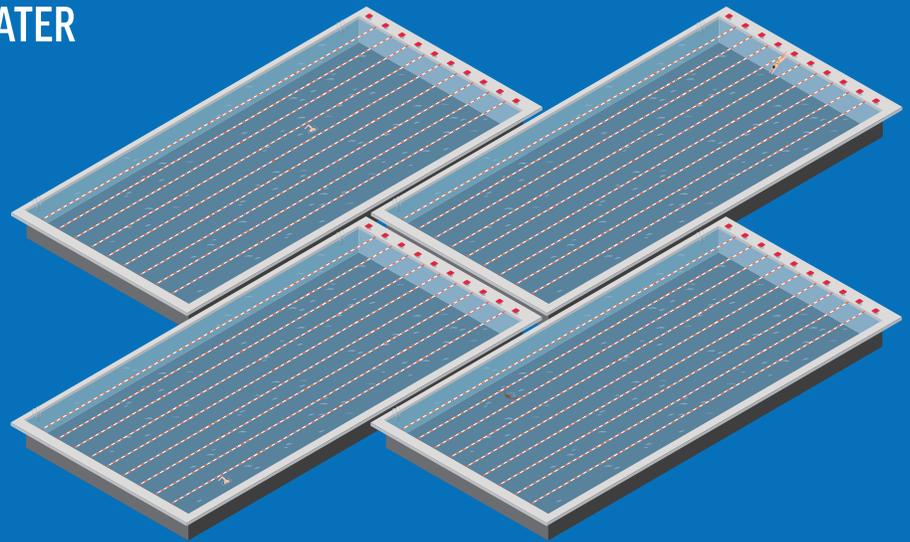
This farm would produce over 30,000 metric tons of salmon per year, making it one of the largest ocean-pen salmon farms in the world.

POLLUTION

Light, noise, and air pollution would turn a cherished oasis into something more resembling an industrial site.

4.1 BILLION GALLONS OF POLLUTED WASTEWATER PER DAY.

That's enough to fill four Olympic-sized swimming pools every minute.

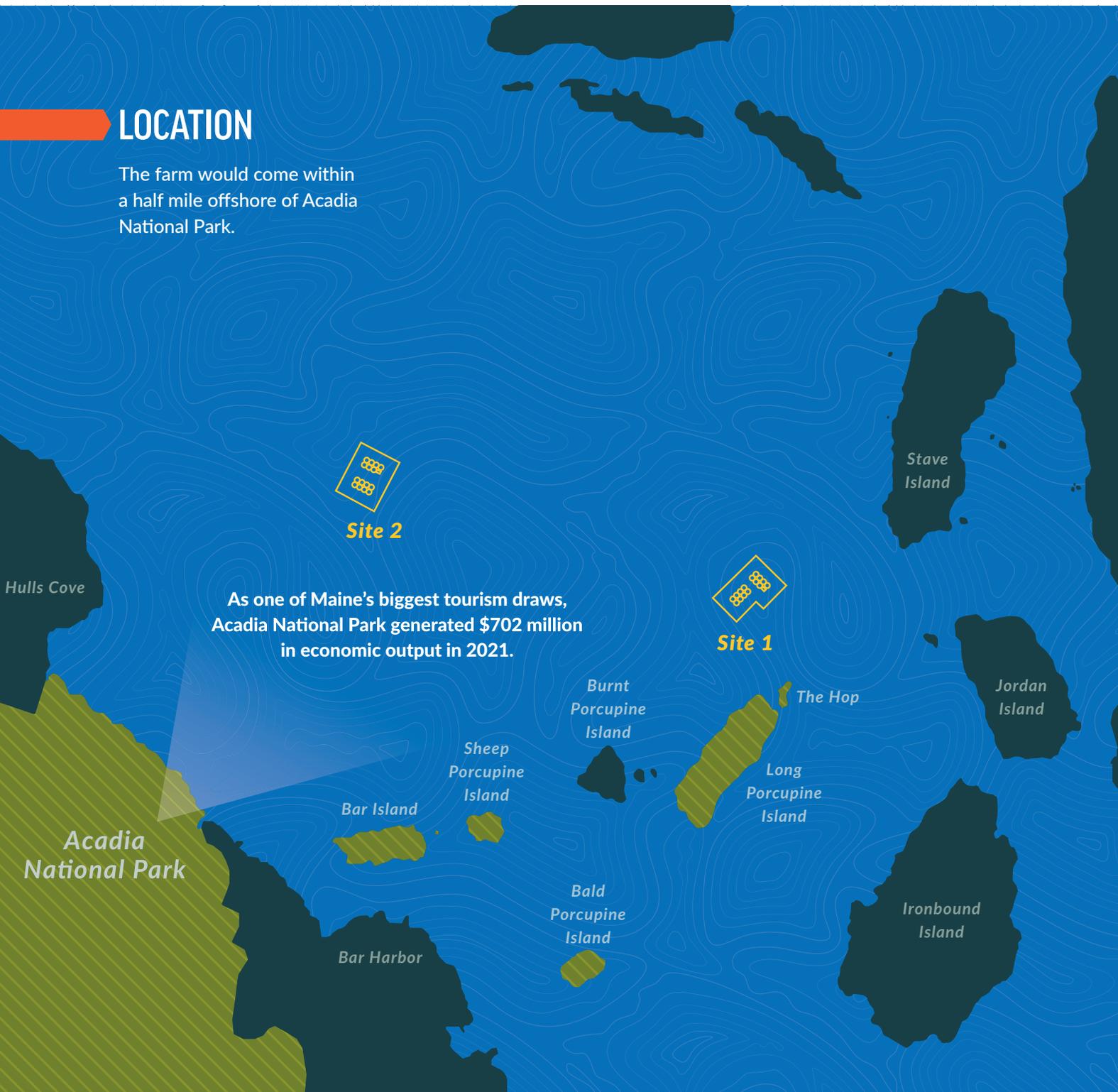


100% OF THE DISSOLVED NUTRIENT WASTE WOULD BE PUMPED FROM THE PENS INTO THE BAY, INCLUDING LARGE AMOUNTS OF NITROGEN.



LOCATION

The farm would come within a half mile offshore of Acadia National Park.



As one of Maine's biggest tourism draws, Acadia National Park generated \$702 million in economic output in 2021.

▶ THE SITES WOULD DISPLACE THE FISHERMEN AND LOBSTERMEN WHO CURRENTLY WORK THOSE WATERS. THE FARM'S POLLUTION OVER TIME COULD IMPACT LOCAL SPECIES AND THREATEN FRENCHMAN BAY'S FRAGILE ECOSYSTEM.



In 2021, a Norway-based company called American Aquafarms submitted permit applications for two Atlantic salmon aquaculture sites in Frenchman Bay, Maine,¹⁵ to be placed within a half mile offshore of Acadia National Park.¹⁶ The company proposed 15 net pens per site,¹⁷ totaling more than 120 acres of leased waters with industrial structures covering 20 acres on the surface — roughly the size of 15 football fields.¹⁸ This would be one of the largest reported near-shore marine salmon aquaculture operations in the world, producing 30,000 metric tons — 1,500 dump trucks¹-worth — of salmon every year.¹⁹

The massive industrial project would bring noise, light, air, and water pollution to an area famous for its natural beauty and tranquility. According to the permit applications, the farm would discharge 4.1 billion gallons of wastewater polluted with dissolved nitrogen and phosphorous every day.²⁰ That is enough wastewater to fill four Olympic-sized swimming pools every minute. Solid waste would be transported across the bay on barges multiple times per week.²¹ The surface footprint would displace lobstering and fishing that has been established in the area for generations, and the increased boat traffic would further disrupt existing fisheries.

As the public learned about the proposal, opposition grew among local residents, scientists, business owners, and politicians. The Maine Department of Environmental Protection held a two-hour public meeting that drew dozens of comments, ranging from fishermen to conservationists, to small-scale aquaculture farmers, and even the office of the Superintendent of Acadia National Park — all staunchly against the fish farm.²² Sixty-six percent of voters in Hancock County, where the operation would be located, opposed the project according to a poll commissioned by Oceana.²³ In public statements, both Gov. Janet Mills and former Gov. Paul LePage came out against American Aquafarms' proposal.²⁴

After a months-long review, the Maine Department of Marine Resources (DMR) rejected American Aquafarms' permit applications due to concerns about the company's egg sourcing.²⁵ In the time since its rejection, American Aquafarms has repeatedly indicated that it intends to reapply. The company closed on the purchase of its Gouldsboro salmon processing plant,²⁶ filed (and later withdrew) a lawsuit against the DMR,²⁷ and said in an interview with the local newspaper Ellsworth American, "We're not going anywhere."²⁸

Without clear limits on the size and scale of aquaculture in Maine, anyone can apply for permits to build an industrial operation of similar scale to American Aquafarms. In fact, nothing in Maine's current regulations will prevent an even bigger and more damaging and disruptive operation from applying for permits. More to the point, the global pressures that motivated American Aquafarms and multiple land-based salmon companies to look at Maine suggest that corporate interest in the state is just getting started.

Global Context: Salmon Aquaculture Around the World

Maine is the last state in the U.S. with salmon farms in its waters.

Global Fish Farming Incidents

Since 2000, there have been several thousand documented finfish farming incidents around the world.²⁹ Below are some of the more destructive and widely reported incidents from the last several years:

Washington, USA

- In 2017, a catastrophic net pen failure at a Cooke Aquaculture farm allowed more than 250,000 non-native Atlantic salmon to escape.³⁰ The state quickly announced a phase-out of non-native fish farming (to protect native fish populations) and then, in 2022, banned finfish farming altogether in state-controlled waters.³¹ This leaves Maine as the only state left in the United States with marine salmon farms in its waters.

Maine, USA

- In August 2021, more than 115,000 Atlantic salmon died in Cooke Aquaculture's net pens near Black Island from low oxygen levels.³²
- In 2019, the state ordered Cooke Aquaculture to pay \$156,000 for multiple violations, including breaching its permitted stocking density limits.³³

Canada

- The aquaculture company Cermaq halted a trial of a technology similar to the system proposed by American Aquafarms in Frenchman Bay. The trial ended due to water quality issues leading to fish mortality, raising serious questions about the technology.³⁴
- In Eastern Canada, an estimated 2.6 million salmon died across 10 sites run by Northern Harvest Sea Farms in 2019, likely due to elevated water temperatures and low oxygen conditions.³⁵
- In Western Canada, over 350 salmon mortality events were reported at marine finfish farms in British Columbia from 2018 to 2021.³⁶

Chile

- In 2016, massive algal blooms and warmer waters killed an estimated 27 million salmon and trout.³⁷
- In 2013, a farm run by the company AquaChile lost nearly 788,000 fish in one of the world's largest reported Atlantic salmon escape events.³⁸

Norway

- In 2019, an algal bloom suffocated an estimated 8 million farmed Atlantic salmon over the course of a few weeks. The event impacted at least nine salmon companies, with losses as high as 40,000 metric tons of salmon.³⁹

Australia

- A virus outbreak killed 1.35 million salmon in Macquarie Harbour in Tasmania over the course of just six months from 2017 to 2018. Tasmania's Environment Protection Authority responded to this mass mortality event with a significant reduction in the Macquarie Harbour's regional biomass limit to allow for environmental recovery.⁴⁰
- In 2020, roughly 50,000 salmon escaped when a net pen caught fire in the D'Entrecasteaux Channel near Bruny Island. The following week, up to 130,000 salmon escaped from a farm in Storm Bay through a tear in the net pen.⁴¹

Throughout the world, often in response to disasters, finfish farming countries have established limits on pesticide and antibiotic use, pollution discharge, and scale and density of farming operations to prevent escapes, die-offs, and sea lice outbreaks. Some governments — like Washington state, which recently joined its U.S. neighbors Alaska, Oregon, and California — have outright banned marine salmon farming in state-controlled waters due to the threat it poses to local ecosystems.⁴² Many of these safeguards were enacted after damage was already done.

How Maine's Regulations Stack Up

The best way to protect against overly large projects threatening coastal ecosystems and economies is to limit their size in the first place. Compare Norway's and Chile's limitations with Maine's:

Norway is the world's No. 1 producer of marine-farmed salmon. Since 2005, most of Norway has biomass limits of 780 metric tons per license for most projects, with 1-6 licenses generally allowed per site. Two far north counties have limits at 945 metric tons due to frigid water temperatures.^{43,44,48}

Chile, the world's No. 2 producer of marine-farmed salmon, has a 17 kg/m³ pen stocking density limit.⁴⁵

Maine has no statutory limits on biomass or stocking density. Maine has 24 existing salmon farms, all owned by the company Cooke Aquaculture. The highest reported biomass (salmon by weight) in Maine is 5,724 metric tons. The 24 existing farms have density limits of 30 kg/m³.⁴⁶

American Aquafarms proposed two sites, each measuring 9,200 metric tons in biomass (18,400 total metric tons) and up to 40 kg/m³ in stocking density.⁴⁷ This farm would be roughly double the limits for such farms in Norway and more than twice as dense as the legal limit in Chile, and far larger and denser than anything in Maine today.





A Wake-Up Call

If ever approved, a project like American Aquafarms would fundamentally change Maine's coastal way of life. Waste, noise and light pollution, displacement of locals from their traditional fishing grounds, the constant threat of a spill or escape, and the visual blight in full view of Acadia National Park all would become a "new normal."

This approval would set a precedent. American Aquafarms has made clear it will be back. And nothing in Maine's current regulatory framework will prevent its return, nor the consideration of similar projects from other companies. These projects could be just as big, if not bigger, and could encroach upon any of Maine's coastal regions.

Maine should look to Norway and Chile – the top two producers of farmed salmon in the world – for examples on how to limit the scale of salmon farms. Norway's biomass limits and 25 kg/m³ stocking density limit demonstrate caution. As does Chile's relatively strict pen stocking density limit of 17 kg/m³. These standards help prevent catastrophes. Maine's existing allowance of limitless biomass and stocking density applications would not meet the standards of Chile or Norway, and that must be considered in developing limits. The most important thing is for Maine to enact clear limits before more oversized applications flow in.

The application for American Aquafarms' monster fish farm should be the last of its kind to ever be considered in Maine. But as of now, the door remains open to this threat. To ensure Maine preserves its economy, its coastal ecosystems, and its way of life, the state should enact clear limits to the biomass and stocking density of marine finfish farms.

To sign Oceana's petition to protect Maine from monster fish farms, please visit [Oceana.org/SaveMaine](https://oceana.org/savemaine).

References

- ¹ Carballeira Braña CB, Cerbule K, Senff P and Stolz IK (2021) Towards Environmental Sustainability in Marine Finfish Aquaculture. *Frontiers in Marine Science* 8: 666662. doi: 10.3389/fmars.2021.666662
- ² Burrige L, Weis JS, Cabello F, Pizarro J and Bostick K (2010) Chemical use in salmon aquaculture: A review of current practices and possible environmental effects. *Aquaculture* 306: 7–23. doi: 10.1016/j.aquaculture.2010.05.020; Hamoutene D, Oldford V and Donnet S (2022) Drug and pesticide usage for sea lice treatment in salmon aquaculture sites in a Canadian province from 2016 to 2019. *Scientific Reports* 12: 4475. doi: 10.1038/s41598-022-08538-w; Love DC, Fry JP, Cabello F, Good CM and Lunestad BT (2020) Veterinary drug use in United States net pen Salmon aquaculture: Implications for drug use policy. *Aquaculture* 518: 734820. doi: 10.1016/j.aquaculture.2019.734820
- ³ Belton B, Little DC, Zhang W, et al. (2020) Farming fish in the sea will not nourish the world. *Nature Communications* 11: 5804. doi: 10.1038/s41467-020-19679-9; Carballeira Braña CB, Cerbule K, Senff P and Stolz IK (2021) Towards Environmental Sustainability in Marine Finfish Aquaculture. *Frontiers in Marine Science* 8: 666662. doi: 10.3389/fmars.2021.666662; Fisheries N (2019) Feeds for Aquaculture | NOAA Fisheries. In: NOAA. Available: <https://www.fisheries.noaa.gov/insight/feeds-aquaculture#what-type-of-food-do-farmed-fish-eat>. Accessed: Dec 13, 2022.; Fisheries N (2021) NOAA USDA Alternative Feeds Initiative | NOAA Fisheries. In: NOAA. Available: <https://www.fisheries.noaa.gov/noaa-usda-alternative-feeds-initiative>. Accessed: Dec 13, 2022.
- ⁴ Carballeira Braña CB, Cerbule K, Senff P and Stolz IK (2021) Towards Environmental Sustainability in Marine Finfish Aquaculture. *Frontiers in Marine Science* 8: 666662. doi: 10.3389/fmars.2021.666662
- ⁵ Rose JM, Bricker SB, Tedesco MA and Wikfors GH (2014) A Role for Shellfish Aquaculture in Coastal Nitrogen Management. *Environmental Science & Technology* 48: 2519–2525. doi: 10.1021/es4041336; Canfield K, Osinski S, Ayvazian S, Mulvaney K and Cobb D. (2021) How shellfish can help improve water quality. U.S. EPA Office of Research and Development. Available: https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=351693&Lab=CEMM. Accessed: Feb 22, 2023.
- ⁶ Gentry RR, Alleway HK, Bishop MJ, et al. (2020) Exploring the potential for marine aquaculture to contribute to ecosystem services. *Reviews in Aquaculture* 12: 499–512. doi: 10.1111/raq.12328; Fisheries N (2020) Seaweed Aquaculture | NOAA Fisheries. In: NOAA. Available: <https://www.fisheries.noaa.gov/national/aquaculture/seaweed-aquaculture>. Accessed: Feb 22, 2023.
- ⁷ (2021) American Aquafarms Public Meeting 10-28-21. In: *Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/ftp/projects/american-aquafarms/American%20Aquafarms%20Public%20Meeting%202010-28-21.mp4>. Accessed: Dec 20, 2022.
- ⁸ (2022) Maine Commercial Landings. State of Maine Department of Marine Resources. Available: <https://www.maine.gov/dmr/sites/maine.gov/dmr/files/docs/AnnualLandingsValue.table.pdf>. Accessed: Dec 15, 2022.
- ⁹ (2022) Historical Maine Lobster Landings. State of Maine Department of Marine Resources. Available: <https://www.maine.gov/dmr/sites/maine.gov/dmr/files/docs/lobster.table.pdf>. Accessed: Dec 15, 2022.
- ¹⁰ Cullinane Thomas C, Flyr M and Koontz L (2022) 2021 national park visitor spending effects: Economic contributions to local communities, states, and the nation. National Park Service.
- ¹¹ (2022) Table of Active Limited Purpose Aquaculture (LPA) Licenses. State of Maine Department of Marine Resources. Available: <https://www.maine.gov/dmr/aquaculture/maine-aquaculture-leases-and-lpas/table-of-active-limited-purpose-aquaculture-lpa-licenses>. Accessed: Dec 19, 2022.; (2022) Table of Standard and Experimental Aquaculture Leases. State of Maine Department of Marine Resources. Available: <https://www.maine.gov/dmr/aquaculture/maine-aquaculture-leases-and-lpas/aquaculture-lease-decisions-table>. Accessed: Dec 13, 2022.
- ¹² (2022) Total Maine Aquaculture Harvest Value. State of Maine Department of Marine Resources. Available: https://www.maine.gov/dmr/aquaculture/data/documents/TotalHarvestValue_2021.pdf. Accessed: Dec 19, 2022.
- ¹³ (2022) Table of Standard and Experimental Aquaculture Leases. State of Maine Department of Marine Resources. Available: <https://www.maine.gov/dmr/aquaculture/maine-aquaculture-leases-and-lpas/aquaculture-lease-decisions-table>. Accessed: Dec 13, 2022.
- ¹⁴ Liddel M and Yencho M (editor) (2022) Fisheries of the United States 2020. United States. National Marine Fisheries Service.
- ¹⁵ American Aquafarms, Gouldsboro. In: *State of Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/projects/americanaquafarms/index.html>. Accessed: Dec 21, 2022.; Dionne CL (2021) American Aquafarms Application for Maine Pollutant Discharge Elimination System (MEPDES) Permit Maine Waste Discharge License (WDL) Acceptance Letter. *State of Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/ftp/projects/american-aquafarms/Application%20Acceptance%20Final%20ltr.pdf>. Accessed: Dec 21, 2022.
- ¹⁶ Costigan, Mary (2021) Section 6 Surrounding Area Use, USA. In: *American Aquafarms Draft Lease Application for the Maine Department of Marine Resources*. Maine Department of Marine Resources. pi-xxvii. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Section-6-Surrounding-Area-Use-Long-Porcupine.pdf>. Accessed: Mar 22, 2023.
- ¹⁷ Costigan, Mary (2021) Section 1 Site Location, USA. In: *American Aquafarms Draft Lease Application for the Maine Department of Marine Resources*. Maine Department of Marine Resources. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Section-1-Site-Location-Long-Porcupine.pdf>. Accessed: Mar 22, 2023.
- ¹⁸ Costigan, Mary (2021) Cover Sheet and Executive Summary, USA. In: *American Aquafarms Draft Lease Application for the Maine Department of Marine Resources*. Maine Department of Marine Resources. p1-2. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Cover-Sheet-and-Executive-Summary-Long-Porcupine.pdf>. Accessed: Mar 22, 2023.

- ¹⁹ Costigan, Mary (2021) Cover Sheet and Executive Summary, USA. In: *American Aquafarms Draft Lease Application for the Maine Department of Marine Resources*. Maine Department of Marine Resources. p1-2. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Cover-Sheet-and-Executive-Summary-Long-Porcupine.pdf>. Accessed: Mar 22, 2023.
- ²⁰ (2021) Public Meeting on DEP review of proposed American Aquafarms net pen sites in Gouldsboro. State of Maine Department of Environmental Protection. Available: <https://www.maine.gov/dep/projects/americanaquafarms/Public%20Notice%209-28-21.pdf> Accessed: Dec 21, 2022; (2020) FB01 Long Porcupine Outfall Information Form with Attachments. State of Maine Department of Environmental Protection. Available: <https://www.maine.gov/dep/ftp/projects/americanaquafarms/applications/mepdes/FB01%20Long%20Porcupine%20Outfall%20Information%20Form%20with%20Attachments.pdf> Accessed: Dec 21, 2022.; (2020) FB02 Bald Rock Outfall Information Form with Attachments. State of Maine Department of Environmental Protection. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/DEP-FB02-Bald-Rock-U.S.-EPA-Form-2D-with-Attachments.pdf>. Accessed: Mar 22, 2023.
- ²¹ Costigan, Mary (2021) Section 3 Operations and Appendix 3, USA. In: *American Aquafarms Draft Lease Application for the Maine Department of Marine Resources*. Maine Department of Marine Resources. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Section-3-Operations-FB01-FB02.PDF.pdf>; https://usa.oceana.org/wp-content/uploads/sites/4/2023/03/Operations-Appendix-3-%E2%80%93-Mar-Fortune_images-Long-Porcupine.pdf. Accessed: Mar 22, 2023.
- ²² (2021) American Aquafarms Public Meeting 10-28-21. In: *Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/ftp/projects/american-aquafarms/American%20Aquafarms%20Public%20Meeting%2010-28-21.mp4>. Accessed: Dec 20, 2022.
- ²³ (2022) A Survey of Maine Voters. *Beacon Research*. Available: <https://usa.oceana.org/wp-content/uploads/sites/4/Maine-Fish-Farm-Poll-E-Oceana-March2022-Toplines-FINAL.pdf>. Accessed: Dec 20, 2022.; (2022) A Survey of Maine Voters: March 2022. *Beacon Research*. <https://usa.oceana.org/wp-content/uploads/sites/4/Maine-Fish-Farm-Poll-March2022-Charts-FINAL.pdf>. Accessed: Dec 20, 2022.; (2022) Hancock County Voters Oppose Monster Fish Farm Proposed for Frenchman Bay. *Oceana USA*. Available: <https://usa.oceana.org/press-releases/hancock-county-voters-oppose-monster-fish-farm-proposed-for-frenchman-bay/>. Accessed: Dec 20, 2022.
- ²⁴ (2022) Gov. Mills Announces Opposition to Monster Fish Farm Proposed for Frenchman Bay. *Oceana USA*. Available: <https://usa.oceana.org/press-releases/gov-mills-announces-opposition-to-monster-fish-farm-proposed-for-frenchman-bay/>. Accessed: Dec 20, 2022.; Sapin R (2022) Maine's candidates for governor denounce American Aquafarms ahead of election. *IntraFish*. Available: <https://www.intrafish.com/aquaculture/maines-candidates-for-governor-denounce-american-aquafarms-ahead-of-election/2-1-1271672>. Accessed: Dec 20, 2022.
- ²⁵ Keliher PC (2022) Chapter 24 and 12 M.R.S.A §6071(4) Review of AquaBounty. *State of Maine Department of Marine Resources*.
- ²⁶ Baldwin L (2022) American Aquafarms buys seafood plant. *The Ellsworth American*. Available: https://www.ellsworthamerican.com/archives/american-aquafarms-buys-seafood-plant/article_250cdc0e-46c7-5440-99a0-b479ce7e017d.html. Accessed: Dec 21, 2022.; Genter E (2022) American Aquafarms buys shuttered Gouldsboro seafood processing plant. *Bangor Daily News*. Available: <https://www.bangordailynews.com/2022/05/02/news/hancock/american-aquafarms-buys-shuttered-gouldsboro-seafood-processing-plant/>. Accessed: Dec 21, 2022.
- ²⁷ (2022) American Aquafarms, Inc. v. Maine Department of Marine Resources Petition for Review of Final Agency Action (Me. R. Civ. P. 80C). State of Maine Cumberland, SS. Superior Court Docket No. AP-22-15.; (2022) American Aquafarms, Inc. v. State of Maine Department of Marine Resources Stipulation of Dismissal. State of Maine Cumberland, SS. Superior Court Docket No. AP-22-15.
- ²⁸ DeAmbrose F (2022) American Aquafarms says, "We're not going anywhere". *The Ellsworth American*. Available: https://www.ellsworthamerican.com/news/american-aquafarms-says-we-re-not-going-anywhere/article_86ce6d3d-42be-56fe-b665-0e64142b440c.html. Accessed: Dec 21, 2022.
- ²⁹ Jackson D, Drumm A, McEvoy S, et al. (2015) A pan-European valuation of the extent, causes and cost of escape events from sea cage fish farming. *Aquaculture* 436: 21–26. doi: 10.1016/j.aquaculture.2014.10.040; Atalah J and Sanchez-Jerez P (2020) Global assessment of ecological risks associated with farmed fish escapes. *Global Ecology and Conservation* 21: e00842. doi: 10.1016/j.gecco.2019.e00842 ; Secretariat TB of C and Secretariat TB of C Mortality events at British Columbia marine finfish aquaculture sites - Open Government Portal. Available: <https://open.canada.ca/data/en/dataset/7fbb2662-391a-4df7-99b4-3343fa68fc93>. Accessed Mar 29, 2023. ; Føre HM and Thorvaldsen T (2021) Causal analysis of escape of Atlantic salmon and rainbow trout from Norwegian fish farms during 2010–2018. *Aquaculture* 532: 736002. doi: 10.1016/j.aquaculture.2020.736002 ; SNIFA - National Information System for Environmental Control. Category: Fish and Aquaculture. Available: <https://snifa.sma.gob.cl/Sancionatorio/Resultado>. Accessed Mar 29, 2023. ; Fish Escape from Salmon Farming | National Fisheries and Aquaculture Service. Available: <http://www.sernapesca.cl/informacion-utilidad/escape-de-peces-de-la-salmonicultura>. Accessed Mar 29, 2023. ; Ford JS, Pelletier NL, Ziegler F, et al. (2012) Proposed Local Ecological Impact Categories and Indicators for Life Cycle Assessment of Aquaculture. *Journal of Industrial Ecology* 16: 254–265. doi: 10.1111/j.1530-9290.2011.00410.x
- ³⁰ Clark D, Lee K, Murphy K and Windrope A (2018) 2017 Cypress Island Atlantic Salmon Net Pen Failure: An Investigation and Review. *Washington Department of Natural Resources*. Available: https://www.dnr.wa.gov/sites/default/files/publications/aqr_cypress_investigation_report.pdf?vdqi7rk. Accessed: Dec 13, 2022.
- ³¹ (2022) Commissioner Franz Ends Net Pen Aquaculture in Washington's Waters. *Washington State Department of Natural Resources*. Available: <https://www.dnr.wa.gov/news/commissioner-franz-ends-net-pen-aquaculture-washington%E2%80%99s-waters>. Accessed: Dec 13, 2022.; Franz, Hilary (2022) Commissioner's Order on Commercial Finfish Net Pen Aquaculture. Order No. 202211. *State of Washington Department of Natural Resources*. Available: https://www.dnr.wa.gov/publications/em_commissioners_order_net_pens.pdf. Accessed: Dec 13, 2022.
- ³² (2022) Cooke Aquaculture USA, Inc., (SWAN BI), Black Island, Frenchboro - Decision History. *State of Maine Department of Marine Resources*. Available: https://www.maine.gov/dmr/sites/maine.gov/dmr/files/leases/SWAN%20BI_Decision%20History.pdf. Accessed: Dec 21, 2022.; (2022) Cooke Aquaculture USA, Inc., (SWAN BIS), west of Black Island, Frenchboro - Decision History. *State of Maine Department of Marine Resources*. Available: https://www.maine.gov/dmr/sites/maine.gov/dmr/files/leases/SWAN%20BIS_Decision%20History.pdf. Accessed: Dec 21, 2022.
- ³³ (2019) Cooke Aquaculture USA Inc., Multiple Sites, Protection and Improvement of Waters and Solid Waste Activities, EIS Docket 2017-142-W, Administrative Consent Agreement (38 M.R.S. § 347-A). *State of Maine Department of Environmental Protection: Office of the Commissioner*. 21p.

- ³⁴ (2021) Valuable data gathered for further testing of SCCS. *Cermaq*. Available: <https://www.cermaq.ca/news/valuable-data-gathered-for-further-testing-of-sccs>. Accessed: Dec 21, 2022.
- ³⁵ Fisheries and Marine Institute of Memorial University of Newfoundland (2020) A Review of the 2019 Newfoundland and Labrador South Coast Cultured Atlantic Salmon Mortality Event. *Government of Newfoundland and Labrador*. 59p. Available: <https://www.gov.nl.ca/ffa/files/publications-pdf-2019-salmon-review-final-report.pdf>. Accessed: Feb 22, 2023.; Michael H (2020) A-2020-005. *Office of the Information and Privacy Commissioner Newfoundland and Labrador*. 12p. Available: <https://www.oipc.nl.ca/pdfs/A-2020-005.pdf>. Accessed: Feb 22, 2023.
- ³⁶ (2022) Mortality events at British Columbia marine finfish aquaculture sites. *Fisheries and Oceans Canada*. Available: <https://open.canada.ca/data/en/dataset/7fbb2662-391a-4df7-99b4-3343fa68fc93>. Accessed: Dec 21, 2022.
- ³⁷ Armijo J, Oerder V, Auger P-A, Bravo A and Molina E (2020) The 2016 red tide crisis in southern Chile: Possible influence of the mass oceanic dumping of dead salmon. *Marine Pollution Bulletin* 150: 110603. doi: 10.1016/j.marpolbul.2019.110603; Franklin J (2016) Toxic 'red tide' in Chile prompts investigation of salmon farming. *The Guardian*. Available: <https://www.theguardian.com/world/2016/may/17/chile-red-tide-salmon-farming-neurotoxin>. Accessed: Feb 22, 2023.; Montes RM, Rojas X, Artacho P, Tello A and Quiñones RA (2018) Quantifying harmful algal bloom thresholds for farmed salmon in southern Chile. *Harmful Algae* 77: 55–65. doi: 10.1016/j.hal.2018.05.004; Trainer VL, Moore SK, Hallegraef G, et al. (2020) Pelagic harmful algal blooms and climate change: Lessons from nature's experiments with extremes. *Harmful Algae* 91: 101591. doi: 10.1016/j.hal.2019.03.009
- ³⁸ Navarro L (2019) Here are the largest recorded farmed Atlantic salmon escapes in history. *IntraFish*. Available: <https://www.intrafish.com/aquaculture/here-are-the-largest-recorded-farmed-atlantic-salmon-escapes-in-history/2-1-388082>. Accessed: Feb 22, 2023.
- ³⁹ Cockburn H (2019) Eight million salmon killed in a week by sudden surge of algae in Norway. *The Independent*. Available: <https://www.independent.co.uk/climate-change/news/salmon-farming-norway-algae-killed-fishing-seafood-council-a8925581.html>. Accessed: Feb 22, 2023.; Klesty V (2019) Eight million salmon have died in Norway over the past week, and algae is the cause. *World Economic Forum*. Available: <https://www.weforum.org/agenda/2019/05/surge-of-algae-kills-millions-of-salmon-in-norway>. Accessed: Feb 22, 2023.; Magra I (2019) Millions of Salmon in Norway Killed by Algae Bloom. *The New York Times*. Available: <https://www.nytimes.com/2019/05/23/world/europe/salmon-norway-algae-bloom.html>. Accessed: Feb 22, 2023.; White C (2019) Norway's deadly algae bloom may be waning, government says. *SeafoodSource*. Available: <https://www.seafoodsource.com/news/aquaculture/norways-deadly-algae-bloom-may-be-waning-government-says>. Accessed: Feb 22, 2023.
- ⁴⁰ Ford W (2018) Statement of reasons for determinations made pursuant to Management Controls 3.3.1 and 3.3.5 of the Macquarie Harbour Marine Farming Development Plan October 2005. *Tasmania Environment Protection Authority*. 10p. Available: <https://epa.tas.gov.au/Documents/MACQUARIE%20HARBOUR%20DETERMINATIONS%201%20JUNE%202018%20TO%2031%20MAY%202020.pdf>. Accessed: Feb 22, 2023.; Galea S, Street E and Dunlevie J (2018) Macquarie Harbour salmon: 1.35 million fish deaths prompt call to 'empty' waterway of farms. *ABC News*. Available: <https://www.abc.net.au/news/2018-05-29/salmon-deaths-in-macquarie-harbour-top-one-million-epa-says/9810720>. Accessed: Feb 22, 2023.; Hoyle A (2018) Tasmania biomass limit slashed after 1.35 million fish deaths. *Fishfarmingexpert*. Available: <https://www.fishfarmingexpert.com/disease-huon-aquaculture-macquarie-harbour/tasmania-biomass-limit-slashed-after-135-million-fish-deaths/1380778>. Accessed: Feb 22, 2023.
- ⁴¹ Breen F (2020) Another farmed salmon mass breakout in Tasmanian waters stuns Huon Aquaculture. *ABC News*. Available: <https://www.abc.net.au/news/2020-12-03/suspicion-around-second-mass-salmon-escape-tasmanian-fish-farm/12947734>. Accessed: Feb 22, 2023.; Costelloe A (2020) Salmon in mass breakout after fire melts Huon Aquaculture pen in southern Tasmania. *ABC News*. Available: <https://www.abc.net.au/news/2020-11-23/salmon-breakout-after-fire-huon-aquaculture-tasmania/12912222>. Accessed: Feb 22, 2023.; Moore G (2020) Huon loses up to 130,000 fish in second escape in 9 days. *Fishfarmingexpert*. Available: <https://www.fishfarmingexpert.com/fish-escape-huon-aquaculture-salmon/huon-loses-up-to-130000-fish-in-second-escape-in-9-days/1216611>. Accessed: Feb 22, 2023.
- ⁴² (2022) Commissioner Franz Ends Net Pen Aquaculture in Washington's Waters. *Washington State Department of Natural Resources*. Available: <https://www.dnr.wa.gov/news/commissioner-franz-ends-net-pen-aquaculture-washington%E2%80%99s-waters>. Accessed: Dec 13, 2022.; Franz, Hilary (2022) Commissioner's Order on Commercial Finfish Net Pen Aquaculture. Order No. 202211. *State of Washington Department of Natural Resources*. Available: https://www.dnr.wa.gov/publications/em_commissioners_order_net_pens.pdf. Accessed: Dec 13, 2022.
- ⁴³ Forskrift om tillatelse til akvakultur for laks, ørret og regnbueørret (laksetilordningsforskriften) - Kapittel 3. Særskilt om tillatelse til akvakultur av matfisk på lokaliteter i sjøvann - Lovdata. Available: https://lovdata.no/dokument/SFO/forskrift/2004-12-22-1798/KAPITTEL_3#%C2%A715. Accessed: Mar 20, 2023.
- ⁴⁴ Misund B (2022) Cost Development In Atlantic Salmon and Rainbow Trout Farming: What Is The Cost of Biological Risk? *SSRN Electronic Journal* doi: 10.2139/ssrn.4307278
- ⁴⁵ Nacional B del C (2002) DECREE 319 | Approves Regulation of Protection Control and Eradication Measures of High Risk Diseases for Hydrobiological Species. In: www.bcn.cl/leychile. Available: <https://bcn.cl/32s3s>. Accessed Mar 20, 2023; Nacional B del C (2002) Search Results: Salmon; kg/m3; Biblioteca del Congreso Nacional | Ley Chile. In: www.bcn.cl/leychile. Available: <https://www.bcn.cl/leychile/consulta/listaresultadosimple?cadena=salmon&itemspagina=10&pagina=1>. Accessed: Mar 20, 2023.
- ⁴⁶ (2014) Cooke Aquaculture USA Inc. Cross Island, Cutler, ME MEG130025, Final Permit. *State of Maine Department of Environmental Protection*. Available: <https://www3.epa.gov/region1/npdes/permits/2014/finalmeg130025permit.pdf> <https://www3.epa.gov/region1/npdes/permits/2014/finalmeg130025permit.pdf>. Accessed: Feb 22, 2023.
- ⁴⁷ (2021) FB01 Long Porcupine Net Pen Aquaculture Supplemental Application Form with Attachments. *State of Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/ftp/projects/american-aquafarms/applications/mepdes/FB01%20Long%20Porcupine%20Net%20Pen%20Aquaculture%20Supplemental%20Application%20Form%20with%20Attachments.pdf>. Accessed: Feb 22, 2023.; (2021) FB02 Bald Rock Net Pen Aquaculture Supplemental Application Form with Attachments. *State of Maine Department of Environmental Protection*. Available: <https://www.maine.gov/dep/ftp/projects/american-aquafarms/applications/mepdes/FB02%20Bald%20Rock%20Net%20Pen%20Aquaculture%20Supplemental%20Application%20Form%20with%20Attachments.pdf>. Accessed: Feb 22, 2023.
- ⁴⁸ MOWI (2022) *Salmon Farming Industry Handbook 2022*. 118p.

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